

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Professional ethics		Module Delivery
Module Type	S		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	17041ATU		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	2	Semester of Delivery	
Administering Department	Medical Physics and Radiation Therapy Engineering	College	College of Technical Engineering
Module Leader	Ahmed Adel Jumaah	e-mail	ahmedadlj7@gmail.com
Module Leader's Acad. Title	Assistant Lecture	Module Leader's Qualification	M.SC.
Module Tutor		e-mail	
Peer Reviewer Name	Dr. Mohammed Kadhimi Alhachami	e-mail	Mohammed.kadhimi@alayen.edu.iq
Scientific Committee Approval Date	7/10/2025	Version Number	1

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف الـهـادـة الـدراسـية ونواتج التعلـم والـمـحتـويات الـارنـشادـية

Module Objectives أهداف الـهـادـة الـدراسـية	The objectives of a course in the curriculum of professional ethics can include: 1. Understand the ethical principles that underpin professional practice: Students in the course should understand the fundamental principles of ethics that are relevant to their professional practice, such as respect for autonomy, beneficence, non-maleficence, and justice. 2. Identify and analyze ethical dilemmas in professional practice: Students should learn how to recognize and analyze ethical dilemmas that can arise in their professional practice. This includes understanding factors that contribute to ethical dilemmas, such as conflicting obligations, power imbalances, and limited resources. 3. Develop decision-making skills to resolve ethical dilemmas: Students should learn how to apply ethical principles to make sound decisions when faced with ethical dilemmas. This includes developing skills in ethical reasoning, communication, and decision-making that can be applied across different contexts. 4. Understand the role of ethical codes and guidelines in professional practice: Students should be familiar with ethical codes and guidelines that govern their professional practice, including their scope, purpose, and limitations. This includes understanding how to navigate conflicts between different ethical codes and guidelines that may apply in a given situation. 5. Develop strategies for ethical self-care and self-discipline: Students should learn how to engage in ongoing ethical reflection and self-assessment to foster ethical self-awareness and self-discipline. This includes developing strategies for coping with ethical stress, handling personal biases, and cultivating empathy and compassion in professional practice. 6. Be able to apply ethical principles in professional practice: Lastly, students should be able to apply ethical principles and relevant ethical codes and guidelines in their professional practice to ensure that they are acting in an ethical manner.
Module Learning Outcomes مخرجات التعلـم الـلـهـادـة الـدراسـية	The learning outcomes subject in the curriculum of professional ethics in health physics and radiotherapy can include: 1. Demonstrating an understanding of the ethical principles that underpin healthcare practice: Students should be able to identify and explain the principles of autonomy, beneficence, non-maleficence, and justice, and understand how they apply in the context of healthcare practice in health physics and

	radiotherapy. 2. Recognizing and analyzing ethical issues in health physics and radiotherapy: Students should be able to recognize and analyze ethical dilemmas that arise in the context of health physics and radiotherapy practice, such as issues related to patient privacy, informed consent, and radiation safety. 3. Developing skills in ethical decision-making: Students should develop skills in ethical reasoning and decision-making that can be applied to ethical issues and dilemmas in health physics and radiotherapy. This includes considering ethical principles, regulations, and codes of conduct when making decisions. 4. Understanding the importance of professional conduct and behavior: Students should demonstrate an understanding of the importance of professional conduct and behavior in health physics and radiotherapy practice. This includes understanding professional expectations, responsibilities, and accountabilities, as well as the consequences of unethical behavior. 5. Being able to apply ethical principles and guidelines in practice: Students should be able to apply ethical principles and guidelines in health physics and radiotherapy practice to ensure that they are providing safe, effective, and ethical care to patients. This includes understanding the importance of informed consent, maintaining patient confidentiality, and practicing radiation safety. 6. Demonstrating an ability to engage in ethical reflection and continuous improvement: Students should demonstrate an ability to engage in ethical reflection and continuous improvement of their ethical practice. This involves reflecting on the ethical implications of their decisions, and seeking out opportunities to learn and improve their understanding of ethics in health physics and radiotherapy.
Indicative Contents المحتويات الإرشادية	The guidance contents of the curriculum of professional ethics in health physics and radiation therapy can include: 1. Introduction to Ethics: An overview of ethics as a discipline, and how ethical principles apply to healthcare practice in health physics and radiation therapy. 2. Professional Codes of Conduct: An exploration of the codes of ethics and professional conduct that guide healthcare practitioners in health physics and radiation therapy. 3. Ethical Principles: An explanation of key ethical principles such as autonomy, beneficence, non-maleficence, and justice, and how they apply to healthcare practice in health physics and radiation therapy. 4. Informed Consent: An understanding of the importance of informed consent and how to obtain it effectively from patients undergoing radiation therapy treatments.

	5. Confidentiality: The importance of patient confidentiality and how to maintain it when dealing with sensitive health information and patient data in the context of radiation therapy treatments. 6. End-of-Life Care: An exploration of ethical issues surrounding end-of-life care in health physics and radiation therapy. 7. Patient Safety: An understanding of the importance of patient safety, and the ethical considerations of maximizing benefits while minimizing risks in radiation therapy treatments. 8. Professionalism: An understanding of professionalism as it pertains to healthcare practice in health physics and radiation therapy, including ethical decision-making, conflict resolution, and the practice of compassionate care. 9. Cultural Competence: An understanding of the role of cultural competence in healthcare practice in health physics and radiation therapy and how to provide equitable care regardless of cultural background or ethnicity. 10. Regulatory Requirements: An understanding of the regulatory requirements for healthcare practice in health physics and radiation therapy in terms of professional ethics, patient safety, and quality assurance. These guidance contents aim to equip students with the necessary knowledge, skills, and attitudes that will enable them to provide ethical healthcare services in health physics and radiation therapy, uphold ethical standards, and demonstrate a commitment to patient-centered care.
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategies used in the curriculum of professional ethics in health physics and radiation therapy can include: 1. Lectures: Lectures can be used to introduce students to the key ethical principles, codes of conduct, and regulatory requirements that guide healthcare practice in health physics and radiation therapy. 2. Case Studies: Case studies can be used to facilitate critical thinking and problem-solving skills in ethical decision-making, allowing students to apply theoretical concepts to practical scenarios and real-life examples.

	3. Group Discussions: Group discussions can encourage peer-learning and collaboration while allowing students to reflect on their own experiences and values in relation to ethical issues in health physics and radiation therapy. 4. Role-Playing: Role-playing can be used to simulate scenarios that require ethical decision-making, allowing students to practice the skills and knowledge required to navigate complex ethical dilemmas in radiation therapy treatments. 5. Guest Speakers: Guest speakers, such as practicing healthcare professionals, can provide students with an insight into the ethical challenges and opportunities they face in their day-to-day work in health physics and radiation therapy. 6. Debates: Debates can be used to encourage students to engage with controversial ethical issues in health physics and radiation therapy and encourage critical thinking and argumentation skills. 7. Reflective Writing: Reflective writing assignments can be used to encourage students to reflect on their own values, beliefs and assumptions, and how these relate to their practice in health physics and radiation therapy. 8. Online Resources: Online resources, such as ethical decision-making tools and case studies, can be used to support students' learning and engagement with ethical issues in health physics and radiation therapy. These learning and teaching strategies aim to provide students with a wide range of opportunities to engage with ethical issues in health physics and radiation therapy, develop critical thinking and ethical decision-making skills and cultivate a commitment to patient-centered care.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال	75		

الفصل	
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Module Evaluation					
تقييم الهادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3 and 7	LO #3, and #5
	Assignments	2	10% (10)	1 and 6	LO #1, #2 and #4, #5, #6, #8, #9, #10
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	9	LO #7
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
البرنامج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to professional ethics in health physics and radiotherapy - Key ethical principles and standards in healthcare - Historical and cultural perspectives on ethics in healthcare - Codes of conduct and regulatory requirements
Week 23-	Ethical decision-making in healthcare - Introduction to models of ethical decision-making - Case studies to demonstrate ethical theories and principles - Role-playing exercises to simulate ethical dilemmas in radiation therapy
Week 5-4	Patient-centered care and ethical considerations - Ethics and rights of patients receiving radiation therapy - Patient autonomy and informed consent - Issues of privacy, confidentiality, and disclosure in radiation therapy
Week 7_6	Responsibilities of healthcare professionals - Professional standards and behaviors - Ethical considerations in interprofessional relationships

	- Ethical boundaries and challenges in healthcare
Week 9_8	Diversity and cultural competence in healthcare - Cultural competence in combating health disparities - Ethical considerations in providing radiation therapy to vulnerable populations - Awareness of implicit bias and its effects on patient care
Week 11_10	Organizational ethics in healthcare - Ethical challenges in the healthcare system - Ethical decision-making in healthcare organizations - Creating an ethical organizational culture
Week 13_12	Technology and ethical considerations - The impact of technology on healthcare delivery - Ethical issues with technological advancements in radiation therapy - Guidelines for ethical use of technology in healthcare
Week 15_14	Ethical leadership and professionalism - Ethical leadership and organizational culture - Professionalism and integrity in healthcare - Personal and professional values and ethics

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	.	
Recommended Texts		
Websites		

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	راسب (قييد السمعة)	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks 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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	advance Mathematics		Module Delivery
Module Type	S		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	17036ATU		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	2	Semester of Delivery	
Administering Department	Department of Health Physics and Radiotherapy Engineering Technology	College	Engineering Technical College
Module Leader	Mohammed Taimah Yasser	e-mail	Kjhg879@gmail.com
Module Leader's Acad. Title	Assistant lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Dr. Mohammed Kadhimi Alhachami	e-mail	Mohammed.kadhimi@alayer.edu.iq
Scientific Committee Approval Date	01/09/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of differential equation . 2. To understand infinite series and its applications. 3. To understand vectors and vector valued functions. 4. To understand functions of several variable. 5. To understand double integral , line integral and vector analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Solving ordinary differential equations. 2. Converting functions to power series forms such as Taylor's series. 3. Using polar coordinates to solve problems. 4. Solving problems related to vector algebra. 5. Solving problem related to double integrals. 6. Solving problems of multi-variable functions.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
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Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	15% (15)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	----	--	--	--
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – classification of Ordinary Differential Equations, Variable separable O.D.E, Homogenous O.D.E
Week 2	Exact O.D.E, Linear First order O.D.E, Bernoulli's O.D.E
Week 3	Solution of Homogenous Higher order D.E
Week 4	Solution of non-Homogenous Higher order D.E.
Week 5	Definition of Sequence and series, Convergence Tests for Infinite Series
Week 6	Maclaurin's Series, Taylor's Series.
Week 7	Polar coordinates and Parametric Equations
Week 8	Vectors in Space, Dot Product, Cross Product
Week 9	Vector Valued Functions
Week 10	Functions of Several Variable, Chain Rule, Constant Level Curves
Week 11	Gradient Vector, Extreme points, Lagrange Multipliers

Week 12	Double Integral in Cartesian and Polar Coordinates
Week 13	Application of Double Integral
Week 14	Line Integral , Integration of vector Field
Week 15	Relation between Line Integral and Double integral, Green's Theorem
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	CALCULUS, Thomas, twelfth edition	Yes
Recommended Texts		No
Websites		

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	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks 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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Atomic Physics		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical	
Module Code	ATU17044			
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	2	Semester of Delivery		3
Administering Department	Healthy Physics and Radiation Therapy Technical Engineering		College	Technical Engineering Collage
Module Leader	Dr. Ismail Shaaban		e-mail	Shaabanismail84@gmail.com
Module Leader's Acad. Title	Asst. Prof.		Module Leader's Qualification	Ph.D.
Module Tutor	None		e-mail	None
Peer Reviewer Name	Dr. Mohammed Kadhimi Alhachami		e-mail	Mohammed.kadhimi@alayer.edu.iq
Scientific Committee Approval Date	07/10/2025		Version Number	1

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	None		Semester	

Co-requisites module	None	Semester	
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To familiarize the student with the special relativity and its consequences. 2. The student should understand the particle-like properties of waves. 3. The student should understand the wave-like properties of particles. 4. The student should understand Schrodinger equation and the basics of quantum mechanics. 5. The student should understand Rutherford and Bohr work on atoms. 6. The basics of the Hydrogen atom
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To outline the concepts special relativity. 2. To describe the concepts of quantum physics 3. Calculate the dynamical properties of objects moving close to the speed of light. 4. Analyze quantum mechanical systems using the Schrodinger equation. 5. Show how special relativity and quantum mechanics are used to study physical systems. 6. Illustrate how to solve problems in special relativity and basic quantum physics.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Special Theory of Relativity - The Principle of Relativity - Inertial References and Lorentz transformations - Michelson-Morley experiment 2. Electromagnetic waves - Blackbody radiation - Photoelectric effect - Compton effect and pair production - X – Ray Spectra 3. Thomson model, Rutherford experiment - Atomic structure and the nuclear Atom - Electron orbits, energy levels and atomic spectra 4. Hydrogen Spectra and structure of the nucleus

	- Electron spin Pauli exclusion principle electronic configuration 5. Quantum Theory of the Hydrogen Atom - Schrodinger's equation for the hydrogen atom - Quantum numbers - Principal quantum number 6. Radioactivity - Binding energy of nuclei - nuclear structure - The basic properties of nucleus - Nuclear Stability Radioactivity
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1. Interactive lectures with multimedia aids, such as videos and animations, to illustrate complex concepts and phenomena. 2. Hands-on laboratory experiments and demonstrations to reinforce theoretical concepts and develop practical skills. 3. Group discussions and problem-solving sessions to encourage critical thinking and collaboration. 4. Computer simulations and modeling exercises to explore complex systems and processes. 5. Field trips to atomic facilities, such as power plants and research reactors, to see real-world applications of nuclear physics. 6. Research projects and presentations to develop research skills and enhance communication abilities. 7. Peer mentoring and tutoring to provide additional support and guidance for students. 8. Online resources, such as interactive simulations, videos, and quizzes, to supplement classroom learning and provide self-paced study options. 9. Assessment strategies, such as quizzes, exams, and projects, to evaluate student understanding and progress. 10. Professional development opportunities, such as internships and conferences, to expose students to career opportunities in nuclear and radiological physics.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	122	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
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Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	78	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	Special Theory of Relativity ,The Principle of Relativity ,Inertial References, Michelson-Morley experiment
Week 2	Postulates of special relativity Lorentz transformations and the consequences of special relativity
Week 3	Electromagnetic waves, blackbody radiation , photoelectric effect, , Compton effect, pair production
Week 4	X – Ray , Production of X – Ray , X – Ray Spectra, Wave – Particle Duality
Week 5	De Broglie waves and the uncertainty principle

Week 6	Thomson model, Rutherford experiment
Week 7	EXAM
Week 8	Atomic Structure ,The Nuclear Atom ,Electron Orbits ,Atomic Spectra, spectral lines and Bohr model
Week 9	The Bohr Atom, Energy Levels and Spectra. Origin of Line Spectra.
Week 10	Hydrogen Spectra ,Structure of the nucleus and. Magnetic Moment (or Magnetic Dipole Moment) Angular Momentum of an Atom
Week 11	Electron Spin Pauli Exclusion Principle Electronic Configuration
Week 12	Quantum mechanics. Introduction. Wave Function. Schrodinger Equation. Particle in a Box. Finite Potential Well. Tunnel Effect
Week 13	Quantum Theory of the Hydrogen Atom, Schrodinger's Equation for the Hydrogen Atom. Quantum Numbers. Principal Quantum Number.
Week 14	Quantum Theory of the Hydrogen Atom Orbital Quantum Number. Magnetic Quantum Number. Zeeman Effect
Week 15	Radioactivity and binding energy of nuclei, Nuclear Structure, The basic properties of nucleus. ,Nuclear Stability Radioactivity
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Michelson interferometer
Week 2	Lab 2: Fabry-Perot interferometer
Week 3	Lab 3: Determination of Planck's constant
Week 4	Lab 4: Rydberg Constant measurement Laser Diffraction in Ultrasonic phase grating
Week 5	Lab 5: Zeeman Effect
Week 6	Lab 6: Characteristics of Microwaves. Waveform analysis and synthesis
Week 7	Lab 7: Franck-Hertz experiment
Week 8	Lab 8: Electro-optic Kerr-Effect
Week 9	Lab 9: Magneto-optic Faraday Effect
Week 10	Lab 10: Study X-ray spectrum

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. Modern Physics, Kenneth S. Krane, Third Edition, 2012. 2. Modern Physics, John Morrison, Second Edition,	

	2015.	
Recommended Texts	1. Elementary Atomic Structure, G. K. Woodgate, WOODGATE, 20002. 2. Modern Physics, Paul A. Tipler, Ralph A. Llewellyn, Fifth Edition, 2015.	
Websites		

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	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks 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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Medical physics		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	17035ATU			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	UGII	Semester of Delivery		3
Administering Department	Health Physics and Radiation Therapy Technical Engineering		College	Engineering Technical College, Al-Ayen University
Module Leader	Farah Dheyaa Ridha Albaiaty		e-mail	Farah.albaity@gmail.com
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	PhD
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Dr. Mohammed Kadhim Alhachami		e-mail	Mohammed.kadhim@alayen.edu.iq
Scientific Committee Approval Date	01/10/2025		Version Number	1.0

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1- To understand the effect of physical forces on the human body and explain how the skeletal system functions. 2- To show how pressure affects the body's organs Recognize physical activity of the lungs and breathing 3- To demonstrate the physics of the cardiovascular system and the urinary system 4- To identify the fundamental concepts of electricity and magnetism and their applications in medical practice 5- To gain knowledge of respiratory and cardiovascular systems as well as related medical equipment 6- To distinguishes the basic principles, using the sound waves in medicine and the use of x-rays in the diagnosis and identification of diseases
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of the course, students should be able to: 1- Understand the difference between the Forces. 2- Know the bone has at least six functions. What are the main components of the bone, and to study the methods of Measurement the minerals quantity in the bone 3- know methods of diathermy 4- Understand how energy transforms within the human body. 5- know pressures inside the body parts and measure it 6- understand how to work the lungs and How the blood and lungs interact 7- know nervous system and the neuron 8- know the graphing devices of the body organs 9- Understand the applications of electricity and magnetism in medicine. 10- know the application of sound in medicine, know sonar devices 11- know the application of light and laser in medicine 12- know Major components of the cardiovascular system 13- Learn the basic principles of nuclear medicine. 14. Understand how x-ray devices work.
Indicative Contents المحتويات الإرشادية	1- Define the Forces , Frictional Forces , Dynamics (5hrs) 2- functions of the skeleton and Bone consists of quite different materials and how to measure mineral in the bones (5 hrs) 3- Types of thermometers , Heat therapy, Cryogenics (5 hrs) 4- Sphygmomanometer, blood pressure, bladder pressure , tonometer(4hrs) 5- Function of Lungs & Breathing, breath rate, airways, Dalton's law of partial pressures(3hrs) 6- The nervous system and the neuron, Electrocardiogram, Electro retion gram (ERG), The magneto cardiogram (MCG)(4hrs) 7- Magnetic signals from the heart –magneto cardiogram(3hrs) 8- Macro shock, Micro shock (3hrs) 9- General Properties of Sound, Acoustic Impedance, Absorption, A-mode Display, Doppler Ultrasound(5hrs)

	10- Endoscope, cystoscopes, Emissive IR photography. (5hrs) 11- Laser, population inversion, X-ray (6hrs) 12- Physics of the cardiovascular system (5 hrs)
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Daily assessment - weekly assessment - quarterly assessment – objective questions - general questions - practical tests.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	22	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3 and 7	LO #3, and #5
	Assignments	2	10% (10)	1 and 6	LO #1, #2 and #4, #5, #6, #8, #9, #10
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	9	LO #7
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Forces on and in the body.
Week 2	Physics of the skeleton.
Week 3	Heat & cold in medicine
Week 4	Energy, work and power of the body, Pressure in body organs
Week 5	Pressure in body organs
Week 6	Physics of the lungs and breathing.
Week 7	Physics of cardiovascular system
Week 8	Physics of urinary system.
Week 9	Electricity within the body.
Week 10	Sound in medicine and physics of hearing.
Week 11	Light in medicine and physics of vision.
Week 12	Diagnostic X-rays
Week 13	Physics of nuclear medicine (radioisotopes in medicine).
Week 14	Physics of radiation therapy
Week 15	Radiation protection
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to laboratory tools
Week 2	Lab 2: X-rays, Characteristic X- rays, Bremsstrahlung x-rays, The X-Ray Tube, X-Rays Spectrum
Week 3	Lab 3: Interaction of radiation with matter, Interaction of heavy charged particles with matter,
Week 4	Lab 4: CT Scan
Week 5	Lab 5: MRI
Week 6	Lab 6: Linear Accelerator
Week 7	Lab 7: Ultra Sound (SONAR)

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Medical Physics - J. R. Cameron, J. G. Skofronick. 1978	No
Recommended Texts	RADIOLOGIC SCIENCE FOR TECHNOLOGISTS: PHYSICS, BIOLOGY, AND PROTECTION	No
Websites	https://www.google.iq/search?hl=ar&tbo=p&tbm=bks&q=inauthor:%22J.+G.+Skofronick%22	

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	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks 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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Biochemistry		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	17031ATU		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	
Administering Department	Department of Health Physics and Radiation	College	Engineering Technical collage
Module Leader	Sokyna Abdalhameed Salim	e-mail	Soso.sna70@gmail.com
Module Leader's Acad. Title	Assistant Lecture	Module Leader's Qualification	M.Eng.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Dr. Mohammed Kadhimi Alhachami	e-mail	Mohammed.kadhimi@alayer.edu.iq
Scientific Committee Approval Date	08/10/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. To learn about the science of biochemistry and the most important clinical diseases 2. To know the most important clinical tests that diagnose diseases in the human body 3. To understand the most important metabolic diseases, their types, causes, methods of diagnosis and treatment 4. Applying diagnostic criteria and comparing their types and learning about the latest clinical signs 5. Analyze the results by comparing the result of the healthy person with the patient
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student learns the skill of how to prepare solutions for laboratory testing 2. The student learns the skill of conducting pathological examinations and diagnosing them using the various available devices. 3. The student acquires the skill of operating the optical absorbance meter. 4. Understand the structure and properties of biological molecules 5. Summarize what is metabolism. 6. Recognize about the simplest types of biochemistry analyzes. 7. Discuss the importance of understanding the citric acid cycle diagram Explain the difference between glycolysis and gluconeogenesis
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. -Understanding the mechanism of action of enzymes and the iso enzymes in the process of metabolism. [15 hrs] - Study of the biological interactions that occur Inside living cells in terms of construction and synthesis, or in terms of demolition and energy production. [15 hrs] -Biochemistry is the basis for the progress of many other modern sciences, such as engineering science. Therefore, the composition of chemicals in the cell, the changes that occur therein, and the vital processes must be studied.. [10 hrs] -The importance of biochemistry is evident in the identification of: Carbohydrates and their metabolism. Lipids and their metabolism, Amino acids, peptides, and proteins and their metabolism, Enzymes and Coenzyme Conjugates, vitamins Generation and storage of biochemical energy, Biosynthesis of biomolecules. [15 hrs] -Understand simple biochemistry analysis methods[6hrs]. Fundamentals -Knowledge Amino acids are found in peptide chains according to

	a specific sequence specific to each enzyme, which ultimately leads to a space structure A determinant that enables an enzyme to speed up its reaction. [15 hrs] -Understanding carbohydrate metabolism because it is considered an essential source of energy production when it is burned in all types of living cells. [7 hrs] -Fats: This group of compounds is distinguished from proteins and sugars by its great diversity and heterogeneity, as it includes compounds They differ greatly in chemical composition and function, so it is important to understand the functions of lipids in living cells [15 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	- Hands-on laboratory experiments and demonstrations to reinforce theoretical concepts and develop practical skills. - Interactive lectures with multimedia aids, such as videos and animations, to illustrate complex concepts and phenomena. - Field trips to public hospitals to learn about medical devices, how they work and how to maintain them. - Assessment strategies, such as quizzes, exams, and projects, to evaluate student Understanding and progress. - Research projects and presentations to develop research skills and enhance communication abilities.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Carbohydrates Basics Carbohydrate classification
Week 2	Carbohydrate Diagnostics
Week 3	Introduction to the basics of fats Fat classification
Week 4	Fat Diagnosis Fat estimation
Week 5	Amino acids and their construction Introduction to the basics of amino acids
Week 6	Classification of amino acids Diagnostics of amino acids
Week 7	estimation of amino acids Building and destroying amino acids Estimation and determination of amino acid sequences
Week 8	Vitamins Enzymes
Week 9	Bioenergetics Bioenergetics, Regulation of metabolism
Week 10	Glycolysis and gluconeogenesis Glycolysis and gluconeogenesis, Metabolic regulation
Week 11	Metabolic regulation

Week 12	Citric acid cycle
Week 13	Oxidative phosphorylation, electron transport chain, photosynthesis Oxidative phosphorylation, electron transport chain, photosynthesis, Fatty acid catabolism
Week 14	Fatty acid catabolism, Amino acid oxidation, urea cycle Amino acid oxidation, urea cycle, Carbohydrate biosynthesis
Week 15	Carbohydrate biosynthesis, Lipid biosynthesis Lipid biosynthesis, Biosynthesis on amino and nucleic acids

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction of collection and handling of blood samples Blood glucose
Week 2	Lab 2: Glycosuria And Blood group test
Week 3	Lab 3: Methods for detecting monosaccharaides
Week 4	Lab 4: Qualitative tests of lipids
Week 5	Lab 5: Qualitative tests of protein
Week 6	Lab 6: Qualitative tests and preparation of amino acids
Week 7	Lab 7: renal function test

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Lippincott's biochemistry	Yes
Recommended Texts	Harper's Illustrated Biochemistry	No
Websites	https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology	

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
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	F - Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks 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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	جرائب نطلب البحث الباند في العراق		Module Delivery
Module Type	Support or related learning activity		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	MTU1007		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	2	Semester of Delivery	
Administering Department	Health Physics and Radiation Therapy Technical Engineering	College	Engineering Technical College, Al-Ayen University
Module Leader	Rabab Ali Mohebes	e-mail	rbabl4489@gmail.com
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Dr. Mohammed Kadhimi Alhachami	e-mail	Mohammed.kadhimi@alayer.edu.iq
Scientific Committee Approval Date	29-9-2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives	أهداف المادة الدراسية يهدف هذا المقرر الدراسي إلى تعزيز فهم الطلاب للجرائم والانتهاكات التي وقعت خلال فترة نظام البعث في العراق وتأثيرها على الأفراد والمجتمع، وتشجيع التحليل والنقاش حول هذه القضايا المهمة. ومن أبرز الأهداف للمادة الدراسية هي اني يكون الطالب قادراً على أن :

	فهم مفهوم الجرائم وأقسامها. 1 . دراسة جرائم نظام البعث والقوانين المتعلقة بها. 2 التعرف على الجرائم النفسية والاجتماعية وآثارها على الفرد والمجتمع. 3 4. تحليل الانتهاكات القانونية في العراق، بما في ذلك الانتهاكات لحقوق الإنسان والجرائم ذات الصلة 5. فهم الجرائم البيئية وآثارها، بما في ذلك التلوث وتدمير المدن والقرى وتخفيف الأضرار 6. دراسة جرائم المقابر الجماعية وفهم أحداث المقابر والتصنيف الزمني لها في العراق.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	مخرجات التعلم للمادة الدراسية هي: فهم مفهوم الجرائم وقدرة الطلاب على تصنيف الجرائم وفقاً لأقسامها. 1 . تحليل جرائم نظام البعث وفهم القوانين المتعلقة بها، بما في ذلك الجرائم الدولية. 2 القدرة على التعرف على الجرائم النفسية لنظام البعث وفهم الآثار النفسية لجرائم نظام البعث على. 3 الأفراد والمجتمع. . 4. القدرة على التعرف على الجرائم الاجتماعية لنظام البعث الآثار الاجتماعية لجرائم نظام البعث على الأفراد والمجتمع. التعرف على الانتهاكات القانونية لنظام البعث في العراق وفهم أنواع الانتهاكات ومكان احتجاز. 5 الأفراد التعرف على صور انتهاكات حقوق الإنسان وجرائم السلطة التي وقعت خلال فترة نظام البعث. 6 التعرف على الانتهاكات السياسية والعسكرية لنظام البعث. 7 فهم الجرائم البيئية لنظام البعث والقدرة على تحليل تأثيرها على البيئة والمجتمع. 8. دراسة جرائم المقابر الجماعية لنظام البعث. 9 فهم الأحداث المرتبطة بجرائم المقابر الجماعية وتصنيفها زمنياً. 10
Indicative Contents المحتويات الإرشادية	المحتويات الإرشادية في مادة اللغة تشمل مجموعة من المفاهيم والمواضيع التي يتم تغطيتها خلال عملية التعلم. ومن بين المحتويات الإرشادية المهمة تعريف الجريمة لغة واصطلاحاً، مفهوم الجريمة اقسام الجريمة 1 _ جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام 2005 _ 2 الجرائم النفسية والاجتماعية وآثارها _ 3 . عسكرة المجتمع، موقف النظام البعثي من الدين _ 4 . انتهاكات القوانين العراقية صور انتهاكات حقوق الإنسان وجرائم السلطة _ 5 . بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث _ 6 أماكن السجون والاحتجاز لنظام البعث _ 7 . الجرائم البيئية لنظام البعث في العراق _ 8 . جرائم المقابر الجماعية _ 9 أحداث مقابر الإبادة الجماعية المرتكبة من النظام البعثي في العراق _ 10 . التصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة 1963م - 2003م _ 11 .

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	استراتيجيات التعلم والتعليم المستخدمة في مادة جرائم حزب البعث البائد تشمل مجموعة متنوعة من النهج والتقنيات التي تعزز عملية التعلم للطلاب. من بين هذه الاستراتيجيات: التفاعل النشط: يتم تشجيع الطلاب على المشاركة والمشاركة الفعالة في الدروس من خلال المناقشات _ 1 الجماعية والأنشطة التفاعلية. التعلم التعاوني يشجع التعاون والتعاون بين الطلاب من خلال العمل الجماعي والمشاريع الجماعية، حيث _ 2 . يتعاون الطلاب مع بعضهم البعض لتحقيق أهداف التعلم المحددة. _ 3

	استخدام التقنيات الحديثة يستفيد الطلاب من استخدام التكنولوجيا في عملية التعلم، مثل استخدام الحواسيب _4 والإنترنت للبحث والتعلم الذاتي. توفير ردود فعل فورية: يتم توفير ردود فعل فورية وتقييم مستمر للطلاب، سواء عن طريق التقييمات _5 . الشفافية أو الكتابية، مما يساعدهم على تحسين أدائهم وتطوير مهاراتهم. التنوع في وسائل التواصل يتم استخدام مجموعة متنوعة من وسائل التواصل والتعليم مثل المحاضرات _6 . التوضيحية والمناقشات الجماعية والأنشطة العملية والعروض التقديمية، لتلبية احتياجات وأساليب التعلم المختلفة للطلاب.
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Student Workload (SWL)			
الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعاً			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	32	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	18	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	2
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	50		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (10)	3, 7, 11	LO # 1, 5, 8
	Assignments	3	15% (10)	2, 6, 13	LO # 2, 4, 9
	Projects / Lab.				
	Report	1	10% (5)	14	LO # 1-10
Summative assessment	Midterm Exam	2hr	10% (20)	7	LO # 1 to 5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الأسبوعي النظري	
	Material Covered
Week 1	تعريف الجريمة لغة واصطلاحاً، مفهوم الجريمة، أقسام الجريمة

Week 2	جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام 2005
Week 3	الجرائم النفسية لنظام البعث وفهم الآثار النفسية لجرائم نظام البعث على الافراد والمجتمع
Week 4	الجرائم الاجتماعية لنظام البعث وفهم الآثار الاجتماعية لجرائم نظام البعث على الافراد والمجتمع
Week 5	انتهاكات القوانين العراقية
Week 6	بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث
Week 7	امتحان نصف الفصل
Week 8	الجرائم البيئية لنظام البعث في العراق (التلوث الحربي وسياسة الارض المحروقة)
Week 9 ,10	تجفيف الاهوار وتجريف بساتين النخيل والاشجار والمزروعات
Week 11, 12	جرائم المقابر الجماعية وأحداث مقابر الابادة الجماعية المرتكبة من النظام البعث في العراق
Week 13 ,14 ,15	التصنيف الزمني لمقابر الابادة الجماعية في العراق للمدة من (1963 _ 2003) م
Week 16	التهيئة لامتحان النهائي

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	منهاج وزارة التعليم العالي والبحث العلمي العراقية _ جرائم نظام البعث في العراق 2023	yes
Recommended Texts		no
Websites	The collage E-Library	

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	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks 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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Applied Biofluid Mechanics		Module Delivery	
Module Type	S		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	17034ATU			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	UGx12	Semester of Delivery		3
Administering Department	Health Physics and Radiation Therapy Technical Engineering		College	Alayen Iraqi University -Engineering Technical Collage
Module Leader	Dr.Fouad Mohamad SALHA		e-mail	fouad.muhammad@alayen.edu.iq
Module Leader's Acad. Title	Asst.Professor		Module Leader's Qualification	Ph.D.
Module Tutor			e-mail	
Peer Reviewer Name	Dr. Mohammed Kadhimi Alhachami		e-mail	Mohammed.kadhimi@alayen.edu.iq
Scientific Committee Approval Date	21/09/2025		Version Number	1.0

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1- Applied Biofluid Mechanics is a multidisciplinary field. This module presents a unified approach that combines the physiology of the cardiovascular and pulmonary systems with the engineering principles of fluid mechanics and blood rheology. 2- Biofluid mechanics applies physics, chemistry, mathematics, and core engineering concepts to study biological systems—primarily the human body. The aim is to reach advanced levels of understanding regarding physiological fluid behavior and the diseases affecting these systems, in order to contribute to better health outcomes and support effective treatment strategies.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The course is intended to prepare students for work in the health care device industry and others for graduate work in Applied Biofluid Mechanics.
Indicative Contents المحتويات الإرشادية	The biofluid mechanics specialist contributes across clinical, industrial, and academic environments. They work in hospitals and clinics to support the installation, calibration, and maintenance of devices related to fluid-based physiological systems—such as blood flow monitors, ventilators, and dialysis machines. They may also be employed by companies that design, manufacture, or service medical devices involving fluid transport and control. In research institutions such as universities, they engage in experimental and computational studies of biological fluids. Their work is closely aligned with their area of specialization and is carried out in collaboration with physicians, nurses, and engineers from various disciplines.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Applied Biofluid Mechanics is one of the emerging branches of engineering that evolved alongside the advancement of modern medicine. In the past, physicians were solely responsible for diagnosis, treatment, and even drug formulation. Today, specialists in biofluid mechanics have become indispensable partners in clinical care—supporting diagnosis, treatment, and patient monitoring through fluid-based technologies. The growing need to develop sophisticated medical devices that enhance patient health and accelerate recovery has required the involvement of experts from diverse engineering disciplines, including electrical, mechanical, and computer engineering. These engineers must also possess foundational knowledge in medical sciences—such as human anatomy, physiology, and pathology—to understand the functional mechanisms of biological systems. This understanding enables them to apply their engineering expertise to the design
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	and optimization of devices that interact with bodily fluids, such as blood, air, and lymph. Their collaboration with physicians is essential, yet complementary, ensuring that engineering innovation supports—but never replaces—the clinical role of the doctor.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuou s	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	A Brief History of Biomedical Fluid Mechanics, Fluid Characteristics and Viscosity ,Displacement and velocity, Shear stress and viscosity ,Clinical feature: polycythemia Fundamental Method for Measuring Viscosity

Week 2	Introduction to Pipe Flow ,Reynolds number ,Poiseuille's law , Flow rate , Bernoulli Venturi meter, Fluid Statics , The Womersley Number α ,A Frequency Parameter for Pulsatile Flow
Week 3+4	Clinical Features ,Functional Anatomy, The Heart as a Pump ,Cardiac Muscle Electrocardiograms ,Heart Valves ,Cardiac Cycle, Heart Sounds ,Coronary Circulation ,Microcirculation ,Lymphatic Circulation
Week 5+6	Clinical features: hyperventilation Alveolar Ventilation ,Ventilation-Perfusion Relationships , Mechanics of Breathing , Airway Resistance ,Gas Exchange and Transport ,Pulmonary Pathophysiology ,Respiration in Extreme Environments
Week 7	Elements of Blood ,Blood Characteristics ,Viscosity Measurement , Erythrocytes ,Leukocytes ,Blood Types ,Plasma
Week 8	General Structure of Arteries , Types of Arteries ,Mechanics of Arterial Walls ,Compliance , Pulse Wave Velocity and the Moens–Korteweg Equation ,Vascular Pathologies ,Stents , Coronary Artery Bypass Grafting
Week 9	Aortic and Pulmonic Valves, Mitral and Tricuspid Valves, Pressure Gradients across a Stenotic Heart Valve, Prosthetic Mechanical Valves, Prosthetic Tissue Valves,
Week 10+11	Fluid Kinematics, Continuity, Complex Numbers, Fourier Series Representation, Navier–Stokes Equations , Pulsatile Flow in Rigid Tubes—Womersley Solution, ,Pulsatile Flow in Rigid Tubes Fry Solution , Instability in Pulsatile Flow
Week 12	Indirect Pressure Measurements, Indirect pressure gradient measurements using, Doppler ultrasound, Direct Pressure Measurement, Flow Measurement,
Week 13	Theory of Models ,Dimensional analysis and the Buckingham π theorem ,Common Dimensionless Parameters in Fluid Mechanics
Week 14	Electrical Analog Model of Flow in a Tube ,Modeling of Flow through the Mitral Valve
Week 16	Problem

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Applied Biofluid Mechanics Lee Waite, Ph.D., P.E. Jerry Fine, Ph.D.	Yes

Recommended Texts		
Websites		

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