MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Medical Diagnostic Instrumentation II**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐ **Lecture** ☒**Lab** ☐**Tutorial** ☒ **Practical** ☐**Seminar**	
Module Code	**UOMU0204061**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	UG-III		**Semester of Delivery**	6	
Administering Department	MIET		**College**	EETC	
Module Leader	Assistant Prof. Dr. Saad Mutashar Abbas Faris		**e-mail**	saad.mutashar.abbas@uomus.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Assistant Prof. Dr. Saad Mutashar Abbas Faris		**e-mail**	saad.mutashar.abbas@uomus.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	8/11/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Medical Diagnostic Instrumentation I	**Semester**	UG-III - S5
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The module aims: 1. To provide a grounding in the theory of relevant biomedical measurement systems including sensors, signal acquisition and conditioning principles, measurement techniques and instrumentation and detectors; 2. To impart the basic theory and physiological interactions of medical imaging modalities (including microscopy, endoscopy, x-ray, ultrasound, CT, MRI, PET and IR) and review applications and image-guided interventions; 3. To teach the basic physiological and anatomical principles of surgical interventions, interventional radiology and how the imaging objectives relate to disease and treatment 4. To review the working principles of existing surgical technology including robotics and how this addresses the surgical intent, including current minimal access techniques and understand the implications for image guidance. 5. To provide a basic understanding of the process of invention and its management; an introduction to entrepreneurship and its interface with invention; product development and its relationship to invention, resultant intellectual property and entrepreneurship
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 1. Understand the principles of operation of relevant sensors and detectors used in biomedical measurement for imaging and their technical specifications. 2. Be able to apply a range of signal analysis and signal processing methods. 3. Understand how medical imaging systems work, how they interact with the tissue, how their images can be interpreted and the limitations of their application. 4. Be familiar with a range of medical imaging applications for different pathologies, including cellular, molecular imaging and interventions. 5. Know how image guidance interacts and operates with instruments and equipment in surgical intervention including robotics. Understand the equipment and instruments required and how it is use. 6. Understand the requirements in quality spatial, contrast and time resolution of imaging modalities used for different outcomes. 7. have knowledge of the research and engineering methods applied in the development of medical imaging. 8. Basic knowledge and understanding of the inventive process and its

	management, the entrepreneurial basis of business development; exploitation and value of Intellectual Property. 9. This gives you a solid understanding of how engineering improves patient care. 10. Having the opportunity to gain valuable experience within a clinical environment – learning about the anatomy and functions of the human biology. 11. Develop research and business management skills within the biomedical industry. 12. the application of engineering principles and design concepts to human biology and medicine, to solve challenges in the healthcare industry. 13. Gain an all-rounded understanding of where and how the technologies you develop will be used.
Indicative Contents المحتويات الإرشادية	The indicative contents of module include: **Part A:** • Physiologic quantities, basic concepts and principles of medical imaging instrumentation. • Signal types, measurement and sensor system properties, transfer functions, Fourier analysis, spectral analysis and filtering theory. [8 hrs.] **Part B:** • Characteristics of detection systems, amplification, noise/noise reduction and biomedical sensor and detector types. • Measurement constraints in the physical environment. [8 hrs.] **Part C:** • Principles and exemplar applications of x-ray and CT imaging. • Principles and exemplar applications of Nuclear and PET imaging. • Principles of MRI imaging, MRI applications and MRI-guided interventions, MRI safety. • Current and future developments of medical optical and photonics imaging, fluorescence, confocal, single/multiphoton, Raman, NIR. [8 hrs.] **Part D:** • Overview of diagnostic and interventional ultrasound and review of likely future developments. • Introduction to the objectives and practice of clinical diagnostic imaging. [12 hrs.]

	Part E: • Introduction to interventional principles, overview of instrumentation and devices, open, minimally invasive and image guided surgery. [12 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategies employed in this module can vary depending on the specific course. However, here are some common strategies that may be used with this course: **Teaching methods include:** • lectures • seminars • tutorials • lab experiments • design assignments • industrial visits • professional training • a variety of projects **Assessment :** methods of assessment include a combination of: • coursework • group project reports • lab reports • written exams.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	96	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	175		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Modern Imaging Systems.
Week 2	X-ray Machines and Digital Radiography.
Week 3	X-ray Machines and Digital Radiography.
Week 4	X-ray Computed Tomography.
Week 5	X-ray Computed Tomography, Electrical Impedance Tomography.
Week 6	Magnetic Resonance Imaging System.
Week 7	Mid-Exam +
Week 8	Nuclear Medical Imaging Systems, Single- Photon – Emission Computed Tomography (SPECT).
Week 9	Nuclear Medical Imaging Systems, Gamma Camera, Positron Emission Tomography (PET) Scanner.

	Ultrasonic Imaging Systems, Three – Dimensional Ultrasound Imaging Systems, Portable Ultrasound Systems.
Week 10	Modern Ultrasound Imaging Systems.
Week 11	Thermal Imaging Systems.
Week 12	Magnetic Resonance Microscopy, Medical Applications of Virtual Reality Technology.
Week 13	Biomedical Telemetry.
Week 14	Telemedicine Technology.
Week 15	Recap and Final Assessments: Review of the Entire Syllabus, **Preparing for final exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	X-ray Machines and Digital Radiography.
Week2	X-ray Machines and Digital Radiography.
Week 2	X-ray Computed Tomography.
Week 3	X-ray Computed Tomography.
Week 4	Magnetic Resonance Imaging System.
Week 5	Magnetic Resonance Imaging System.
Week 6	Nuclear Medical Imaging Systems.
Week 7	Nuclear Medical Imaging Systems.
Week 8	Ultrasonic Imaging Systems.
Week 9	Ultrasonic Imaging Systems.
Week 10	Modern Ultrasound Imaging Systems.
Week 11	Thermal Imaging Systems.
Week 12	Biomedical Telemetry.
Week 13	Telemedicine Technology.
Week 14	Medical Applications of Virtual Reality Technology.
Week 15	Preparatory Week Before the Final Exam.,

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Khandpur , R. S. (1990) . Handbook of Biomedical Instrumentation , Tata McGraw Hill Publishing Co. 2. Joseph D. Bronzino (2006). The Biomedical Engineering Handbook, 3rd. Edition. Germany: Taylor & Francis.	**Yes**
Recommended Texts	1. Press.Joseph D. Bronzino (2006). Medical Devices and Human Engineering. (2017). United Kingdom: CRC Press. 2. Khandpur, R. S. (2004). Biomedical Instrumentation: Technology and Applications. India: McGraw Hill LLC. 3. Brown, J. M., Carr, J. J. (2001). Introduction to Biomedical Equipment Technology. India: Prentice Hall.	**No**
Websites	https://www.intuitive.com/en-us/products-and-services/da-vinci/learning.	

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.