Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditatio
Accreditation Department

Academic Program Description for medical instrumentation

2024

Academic Program Description Form

University Name: .Alayen Iraqi University

Faculty/Institute: Engineering technical collage.....

Scientific Department: .. Medical instrumentation.....

Academic or Professional Program Name: ..... Medical instrumentation.....

Final Certificate Name: .....BSc

Academic System: Annual

Description Preparation Date: 18|9|2024

File Completion Date: 18/2025

Signature:

Head of Department Name: Mohammed Ghaleb Mathem

Date: 25/1/2025

Signature:

Scientific Associate Name: Dr. Rawid N. Alubady

Date: 25/1/2025

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: 25/1/2025 Mohammed Hussien Haider

Signature:

Approval of the Dean

1. Program Vision

Qualifying distinguished and innovative competencies scientifically and with high skill and professional and ethical behavior that is able to keep pace with developments in the fields of medical instrumentation and facing the engineering scientific challenges to provide applicable solutions and community service.

2. Program Mission

Graduating distinguished technical engineers with qualified scientific and ethical levels and high efficiency in the fields of medical instrumentation technologies by providing an advanced scientific environment and specialized faculty to be able to complete the process of higher education and professional learning and provide community service within multidisciplinary work teams.

3. Program Objectives

PEO1: competently apply engineering methods to solve professional problems associated with the design, development, manufacture, and maintenance of medical instrumentation and related systems by understanding the social, ethical, and environmental context of their work.

PEO2: communicate effectively with diverse and international communities, collaborate competently in cross-functional teams, and assume leadership roles while meeting the expectations of their employers.

PEO3: habitually engage in technical professional development.

PEO4: Preparing applied engineers with the ability and skill to deal with different medical devices and keep pace with the advanced generations of new medical devices.

PEO5: Providing the student with the skills to install and operate devices and train on the use of medical devices and equipment and perform diagnostic and maintenance work.

PEO6: Providing the student with solid scientific knowledge and applied skills to enable him to diagnose malfunctions in electronic systems of diagnostic and therapeutic medical devices.

PEO7: Preparing a graduate with extensive and detailed knowledge of the new technologies in the field of medical devices and providing him with sufficient skills to make the necessary updates regarding the technology of engineering medical devices

PEO8: Vertical expansion towards creating postgraduate programs in the field of medical devices technology

PEO9: The department seeks to achieve the program's objectives in line with achieving international quality standards according to the available capabilities

4. Program Accreditation

UNDER PREPERATION

5. Other external influences

Labor market: where many seminars and meetings held to discuss academic and applied content with employers

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	8	20	9%	
College Requirements	١2	٥5	26%	
Department Requirements	٢4	١39	65%	
Summer Training				
Other				

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			Theoretical	Practical

Third	**MIET3101**	**Medical Diagnostic Devices 1**	2	2
Third	**MIET3102**	**Microprocessors**	2	2
Third	**MIET3103**	**Electromagnetic fields**	2	2
Third	**MIET3104**	**Signals and Systems**	2	2
Third	**MIET3105**	**Computer Programming and its Applications 11**	2	2
Third	**MIET3106**	**Project Management**	2	2
Third	**MIET3201**	**Medical Diagnostic Devices 11**	2	2
Third	**MIET3202**	**Medical electronic systems**	2	2
Third	**MIET3203**	**Medical Communication Systems**	2	2
Third	**MIET3204**	**Power electronics**	2	2
Third	**MIET3205**	**Project 1**	2	2
Third	**MIET3206**	**advanced computer programming**	2	2
Fourth	**MIET4101**	**Medical Therapeutic Devices 1**	2	2
Fourth	**MIET4102**	**Medical Laser Systems**	2	2
Fourth	**MIET4103**	**Control systems**	2	2
Fourth	**MIET4104**	**Biomedical Signal Processing**	2	2
Fourth	**MIET4105**	**Project 11**	2	2
Fourth	**MIET41XX**	**Elective 1**	2	2
Fourth	**MIET4201**	**Medical Therapeutic Devices 111**	2	2
Fourth	**MIET4202**	**Radiological Instrumentation Engineering**	2	2
Fourth	**MIET4203**	**Prosthetics and Robotics**	2	2
Fourth	**MIET42XX**	**Elective 11**	2	2
Fourth	**MIET42XXX**	**Elective 111**	2	2
Fourth	**MTU 1008**	**Professional Ethics**	2	2

8. Expected learning outcomes of the program

Knowledge	
A1	Knowledge and understanding of programs and work methods, especially in the field of medical equipment technology and maintenance..
A2	Knowledge and understanding of on-site supervision of implementation and engineering distribution works for devices within hospitals and treatment service centers.
A3	Knowing and understanding the components of medical instruments and how to solve their problems.
A4	Knowledge and understanding of electronic circuits for different medical devices and how to design them.
A5	Knowledge and understanding of different medical instrumentation systems and how to take advantage of them.
A6	Know the types of digital medical instrumentation systems and how to design and program them.
Skills	
B1	Design and implementation of electronic circuits for medical devices.
B2	Electronic systems maintenance skills for medical instruments.
B3	Training and qualifying technical engineers and technicians to operate and maintain medical devices and keep pace with the latest developments.
B4	Diagnosis and maintenance of malfunctions that occur in medical instruments and its computer accessories.
B5	Decision-making skills
Ethics	
C1	Planting the spirit of creativity among students to ensure that they can find innovative solutions to problems.
C2	Developing students' ability to present projects in designing electronic circuits for medical devices
C3	Sense of responsibility among students and psychological configuration to carry burdens.
C4	Development and planning to keep pace with what is compatible with the future needs of medical devices, working to achieve satisfactory results.

9. Teaching and Learning Strategies

1. Use the strategy of cooperation and assistance during the educational process.
2. Field visits to relevant ministries and educational institutions.
3. Organizing seminars, courses and workshops for students that encourage spiritual values.
4. Discussions during lectures.
5. Labs, PowerPoint and multimedia presentation.
6. Visual aids: Use visual aids such as pictures, charts, graphs, and diagrams.

10. Evaluation methods

1. Observing students' interaction with electronic circuits
2. Problems -based scenarios
3. Homework
4. Questionnaires
5. Short MCQs
6. Oral exam and direct questions in the class
7. Midterm exam
8. Electronic exams on the electronic platform
9. Final exam

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Doctor Engineer	–	5				5
Teaching assistant	١٢				12	

Professional Development

Mentoring new faculty members

1- Participation in training courses held within the college.

2- Participation in professional courses held at the college within the prescribed curriculum, as well as professional educational courses held at the Engineers Syndicate, which helps in developing the graduate's personal skills in professional and functional aspects.

3- Within the program there are specific personal development modules that provide faculty and students with the opportunity and encouragement to engage in relevant professional qualifications that allow them to reflect on their own professional development.

Professional development of faculty members
1- The department organizes different courses through the center of continuing education in several areas. 2- Planning for personal development Participation in training courses held within the college. 3- Continuous improvement and development of faculty members through training programs and workshops inside and outside the department in cooperation with other universities and the Ministry of Higher Education.

12. Acceptance Criterion
This is done according to the acceptance rate in Engineering Group (of Electrical Engineering Technical College, Medical Instrumentation Department) within the electronic form approved by the Ministry of Higher Education and Scientific Research (central admission). The central admission standards have been applied to the college since the 2017 academic year.

13. The most important sources of information about the program
1. Lectures given by the subject teacher. 2. Books available in the college library. 3. Books on the Al-Ayen University platform. 4. Any website related to studying electronic circuits. Using modern references, using the latest books used in international universities, and developing the curriculum annually in a way that is compatible with university education

14. Program Development Plan
1. Creating an urgency for innovation and change 2. Overcoming barriers that often get in the way of effective change efforts 3. Looking outward for innovative inspiration and best practices 4. Determining the need for new facilities 5. Budgeting for marketing and recruitment efforts 6. Improving the quality of academic programs by developing their objectives and outcomes. 7. Addressing weaknesses that may appear during the implementation of the

academic program and developing executive plans for continuous development and improvement.

8. Developing learning outcomes according to the characteristics of graduates in new programs, based on the opinions of consultants and the labor market.
9. Keeping pace with labor market developments and harmonizing with local community changes.
10. Responding to the requirements of national and international bodies regarding academic accreditation at the national or international level.

Program Skills Outline

					Required program Learning outcomes														
Year/Level	**Course Code**	**Course Name**	**Basic or optional**	**Knowledge**						**Skills**					**Ethics**			
				A 1	A 2	A 3	A 4	A 5	A 6	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4
Third	MIET3102	Microprocessors	Basic	X		X	X		X	X	X		X	X	X	X	X	X
	MIET3103	Digital Signal Processing	Basic	X	X	X	X	X		X		X	X	X	X	X		X
	MIET3104	Electrical Technology	Basic	X	X	X	X		X		X	X	X		X	X		X
	MIET3105	Medical Instrumentation 11	Basic		X	X	X	X			X	X		X	X	X	X	
	MIET3106	Medical Electronic Systems	Basic	X			X	X	X	X		X		X	X	X	X	X
	MIET3201	Medical Communication Systems	Basic	X	X		X	X	X	X	X		X		X	X	X	
	MIET3202	Power Electronics	Basic	X		X			X	X		X		X	X	X		X
	MIET3203	Systematic Training on Medical Instruments and Systems	Optional	X	X			X		X	X	X	X			X	X	X
	MIET3204	Computer Applications	Basic		X	X	X		X		X		X		X	X		X
Fourth	MIET4101	Medical Devices 111	Basic	X		X		X	X		X	X		X	X	X	X	

	MIET4102	Medical Laser Systems	Basic	X	X	X		X	X	X		X		X	X	X		X
	MIET4103	Control Systems	Basic	X	X	X			X	X	X	X		X	X		X	X
	MIET4104	Project Management	Optional	X		X	X	X			X	X	X			X	X	X
	MIET4105	Advanced Digital Design	Basic	X	X		X		X	X		X	X	X	X		X	X
	MIET4106	Radiological Instrumentation Engineering	Basic	X		X	X	X		X	X	X	X		X	X	X	X
	MIET4201	Computer Applications	Optional			X			X	X	X	X	X	X	X	X	X	
	MIET4202	Professional Ethics	Optional	X			X	X	X		X	X	X			X	X	X
	MIET4203	Project	Basic	X	X	X	X	X		X	X	X	X	X	X	X	X	X

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:
2. Course Code:
3. Semester / Year:
4. Description Preparation Date:
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
7. Course administrator's name (mention all, if more than one name)
Name: Email:
8. Course Objectives

Course Objectives	

9. Teaching and Learning Strategies

Strategy	

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Control System
2. Course Code:
MIET4103
3. Semester / Year:
Fourth (Yearly)
4. Description Preparation Date:
21/02/2025
5. Available Attendance Forms:
Compulsory
6. Number of Credit Hours (Total) / Number of Units (Total)
120 Hours /6 Unit
7. Course administrator's name (mention all, if more than one name)
Name: Abdelhady Ali Ellakany Email: Abdelhady_ali@alayen.edu.iq

8. Course Objectives	
Course Objectives	1. Knowledge the process of converting mathematical functions from th time domain to the frequency domain and vice versa. 2. Understanding how to analyze and solve control systems. 3. Understanding how to solve derivatives with different analytical methods.

9. Teaching and Learning Strategies	
Strategy	1. Academic lectures: providing a solid foundation upon which to develop 2. cognitive balance for students 3. Practical laboratory, which provides each student the expertise to help develop 4. Practical skills side and consolidate the principles necessary to carry out the projects 5. Discussions during lectures.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1st,	2	A1, A2, A4 B2, B5 C1, C2, C4	Introduction to control system	Theoretical lecture and laboratory	1. Short MCQs 2. Oral exam and direct questions in the class 3. Midterm
2nd,3th,	4	A1, A2, A4 B2, B5 C1, C2, C4	Laplace transform, applications, properties and	Theoretical lecture and laboratory	

			theories		exam 4. Electronic exams on the electronic platform 5. Final exam
4th,5th, 6th,	6	A1, A2, A4 B2, B5 C1, C2, C4	Transfer function, block diagram reduction, signal flow diagram	Theoretical lecture and laboratory	
7th, 8th,9th,	6	A1, A2, A4 B2, B5 C1, C2, C4	Time domain analyses, steady state analysis	Theoretical lecture and laboratory	
10th,11th,	4	A1, A2, A4 B2, B5 C1, C2, C4	Stability analysis, Routh,Nyquist	Theoretical lecture and laboratory	
12th, 13th,	4	A5, A6, A4 B1, B5, B3 C1	Root locus technique	Theoretical lecture and laboratory	
14th,15th, 16th	6	A2, A3, A4, A6 B1, B2, B3 C2, C4	Frequency domain analysis, gain margin, phase margin &bode	Theoretical lecture and laboratory	
17th, 18th	4	A2, A3 B1, B2, B5 C2, C4, C1	Frequency domain synthesis, phase lead	Theoretical lecture and laboratory	
18th , 19th,	4	A2, A3 B1, B2, B5 C2, C4, C1	Frequency domain synthesis, phase lead	Theoretical lecture and laboratory	
21st,22th, 23th, 24th,	8	PID controllers design	PID controllers design	Theoretical lecture and laboratory	
25th ,26th, 27th	6	A1, A4, A6 B1, B5, B3 C1, C4	State space representation &analysis	Theoretical lecture and laboratory	
28th ,29th, 30th	6	A2, A3 B1, B2, B5 C2, C4, C1	State diagram, analogue computer, Black diagram representation	Theoretical lecture and laboratory	

11.Course Evaluation

		Time/Number	Weight (Marks)	Week Due
Formative assessment	Semester 1 Quizzes	2	25% (25)	5, 10
	Semester 1 Quizzes	2	25% (25)	17, 25
	Projects / Lab.	1	10% (10)	Continuous
	Final Exam	3hr	40% (40)	30
Total assessment			100% (100 Marks)	

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. Modern control system By : OGATA
Main references (sources)	Lectures presented by the subject teacher
Recommended books and references (scientific journals, reports...)	**1.** Advanced 'Engineering Mathematics, 5th Edition Peter V. O Neil, Thomson

	Brooks /Cole, 2005. 2. Numerical Methods for Scient-ists and Engineers, R. W. Hmming, 2th Edition, 1986
Electronic References, Websites	• www.ocw.mit.edu www.math.uiowa.edu

Course Description Form

1. Course Name:

Medical Laser Systems

2. Course Code:

MIET4102

3. Semester / Year:

Fourth year (Yearly)

4. Description Preparation Date:

18/01/2025

5. Available Attendance Forms:

Compulsory

6. Number of Credit Hours (Total) / Number of Units (Total)

120 Hours /6 Unit

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Ali Shahin
Email: Ali.Ahmad@alayen.edu.iq

8. Course Objectives

Course Objectives	1. To understand the principle of laser action. 2. To understand optical fiber types and uses. 3. To understand types of detectors. 4. To understand laser-tissue interaction mechanisms.

9. Teaching and Learning Strategies

Strategy	1. Academic lectures: providing a solid foundation upon which to develop 2. cognitive balance for students 3. Practical laboratory, which provides each student the expertise to help develop 4. Practical skills side and consolidate the principles necessary to carry out the projects 5. Discussions during lectures.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1st, 2nd,	8	A1, A2, A3, B1, B2, B3, C1, C3	Introduction to light & Laser generation	Theoretical lecture and laboratory	1. Short MCQs 2. Oral exam and direct

3rd	4	A1, A2, A3, B1, B2, B3, C1, C3, C4, C5	Laser Generation – The Einstein Relations	Theoretical lecture and laboratory	questions in the class 3. Midterm exam 4. Electronic exams on the electronic platform 5. Final exam
4th & 7th	16	A1, A2, A3, B1, B2, B3, C1, C3,	Laser Types	Theoretical lecture and laboratory	
8th -14th	28	A1, A2, A3, B1, B2, B3, C1, C3, C4, C5	Light Propagation in glass-fiber optics	Theoretical lecture and laboratory	
15th	4	A1, A2, A3, B1, B2, B3, C1, C3, C4	Photonic Crystal Fiber	Theoretical lecture and laboratory	
16th - 19th	16	A1, A2, A3, B1, B2, B3, C1, C3, C4, C5	Receiver devices and circuit-quantum detectors	Theoretical lecture and laboratory	
20th, 21th	8	A1, A2, A3, B1, B2, B3, C1, C3, C4, C5	Thermal detectors	Theoretical lecture and laboratory	
22th, 24th	12	A1, A2, A3, B1, B2, B3, C1, C3, C4,	Photodiode light detectors	Theoretical lecture and laboratory	
25th & 28th	16	A1, A2, A3, B1, B2, B3, C1, C3, C4, C5	Laser medical applications	Theoretical lecture and laboratory	
29th & 30th	4	A1, A2, A3, B1, B2, B3, C1, C3, C4, C5	Laser Hazards	Theoretical lecture and laboratory	

11.Course Evaluation

		Time/Number	Weight (Marks)	Week Due
Formative assessment	**Semester 1 Quizzes**	2	25% (25)	5, 10
	Semester 2 Quizzes	2	25% (25)	17, 25
	Projects / Lab.	1	10% (10)	Continuous
	Final Exam	3hr	40% (40)	30
Total assessment			100% (100 Marks)	

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	Laser principles and applications, J. Wilson & J. F. B. Hawkes.
Main references (sources)	An Introduction To Lasers Theory And Applications, M N Avadhanulu, P

	S Hemne, 2012 .
Recommended books and references (scientific journals, reports...)	Laser tissue interaction, Markolf Neims, 2016.
Electronic References, Websites	www.mit.edu

Course Description Form

1. Course Name:
Computer Applications
2. Course Code:
MIET4106
3. Semester / Year:
Fourth year (Yearly)
4. Description Preparation Date:
21/02/2025
5. Available Attendance Forms:
Compulsory
6. Number of Credit Hours (Total) / Number of Units (Total)
90 Hours /4 Unit
7. Course administrator's name (mention all, if more than one name)
Name: Maysaa Aziz Mahdi Email: Maysaa.Aziz@alayen.edu.iq

8. Course Objectives

Course Objectives	1:knowing how to run the program. 2:Know the program interface. 3: Know how to create a presentation. 4: Knowing how to insert a new slide for your presentation. 5: Know how to enter the fees for the presentation. 6: Knowledge of adding images and data tables and controlling them.

9. Teaching and Learning Strategies

Strategy	Academic lectures that contribute to establishing a strong foundation to support the cognitive ability of the student practical laboratory, which provides practical experience to the student through practical experiments, which in turn support and promote the understanding and perception of the theoretical side.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1st, 2nd,3th, 4th,5th 6th	18	A1 B5, C1, C2, C3	***Basics of a PowerPoint application.***	Theoretical lecture and laboratory	Oral exam, paper exam, lab. Report
7th ,8th,9th,10th,11th 12th,13th,14th	24	A3, A4, , B5 C1, C4	***Build a new presentation, store the presentation,***	Theoretical lecture and laboratory	

			perform.		
15th,16th,17th,18th,19	15	A1,A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	***Insert a new slide (text or image) Enter notes Enter the two main titles for the slide.***	Theoretical lecture and laboratory	
20th,21th,22th,23th	12	B3, B5 C1,C3,C4	***Edit text and control In its form, control the colors and the floor of the slide.***	Theoretical lecture and laboratory	
24th,25th	6	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	***Adding natural images and their controls, adding charts from Excel, and databases from Access.***	Theoretical lecture and laboratory	
26th,27th,28th	9	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	***Transition between program slides, animation styles and sound effects for slides***	Theoretical lecture and laboratory	
29th,30th	6	A1,A2,A5,C1,C3	cad-cam	Theoretical lecture and laboratory	

11. Course Evaluation

		Time/Number	Weight (Marks)	Week Due
Formative assessment	**Semester 1 Quizzes**	1.5 hr	25% (25)	5, 10
	Semester 2 Quizzes	1.5 hr	25% (25)	17, 25
	Final Exam	3hr	40% (40)	30
Total assessment			100% (100 Marks)	

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. PowerPoint 2007: Part Stephen Moffat, The Mouse

	Training Company
Main references (sources)	PowerPoint 2013 Shelley Fishel
Recommended books and references (scientific journals, reports...)	PowerPoint 2013 Shelley Fishel
Electronic References, Websites	http://www.powerpointninja.com/

Course Description Form

1. Course Name:
Radiological Instrumentation Engineering
2. Course Code:
MIET4106
3. Semester / Year:
Third year (Yearly)
4. Description Preparation Date:
21/02/2025
5. Available Attendance Forms:
Compulsory
6. Number of Credit Hours (Total) / Number of Units (Total)
120 Hours /6 Unit
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Akram hatem Email: Akram.mohamad@alayen.edu.iq
8. Course Objectives

Course Objectives	• To provide the students with an understanding of the fundamental principles of physics and mathematics used in radiation protection, including radioactive processes. • To provide the students with an understanding of the basics of ionizing and non-ionizing radiation; radiation safety and protection; and an overview of the variety of health physics applications, especially as it pertains to the medical field and to radioactive materials research in academia. • To provide foundation training in radiation protection and the safety of radiation sources • Students will be aware of sources of radiation and understand the interactions of radiation with matter, known effects of the human body • The focus of the standard syllabus is on the radiation safety framework necessary for regulatory and operational controls for protection against ionizing radiation and the safe use radiation sources in all their applications • To introduce the trainee to a range of equipment and techniques used in Nuclear Medicine and Diagnostic Radiology and understand the effects of image acquisition parameters and post processing. • Using laboratory or field equipment, becoming familiar with radiation protection software • Use physics laboratories with equipment and procedures to conduct basic experiments on radioactivity and interaction of radiation with matter.

9. Teaching and Learning Strategies

Strategy	1. Academic lectures: providing a solid foundation upon which to develop 2. cognitive balance for students 3. Practical laboratory, which provides each student the expertise to help develop 4. Practical skills side and consolidate the principles necessary to carry out the projects 5. Discussions during lectures.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1,2	8	A1,A3,A4 B1,B2 C1,C2,C4	Atomic structure and atomic radiation.	Theoretical lecture and laboratory	1. Short MCQs 2. Oral exam and direct questions in the class 3. Midterm exam 4. Electronic exams on the electronic platform 5. Final exam
3,4	8	A1,A3,A4 B1,B2 C1,C2,C4	The nuclear and nuclear radiation.	Theoretical lecture and laboratory	
5,6	8	A1,A3,A4 B1,B2 C1,C2,C4	Interaction of radiation with matter.	Theoretical lecture and laboratory	
7,8,9	12	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Radiation detection & engineering of radiation detectors.	Theoretical lecture and laboratory	
10,11,12	12	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Engineering of radiation dosimetry and dosimeters.	Theoretical lecture and laboratory	
13,14	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Radiation protection.	Theoretical lecture and laboratory	
15,16	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Engineering of body scanners.	Theoretical lecture and laboratory	
17,18	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Production of x-rays.	Theoretical lecture and laboratory	
19,20	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Clinical radiation generators.	Theoretical lecture and laboratory	
21,22	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Dose distribution and scatter analysis.	Theoretical lecture and laboratory	
23,24	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	A system of dosimetric calculations.	Theoretical lecture and laboratory	

25,26	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Treatment planning.	Theoretical lecture and laboratory	
27,28	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Engineering of electron beam therapy.	Theoretical lecture and laboratory	
29,30	8	A3,A4,A5,A6, B1,B3,B4,B5 C1,C4	Brachy therapy	Theoretical lecture and laboratory	

11. Course Evaluation

		Time/Number	Weight (Marks)	Week Due
Formative assessment	**Semester 1 Quizzes**	2	25% (25)	5, 10
	Semester 2 Quizzes	2	25% (25)	17, 25
	Projects / Lab.	1	10% (10)	Continuous
	Final Exam	3hr	40% (40)	30
Total assessment			100% (100 Marks)	

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. R. S. Khandpur: Handbook of Biomedical Instrumentation, McGraw-Hill Publishing. Third Edition, 2014 2. Nuclear Engineering and Effects of Radiation, Rehab O. Abdel Rahman and Hosam Saleh 2018
Main references (sources)	Physics for scientists and engineers with the modern physics, eighth edition. By **John W. Jewett, Raymond A. Serway,**
Recommended books and references (scientific journals, reports...)	1. IAEA Program in the Field of Radiation Technology
Electronic References, Websites	• https://www.healthysimulation.com/ **https://radiologyresidentcorelectures.com**

Course Description Form

1. Course Name:

Medical Advanced Logic Design

2. Course Code:

MIET4105

3. Semester / Year:

Third year (Yearly)

4. Description Preparation Date:

21/02/2025

5. Available Attendance Forms:

Compulsory

6. Number of Credit Hours (Total) / Number of Units (Total)

120 Hours /4 Unit

7. Course administrator's name (mention all, if more than one name)

Name: MSC.Adian Lateef
Email: adian.Latif@alayen.edu.iq

8. Course Objectives

Course Objectives	1- Teaching the student to program microcontrollers (microcontrollers) of type in C language 2- Teaching the student how to use the microcontroller in various scientif 3- Designing and implementing various scientific projects based on the A microcontroller 4- Teaching the student to recognize advanced digital electronic circuits distinguish between them 5- Teaching the student to design digital electronic circuits 6- Identifying the types of digital memories and programmable electronic

9. Teaching and Learning Strategies

Strategy	1- Use the strategy of cooperation and assistance during the educationa 2. Field visits to relevant ministries and educational institutions. 3.Organizing seminars, courses and workshops for students that encou 4. Discussions during the lecture

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning m

1	2+2	A1, A2, A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Introduction to Arduino**	Theoretical lectu
2,3,4	6+6	A2, A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Arduino programming language** **Digital and analogy input of Arduino**	Theoretical le practica
5,6,7	6+6	A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Getting input from sensors to Arduino** **Matrix keypad interface with Arduino**	Theoretical le practica
,8,9,10	6+6	A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Liquid crystal display LCD interface with Arduino** **Arduino Hardware interrupt**	Theoretical le practica
11,12,13	6+6	A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Arduino power saving sleep modes Wave generator base on Arduino.**	Theoretical le practica
14,15	6+6	A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Interface GLCD with Arduino .**	Theoretical le practica
16,17,18	4+4	A2, A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Arduino troubleshooting** **TTL and CMOS family** **Astable multivibrators**	Theoretical le practica
18,19	6+6	, A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Decoders (4_to_16 decoders , the BCD decoder Seven _segment decoder).V**	Theoretical le practica
20,21	4+4	A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Random access memories (RAM)**	Theoretical le practica
22,23	4+4	A2, A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Read only memories (ROMS)**	Theoretical le practica
24,25	4 + 4	, A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Programmable Read only memories (PROMs)(EPROMs,UV,EPROMs,and EEPROMs)**	Theoretical le practica
,26,27	4 + 4	A2, A4, A6,B1 , B3, B4,,B5,C1, C3, C4	**Programmable Logic Arrays (PLAs)(PAL,FPLA and FPGA)** **First in _first out serial memories**	Theoretical le practica
28,29,30	4 + 4	A2, A4, A6,B1 , B3, B4,,B5,C1, C3, C4.	**Last in-first out memories (LIFOs)** **Universal Asynchronous Receiver Transmitter (UART)**	Theoretical le practica

11. Course Evaluation

		Time/Number	Weight (Marks)	Week Due
Formative assessment	**Semester 1 Quizzes**	2	25% (25)	5, 10
	Semester 2 Quizzes	2	25% (25)	17, 25
	Projects / Lab.	1	10% (10)	Continuous
	Final Exam	3hr	40% (40)	30
Total assessment			100% (100 Marks)	

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Digital fundamentals ninth editic 2- "Arduino Cookbook" Publishe

	Michael Margolis Inc., First Edition. 2011 United S
Recommended books and references (scientific journals, reports...)	1-Digital Principles and Logic D and N. Manna. 2007. 2- Digital Electronics Principles, chapter5. by Anil K. Maini 2007 3- Theory and Problems of digita chapter6. by ROGER L. TOKHE 4 -PIC microcontrollers Author:
Electronic References, Websites	

Course Description Form

1. Course Name:	
Medical Instrumentation III	
2. Course Code:	
MIET4101	
3. Semester / Year:	
Fourth year (Yearly)	
4. Description Preparation Date:	
20/02/2025	
5. Available Attendance Forms:	
Compulsory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
120 hrs /7 Unit	
7. Course administrator's name (mention all, if more than one name)	
Name: Dr. Ismail Shaaban Email: shaabanismail84@gmail.com	
8. Course Objectives	
Course Objectives	**1.** Competently apply engineering methods to solve professional problems associated with the design, development, manufacture, and maintenance of medical instrumentation and related systems by understanding the social, ethical, and environmental context of their work. **2.** Communicate effectively with diverse and international communities, collaborate competently in cross-functional teams, and assume leadership roles while meeting the expectations of their employers. **3.** Habitually engage in technical professional development. **4.** Preparing applied engineers with the ability and skill to deal with different medical devices and keep pace with the advanced generations of new medical devices. **5.** Providing the student with the skills to install and operate devices and train on the use of medical devices and equipment and perform diagnostic and maintenance work. **6.** Providing the student with solid scientific knowledge and applied skills to enable him to diagnose malfunctions in electronic systems of diagnostic and therapeutic medical devices. **7.** Preparing a graduate with extensive and detailed knowledge of the new technologies in the field of medical devices and providing him with sufficient skills to make the necessary updates regarding the technology of engineering medical

	devices. **8.** Vertical expansion towards creating postgraduate programs in the field of medical devices technology. **9.** The department seeks to achieve the program's objectives in line with achieving international quality standards according to the available capabilities

1. Teaching and Learning Strategies

Strategy	**1.** Academic lectures: providing a solid foundation upon which to develop. **2.** cognitive balance for students. **3.** Practical laboratory, which provides each student the expertise to help develop. **4.** Practical skills side and consolidate the principles necessary to carry out the projects. **5.** Short MCQs and homework. **6.** Discussions during lectures.

2. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
h and 2th1	10	A1, A2, A4 B2, B5 C1,C2,C4	Introduction to General Systems and Specialized Tools in General Surgery.	Theoretical lecture and laboratory	**1.** Short MCQs **2.** Oral exam and direct. questions in the class. **3.** Midterm exam. **4.** Electronic exams on the electronic platform. **5.** Final exam
h, 4th and 5th3	10	A5, A6, A4 B1, B5, B3 C1	Specialized systems and Inst. Suction Unit. Cardiac Defibrillators	Theoretical lecture and laboratory	
h and 7th6	10	A2, A3, A4, A6 B1, B2, B3 C2, C4	Ophthalmic microsurgical Inst. Laser in Ophthalmic Surgery	Theoretical lecture and laboratory	
h and 9th8	8	A2, A3 B1, B2, B5 C2, C4,C1	Open heart & cardiovascular	Theoretical lecture and laboratory	
10th	6	A1, A4, A6 B1, B5, B3 C1, C4	Heart – lung machine	Theoretical lecture and	

				laboratory
11th,12th and 13th	10	A2, A3, A4 B1, B2, B5 C2, C4,C1	Kidney machine	Theoretical lecture and laboratory
14th	6	A4, A6 B1, B2, B3 C2, C4	Electrosurgical unit (Surgical diathermy)	Theoretical lecture and laboratory
15th, 16th and 17th	10	A1, A2, A4 B2, B5 C1,C2,C4	Artificial organs – internal & external	Theoretical lecture and laboratory
18th, 19th and 20th	10	A5, A6, A4 B1, B5, B3 C1	Specialized systems and Inst. Dental system	Theoretical lecture and laboratory
21th and 22th	8	A2, A3, A4, A6 B1, B2, B3 C2, C4	Gynecology Inst.	Theoretical lecture and laboratory
23th and 24th	8	A2, A3 B1, B2, B5 C2, C4,C1	Gynecology Inst. Ultrasonic assisting device.	Theoretical lecture and laboratory
25th and 26th	8	A1, A4, A6 B1, B5, B3 C1, C4	Audio logical surgical units - ENT Chair	Theoretical lecture and laboratory
27th and 28th	8	A2, A3, A4 B1, B2, B5 C2, C4,C1	Anesthesia Machine	Theoretical lecture and laboratory
29th and 30th	8	A1, A2, A4, A6 B1, B2, B3 C2, C4	Intensive care units	Theoretical lecture and laboratory

3. Course Evaluation

s		Time/Number	Weight (Marks)	Week Due
Formative assessment	**Semester 1 Quizzes**	2	25% (25)	5, 10
	Semester 2 Quizzes	2	25% (25)	17, 25
	Projects / Lab.	1	10% (10)	Continuous

	Final Exam	3hr	40% (40)	30
Total assessment			100% (100 Marks)	

4. Learning and Teaching Resources

Required textbooks (curricular books, if any)	**1.** John G. Webster and Amit J. Nimunkar. 2020. Medical Instrumentation: Application and Design, 5th Edition. **2.** S. Ananthi ,2005. A text book of medical instruments. **3.** B H Brown, R H Smallwood, D C Barber,P V Lawford and D R Hose,1999," MEDICAL PHYSICS AND BIOMEDICAL ENGINEERING". • Lectures given by the subject teacher. • Books available in the college library. • Books on the Al-ayan University platform. • Any website related to studying medical devices. 🎬 Using modern references, using the latest books used in international universities, and developing the curriculum annually in a way that is compatible with university education.
Main references (sources)	• Lectures given by the subject teacher. • Books available in the college library. • Books on the Al-ayan University platform. • Any website related to studying medical devices. 🎬 Using modern references, using the latest books used in international universities, and developing the curriculum annually in a way that is compatible with university education.
Recommended books and references (scientific journals, reports...)	**1.** John G. Webster and Amit J. Nimunkar. 2020. Medical Instrumentation: Application and Design, 5th Edition. **2.** S. Ananthi ,2005. A text book of medical instruments. **3.** B H Brown, R H Smallwood, D C Barber,P V Lawford and D R Hose,1999," MEDICAL PHYSICS AND BIOMEDICAL

	ENGINEERING".
Electronic References, Websites	Any website related to studying Medi Instrumentation.