Northern Technical University
الجامعة التقنية الشمالية

Bachelor of Science (B.Sc.) – Medical Instrumentation Techniques

البكالوريوس التقني - تقنيات هندسة الاجهزة الطبية

Table of Contents | جدول المحتويات

1. Mission & Vision Statement

Vision Statement

The vision of the department of medical instrumentation engineering techniques is to pioneering the education of medical device technologies and preparing innovative engineers to improve healthcare.

Mission Statement

The department of medical instrumentation engineering techniques trains its students on the design, development, and maintenance of modern medical devices used in the healthcare field. The department strives to enhance its students' skills and provide them with the necessary knowledge to keep up with the latest advancements in this field, as it plays a crucial role in improving the quality of healthcare in the health and medical institutions.

The department offers courses in areas such as medical engineering, medical electronics, medical imaging, biomedical devices, control and automation, engineering design, industrial design, advanced manufacturing, and other related fields. Additionally, the department employs the latest teaching techniques and methods, providing a supportive learning environment that encourages students to be creative and innovative.

2. Program Specification

Program code:	BSc-MITE	**ECTS**	240
Duration:	4 levels, 8 Semesters	**Method of Attendance:**	Full Time

The specification of medical instrumentation techniques engineering program defines the knowledge and skills needed for a career installing, calibrating, and maintaining medical instruments. This program emphasizes the development of technical expertise in the medical device sector, new medical techniques, hospital administration, and medical device maintenance. Typically, the program consists of classroom lectures, practical training, and on-site work.

Additionally, the program emphasizes the development of technical skills such as electrical circuit design, computer-aided design, microcontroller programming, estimation, and medical project management. The program aims to provide graduates with the skills necessary to work as medical instrument engineers, team leaders of medical engineering teams, medical device inspectors, cost estimators, and other technical positions in the medical engineering field.

3. Program Goals

Medical instrumentation techniques engineering is one of the modern disciplines concerned with the design, development, and maintenance of medical devices and equipment used in healthcare for diagnosis, treatment, monitoring, and analysis. It is one of the most essential departments, providing technical assistance to medical institutions and healthcare facilities. The general objectives of the department are:

1. Conducting scientific research in biomedical fields of study, with an emphasis on applied research, in order to keep up with the rapid development of science and technology.
2. Continuous communication with graduates contributes to their ongoing development and provides input for the department's curriculum development in response to the labor market.
3. Design and develop cutting edge medical devices and instruments that enhance the quality of patient care and facilitate optimal diagnosis and treatment.
4. Design and develop modern medical devices and tools that help improve the quality of healthcare and provide optimal diagnosis and treatment for patients.
5. Training and qualifying medical technicians and providing them with the necessary skills and knowledge to deal with modern medical devices, maintain and operate them properly.
6. Collaborating with physicians and healthcare institutions to provide the necessary technical support for operating medical devices correctly and effectively.

4. Student Learning Outcomes

Medical instrumentation techniques engineering program's unique goals and objectives that have an impact on the learning results for its students. The program student learning outcomes are:

Outcome 1

A. Knowledge and Understanding

1. Knowledge of medical materials and methods: Students can be able to demonstrate a strong understanding of medical materials and methods, including their properties, advantages, and limitations.
2. Knowledge of medical devices: Students can be able to demonstrate a strong understanding of using, calibrating, maintenance of medical devices.

3. Ability to read and interpret blueprints: Students should be able to read and interpret service manual catalog, as well including elevations, sections, and details.
4. Communication and teamwork: Students should be able to effectively communicate with medical staff, clients, patients and end user of medical devices, in addition to work collaboratively in a team environment.
5. Safety: students will be aware of safety in the medical sectors, such as the hazards of high electrical voltage, and potential hazards on a job site, such as, contacts with patients, and the spread of viruses, and risks of some medical devices such as radiation instruments.

Outcome 2

Oral and Written Communication

Graduates will be able to formally communicate the results of biological investigations using both oral and written communication skills.

Outcome 3

Laboratory and Field Studies

Students will acquire practical skills through laboratory experiments, which involve working with electronic components, using test and measurement equipment, and troubleshooting circuits and systems.

Outcome 4

Scientific Knowledge

Graduates will be able to demonstrate a balanced concept of how scientific knowledge develops, including the historical development of foundational theories and laws and the nature of science.

Outcome 5

Problem-solving and Analytical Skills

Students will develop problem-solving and analytical skills, allowing them to identify and solve complex engineering problems in the field of medical instrumentations techniques.

Outcome 6

Critical Thinking

Graduates will be able to use critical-thinking and problem-solving skills to develop a research project and/or paper.

Outcome 7

Subject-specific skills

• The ability to design simple and advanced programs in different programming languages and to control them or through them on electronic systems.

• The ability to think and address issues according to their algorithms and methods of work.

• Writing scientific reports, reading charts and analyzing digital data.

5. Academic Staff

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6. Credits, Grading and GPA

Credits

Northern Technical University is following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 25 student workloads, including structured and unstructured workload.

Grading

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				
NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

Calculation of the Grade Point Average (GPA)

1. The GPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

   GPA of 4-year B.Sc. degrees:

   GPA = [(1st module score x ECTS) + (2nd module score x ECTS) + ……] / 240

7. Curriculum/Modules

First Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
One	1	MITE101	Direct Current Circuit Analysis	تحليل دوائر التيار المستمر
	2	MITE102	Mechanical Engineering	الميكانيك الهندسي
	3	TECK101	Differentiation and Integration	التفاضل والتكامل
	4	TECK104	Physics	الفيزياء
	5	NTU100	Human Rights and Democracy	حقوق الانسان والديمقراطية
	6	NTU101	English Language	اللغة الانكليزية

Second Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
Two	1	MITE103	Alternating Current Circuit Analysis	تحليل دوائر التيار المتناوب
	2	MITE104	Chemistry	الكيمياء
	3	MITE105	Medical Physics	الفيزياء الطبية
	4	TECK103	Workshops	الورش
	5	NTU102	Computer	الحاسوب
	6	TECK102	Engineering Drawing	الرسم الهندسي
	7	NTU103	Arabic Language	اللغة العربية

Third Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
One	1	MITE201	Medical Laboratory Instrumentation	الأجهزة الطبية المختبرية
	2	MITE202	Principles of Electronic Circuits	مبادئ الهندسة الالكترونية
	3	MITE203	Anatomy and Physiology	التشريح و الفسلجة
	4	MITE204	Programming Language	لغة البرمجة
	5	TECK200	Differential Equations	المعادلات التفاضلية
	6	NTU200	Baath Crimes	جرائم البعث

Fourth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية

Two	1	MITE205	Measurements and Medical Transducers	القياسات والمحولات طبية
	2	MITE206	Clinical Chemistry Techniques	تقنيات الكيمياء السريرية
	3	MITE207	Electronic Circuits	الدوائر الالكترونية
	4	TECK201	Engineering Statistics	الاحصاء الهندسي
	5	NTU201	English Language II	اللغة الانكليزية II
	6	NTU202	Computer	الحاسوب
	7	NTU203	Arabic Language	اللغة العربية

Fifth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
One	1	MITE300	Medical Diagnostic Instrumentation	الأجهزة الطبية التشخيصية
	2	MITE301	Anatomy and Physiology	التشريح و الفسلجة
	3	MITE302	Signals and Systems	الانظمة والاشارات
	4	MITE303	Fundamentals of Communication Engineering	مبادئ هندسة الاتصالات
	5	TECK300	Engineering analysis	التحليلات الهندسية
	6	MITE304	Microcontrollers and Embedded Systems	المعالجات الدقيقة والانظمة المدمجة

Sixth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
Two	1	MITE305	Medical Electronic Systems	نظم الالكترونيات الطبية
	2	MITE306	Medical Communication Systems	نظم الاتصالات الطبية
	3	MITE307	Biomedical Sensors and Transducers	المستشعرات والمحولات الطبية الحيوية
	4	MITE308	Digital Signal Processing	معالجة الاشارة الرقمية
	5	MITE309	Power Electronics	الكترونيات القدرة
	6	MITE310	Medical Equipment Calibration and Testing	معايرة واختبار المعدات الطبية

Seventh Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية

One	1	MITE400	Medical Therapeutic Instrumentation	الأجهزة الطبية العلاجية
	2	MITE401	Medical Laser Systems	نظم الليزر الطبية
	3	MITE402	Digital Image Processing	معالجة الصور الرقمية
	4	MITE403	Clinical Engineering and Hospital Management	الهندسة السريرية وإدارة المستشفيات
	5	MITE404	Internet of Things (IoT) in Healthcare	انترنت الاشياء في الرعاية الصحية
	6	TECK400	Research Methodology	منهجية البحث

Eighth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
Two	1	MITE405	Radiation Engineering in Medical Applications	هندسة الاشعاع في التطبيقات الطبية
	2	MITE406	Artificial Intelligence in Medical Devices	الذكاء الاصطناعي في الاجهزة الطبية
	3	MITE407	Control Systems	نظم السيطرة
	4	MITE408	Medical Device Standards and Regulations	معايير وتنظيمات الاجهزة الطبية
	5	MITE409	Rehabilitation and Assistive Devices	اجهزة اعادة التأهيل والاجهزة المساعدة
	6	TECK401	Graduation Project	مشروع التخرج

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