

University Name: Al-Rafidain University

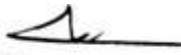
College: College of Health and Medical Techniques

Scientific Department: Radiology Techniques Department

Name of the Academic or Professional Program: Radiology Techniques

Name of the Final Degree: Bachelor's Degree in Medical Radiology Techniques

Academic System: Semester System

Name of the Head of the Department: 
د. ب. د. ر. يافوحي محمد

Date: 27/11/2025

Name of the Scientific Assistant: 
د. ب. د. ر. بشار محمد

Date: 27/11/2025

Reviewed by:

The Quality Assurance and University Performance Division

Name of the Director of the Quality Assurance and University Performance Division: 
د. م. م. قمر جبار جبار

Date: 27/11/2025

Approval of the Dean: 
د. ب. د. ر. هادي جبار

Date: 27/11/ 2025

Academic Program Description Form for the Department of Radiology Techniques

Academic Program Description

The Academic Program Description for the Department of Radiology Techniques has been developed based on the recognition that the department constitutes one of the important departments within the medical disciplines, given its effective role in preparing and providing qualified personnel specialized in radiology and ultrasound for employment in the Ministry of Health and the private sector.

No.	Item	Description
1	Educational Institution	Al-Rafidain University
2	University Department / Center	Department of Radiology Techniques
3	Name of the Academic Program	Radiology Techniques
4	Name of the Final Degree	Bachelor's Degree in Medical Radiology Techniques
5	Academic System	Semester System
6	Accreditation Program Adopted	
7	Other External Influencing Factors	Quality Assurance Program of the Ministry of Higher Education and Scientific Research
8	Date of Preparation of the Program Description	
9	Academic Program Objectives	The Department of Radiology Techniques was established within the College of Health and Medical Techniques at Al-Rafidain University in the academic year 2017/2018 as a specialized department offering a morning study program. It follows a four-year semester-based system, leading to a Bachelor's Degree in Radiology Techniques. The department has qualified academic and technical staff, as well as specialized laboratories equipped with modern medical technologies to develop students' theoretical and practical skills.

10. Required Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

Learning Outcome	Teaching and Learning Methods	Assessment Methods
A. Knowledge and Understanding		
1. Understand the principles of ionizing and non-ionizing radiation and their interaction with human tissues.	Theoretical lectures, computer simulations, and tutorials.	Written exams, quizzes, and oral discussions.
2. Understand radiographic anatomy and medical terminology for accurate patient positioning.	Demonstrations, anatomical models, and hospital visits.	Practical exams (OSPE) and image identification.
B. Subject-Specific Skills		
1. Operate X-ray, CT, and MRI equipment and adjust basic technical parameters (kVp, mAs).	Laboratory practice, workshops, and clinical training.	Practical performance assessment and training reports.
2. Apply radiation protection principles for patients and healthcare personnel.	Applied lectures, safety simulations, and presentations.	Competency tests and direct observation.
C. Thinking Skills		
1. Evaluate radiographic image quality and determine the need for repetition or technical adjustment.	Image analysis, case studies, and brainstorming.	Graduation projects and case discussions.
2. Select appropriate patient positioning according to clinical conditions.	Practical sessions and clinical problem-solving exercises.	Written/oral exams and practical assessment.
D. General and Transferable Skills		
1. Apply professional ethics, patient confidentiality, and teamwork.	Discussions, professional development, and group activities.	Professional behavior assessment and supervisor observations.
2. Use PACS and modern digital techniques and develop self-learning skills.	Computer laboratory sessions and self-directed learning.	Technical assignments and software skills assessment.

Department: Radiology Techniques**Academic Program Structure (Courses for the Four Stages)**

Stage	Semester	No.	Course Title	Theory	Practical	Credits	Language of Instruction
First	First	1	Anatomy of the Skeleton	2	3	3	English
		2	General Physics	2	3	3	English
		3	General Physiology	2	3	3	English
		4	Biology	2	3	3	English
		5	General Chemistry	2	3	3	English
		6	Computer Principles I	1	2	2	English
		7	Human Rights and Democracy	2	–	2	Arabic
		8	English Language	3	–	3	English
First	Second	1	Anatomy of Body Systems	2	3	3	English
		2	Atomic Physics	2	3	3	English
		3	Systemic Physiology	2	3	3	English
		4	Radiobiology	2	4	4	English
		5	Principles of Nursing	2	4	4	English
		6	Computer Principles II	1	2	2	English
		7	Medical Terminology	2	–	2	English
		8	Arabic Language	2	–	2	Arabic
Second	First	1	Conventional Radiological Equipment Techniques	2	5	4	English
		2	Radiographic Techniques for the Upper Limbs	2	5	4	English
		3	Special Radiological Procedures of the Gastrointestinal Tract and Bones	2	5	4	English
		4	Radiological Anatomy of the Upper Limbs	2	4	4	English

		5	Fundamentals of Radiation Physics	2	3	3	English
		6	Fundamentals of Radiation Protection	2	3	3	English
Second	Second	1	Computed Tomography Equipment Techniques	2	5	4	English
		2	Radiographic Techniques for the Lower Limbs	2	5	4	English
		3	Special Radiological Procedures of the Biliary and Reproductive Systems	2	5	4	English
		4	Radiological Anatomy of the Lower Limbs	2	4	4	English
		5	Physics of Computed Tomography	2	3	3	English
Third	First	1	Magnetic Resonance Imaging Equipment Techniques	2	4	4	English
		2	Radiographic Techniques for the Head and Spine	2	4	4	English
		3	Special Radiological Procedures of the Head, Breast, and Respiratory System	2	4	4	English
		4	Radiological Anatomy of the Head and Spine	2	2	3	English
		5	General Pathology	2	2	3	English
		6	Physics of Magnetic Resonance Imaging	1	3	2	English

		7	Biological Effects of Radiation	2	3	3	English
		8	Computer Applications I	1	2	2	English
Third	Second	1	Ultrasound Equipment Techniques	2	4	4	English
		2	Radiographic Techniques of the Thorax and Abdomen	2	4	4	English
		3	Special Radiological Procedures of the Cardiovascular and Central Nervous Systems	2	4	4	English
		4	Radiological Anatomy of the Thorax and Abdomen	2	2	3	English
		5	Systemic Pathology	2	2	3	English
		6	Physics of Ultrasound	1	3	2	English
		7	Computer Applications II	1	2	2	English
Fourth	First	1	Computed Tomography Imaging of the Head and Spine	2	5	4	English
		2	Principles of Magnetic Resonance Imaging and Head Examinations	2	5	4	English
		3	Abdominal Ultrasound Imaging	2	5	4	English
		4	Internal Medicine	2	3	3	English
		5	Biostatistics and Computer Applications	2	4	4	English
Fourth	Second	1	Computed Tomography Imaging of the	2	5	4	English

			Chest, Abdomen, and Pelvis				
		2	Magnetic Resonance Imaging of the Musculoskeletal System, Abdomen, and Pelvis	2	5	4	English
		3	Obstetric and Gynecological Ultrasound Imaging	2	5	4	English
		4	Surgical Medicine	2	3	3	English
		5	Professional Ethics	2	–	2	Arabic
		6	Graduation Project	–	6	4	English

- In addition to the above, students undertake practical summer training during the second and third academic years, with 180 practical hours for each year.

- The Graduation Project hours are included in the second semester of the fourth academic year, with a total of 6 practical hours.

Department of Radiology Techniques

Academic Program Structure (Number of Hours and Credits per Semester)

Academic Stage	Semester	Total Theoretical Hours	Total Practical Hours	Total Weekly Hours	Total Credits
First Stage	First	16	17	33	22
	Second	15	19	34	23
Second Stage	First	12	25	37	22
	Second	10	22	32	19
Third Stage	First	14	24	38	25
	Second	12	21	33	22
Fourth Stage	First	10	22	32	19
	Second	10	24	34	21

Department of Radiology Techniques

Academic Program Structure (Description of Courses for Each Academic Stage and Semester)

1. First Stage – First Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Anatomy of the Skeleton	2	3	3	Specialized	English
2	General Physics	2	3	3	Supporting	English
3	General Physiology	2	3	3	Supporting	English
4	Biology	2	3	3	Supporting	English
5	General Chemistry	2	3	3	Supporting	English
6	Computer Principles I	1	2	2	Supporting	English
7	Human Rights and Democracy	2	–	2	General	Arabic
8	English Language	3	–	3	General	English

2. First Stage – Second Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Anatomy of Body Systems	2	3	3	Specialized	English
2	Atomic Physics	2	3	3	Supporting	English
3	Systemic Physiology	2	3	3	Supporting	English
4	Radiobiology	2	4	4	Supporting	English
5	Principles of Nursing	2	4	4	Supporting	English
6	Computer Principles II	1	2	2	Supporting	English
7	Medical Terminology	2	–	2	Supporting	English
8	Arabic Language	2	–	2	General	Arabic

3. Second Stage – First Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Conventional Radiological Equipment Techniques	2	5	4	Specialized	English
2	Radiographic Techniques for the Upper Limbs	2	5	4	Specialized	English
3	Special Radiological Procedures of the Gastrointestinal Tract and Bones	2	5	4	Specialized	English
4	Radiological Anatomy of the Upper Limbs	2	4	4	Specialized	English
5	Fundamentals of Radiation Physics	2	3	3	Supporting	English
6	Fundamentals of Radiation Protection	2	3	3	Supporting	English

4. Second Stage – Second Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Computed Tomography Equipment Techniques	2	5	4	Specialized	English
2	Radiographic Techniques for the Lower Limbs	2	5	4	Specialized	English
3	Special Radiological Procedures of the Biliary and Reproductive Systems	2	5	4	Specialized	English
4	Radiological Anatomy of the Lower Limbs	2	4	4	Specialized	English
5	Physics of Computed Tomography	2	3	3	Supporting	English

5. Third Stage – First Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Magnetic Resonance Imaging Equipment Techniques	2	4	4	Specialized	English
2	Radiographic Techniques for the Head and Spine	2	4	4	Specialized	English
3	Special Radiological Procedures of the Head, Breast, and Respiratory System	2	4	4	Specialized	English
4	Radiological Anatomy of the Head and Spine	2	2	3	Specialized	English
5	General Pathology	2	2	3	Supporting	English
6	Physics of Magnetic Resonance Imaging	1	3	2	Supporting	English
7	Biological Effects of Radiation	2	3	3	Supporting	English
8	Computer Applications I	1	2	2	Supporting	English

6. Third Stage – Second Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Ultrasound Equipment Techniques	2	4	4	Specialized	English
2	Radiographic Techniques of the Thorax and Abdomen	2	4	4	Specialized	English
3	Special Radiological Procedures of the Cardiovascular and Central Nervous Systems	2	4	4	Specialized	English
4	Radiological Anatomy of the Thorax and Abdomen	2	2	3	Specialized	English
5	Systemic Pathology	2	2	3	Supporting	English
6	Physics of Ultrasound	1	3	2	Supporting	English
7	Computer Applications II	1	2	2	General	English

7. Fourth Stage – First Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Computed Tomography Imaging of the Head and Spine	2	5	4	Specialized	English
2	Principles of Magnetic Resonance Imaging and Head Examinations	2	5	4	Specialized	English
3	Abdominal Ultrasound Imaging	2	5	4	Specialized	English
4	Internal Medicine	2	3	3	Supporting	English
5	Biostatistics and Computer Applications	2	4	4	Supporting	English

8. Fourth Stage – Second Semester

8. Fourth Stage – Second Semester

No.	Course Title	Theory	Practical	Credits	Course Level	Language of Instruction
1	Computed Tomography Imaging of the Chest, Abdomen, and Pelvis	2	5	4	Specialized	English
2	Magnetic Resonance Imaging of the Musculoskeletal System, Abdomen, and Pelvis	2	5	4	Specialized	English
3	Obstetric and Gynecological Ultrasound Imaging	2	5	4	Specialized	English
4	Surgical Medicine	2	3	3	Supporting	English
5	Professional Ethics	2	–	2	General	Arabic
6	Graduation Project	–	6	4	Specialized	English

Description of the Academic Program
Curriculum
Semester System
Department of Radiology Techniques

المرحلة الأولى

الفصل الأول

عدد الساعات النظري = 16 / عدد الساعات العملي = 17 / مجموع الساعات الأسبوعية = 33 / عدد الوحدات = 22 وحدة

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الأول	تشريح الهيكل العظمي	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Anatomy of skeleton	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

Define the surface anatomy, anatomical positions & planes of the body and:

1. The general anatomy of the upper limbs skeleton.
2. The general anatomy of the chest skeleton.
3. The general anatomy of the vertebral column.
4. The general anatomy of the lower limbs skeleton.
5. The general anatomy of the upper & lower limbs muscles.
6. The general anatomy of the joints, type of joints & mechanism of movement.
7. The general anatomy of the skull, facial bones & paranasal sinuses.

Theoretical & practical syllabus	
Week	Details
1	• Introduction, definition: - surface anatomy & anatomical position, - vertical & horizontal lines & planes of abdominal organs, - cell & tissues, - Types.
2	• Skeleton of the upper limb: - shoulder girdle: (clavicle and scapula bones)
3	- The humerus, - radius ulna bones
4	The hand
5	The muscles of upper limbs
6	• Joints: - type of joints - mechanism of movement
7	• Skeleton of the chest: - Ribs, sternum and segments of the spinal cord
8	• Vertebrate - (cervical, thoracic, lumbar, sacrum and coccyx) - intervertebral disc
9	• Skeleton of the lower limb: - bony pelvis (pelvic girdle)
10	The femur, tibia and fibula bones
11	The foot

12	The muscles of lower limbs
13	• Skull: - bone of the skull
14	- Facial bones, - mandible - TMJ
15	- Nasal cavity & - paranasal sinus

References:

1. VanPutte, C. L., Regan, J. L., Russo, A. F., Seeley, R. R., Stephens, T., & Tate, P. (2017). Seeley's anatomy & physiology. McGraw-Hill. (Eleventh edition).
2. Abrahams, P. H., Spratt, J. D., Loukas, M., & VanSchoor, A. (2018). Abrahams' and McMinn's Clinical Atlas of Human Anatomy.
3. Netter, F. H. (2018). Atlas of Human Anatomy.
4. Drake, R., Vogl, A. W., & Mitchell, A. W. (2014). Gray's anatomy for students. (Third edition).
5. Marieb. Wilhelm. Mallat. Human anatomy. Eighth edition.
6. S. Hombach-Klonish, T. Klonish, J. Peeler. Sobota clinical atlas of human anatomy. First edition.

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الأول	الفيزياء العامة	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		General physics	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. Learn the standard units of measurements.
2. Define the Electricity & Magnetism.
3. Know the Gravitation and Kinetic Energy.
4. Define the Work-energy relation.
5. Know the Conservative and neoconservative forces.
6. Define Momentum, Impulse and Collisions.
7. Define Periodic Motion.
8. State and explain the Dynamics of Rotational Motion.
9. Define the heat and pressure.

Theoretical & pratical syllabus		
Week	Theoretical	Practical
1	• Standard units of measurements – Length – Mass – Time	• Preface – Instructions to students – Important notes about the lab
2	• Electricity – Electrostatics ❖ Electrostatic Laws ❖ Electric Potential – Electrodynamics ❖ Electric Circuits ❖ Electric Power • Magnetism – Electromagnetism ❖ Electromagnetic Induction ❖ Electromechanical Devices (transformer)	– Concept of measurement – Accuracy and uncertainty of the measurement – Plotting graphs and graph analysis
3	• Mechanics – Velocity – Accelartion	• Measurement & Instruments – Physical Measurements – Electrical Measurements – Glossary of laboratory instruments

4	- Newton's Laws of Motion - Gravitational field - Weight - Friction - force and acceleration	Ohm's Law
5	- Momentum - Impulse - Impulse and Collisions - Impulse-momentum relation - Law of conservation of momentum	Determination the effect of force acting on a mass. The surface tension The appointment of the surface tension of a liquid
6	- Work - Energy - Types of energy - Energy Conservation	Conservation of Energy
7	- Work-energy relation - Power - Conservative and neoconservative forces - Gravitational potential energy	Study of the body fall through the viscous medium.
8	• Periodic Motion - Simple harmonic motion: springmass system, simple pendulum, physical pendulum	Hooke's Law & Simple Harmonic Oscillators
9	• Dynamics of Rotational Motion - Moment of inertia - Angular position, angular velocity, angular acceleration - Torque	1.The Simple Pendulum 2. Determination the rotational inertia of a body
10	- Torque-angular acceleration relation - Static equilibrium - Rotational kinematics - Work done by a torque	The moment of inertia of Gyroscope
11	- Rotational kinetic energy - Angular momentum - Static equilibrium experiments - Rotational motion problems	1. Moment of Inertia of a Wheel 2. Measuring the effect of torque acting on a rotating mass.
12	- Damped and Driven oscillation - Periodic Motion experiment	Damped and Forced Oscillators
13	- Gravitational potential energy - Escape velocity	Measure the Young coefficient of the wire
14	• Heat,temperature - Latent heat - Specific Heat - Methods of heat transferring	Specific Heat Set the specific heat of metal

15	• Gases, • Pressure & volume, laws of pressure.	Boyle's Law
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References:

1. M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi " ***Radiation Physics and its applications in diagnostic radiological techniques***", Middle Technical University (MTU), Iraq, (2015).
2. RF Farr and PJ Allisy-Roberts "***Physics for Medical Imaging***", Saunders, 4th edition (2001).
3. Stewart Carlyle Bushong, "***Radiologic Science for Technologists Physics, Biology, and Protection***" Elsevier, Inc. , 7th edition, 2017.

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الاول	علم الفسلجة العامة	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		General Physiology	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. Understand the main physiologic concepts of cells and their component.
2. Understand the factors of homeostasis regulation in human body
3. Understand the physiologic mechanisms of blood flow, gases exchange and gastric secretions

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	Introduction to Human Physiology - Cell components and organelles	Microscope parts & uses
2	Blood: -Blood Functions blood components: blood plasma, plasma proteins function	Finger puncture –blood smear
3	Formed elements: leukocytes (types and function), Platelets, and Erythrocytes, Erythropoietin Role in Erythrocytes Production.	Preparation of blood smear: slide method
4	Blood Clotting: clotting factors and Mechanism of Blood Clot Formation	Staining of blood film
5	Fluid Compartments in the Body: ICF,ECF, interstitial fluid and transcellular fluids, compositions of body fluids	Sahli method for hemoglobin estimation
6	Fluid shift: Diffusion, Osmosis, hydrostatic pressure, filtration & Active Transport Across Cell Membranes	Packed cell volume(PCV)
7	Homeostasis: Blood glucose homeostasis, excretion homeostasis and Body Temperature Regulation	Scientific film about blood & circulating system
8	Heart and blood vessels: -Heart function -Blood vessels function -cardiac valves and their functions - Heart sounds.	Blood grouping & Rh factor

9	Circulations: systemic circulation, pulmonary circulation, Cardiac cycle, cardiac output, and electrical properties	Determination of Bleeding time
10	Blood Pressure: -Mean arterial blood pressure and its regulation -Role of kidney in regulation blood pressure	Determination of Clotting time
11	Measurement of lung function: -Lung volumes and capacities - Exchange & transport of gases in the blood	Hemocytometry
12	Gastrointestinal tract: -GI tract general functions -Oral cavity function, Salivary glands function, stomach function, small intestine and large intestine function	Red blood cell count
13	Gastrointestinal tract Secretions: General characteristic of GI Secretions and their functions	Differential count of white blood cell(WBC) and Total White blood cell count
14	Physiology of Pregnancy: Parturition, stages of labor hormonal stimulation of parturition and lactation	Scientific film about bleeding & transfusion
15	Fetal development: - The newborn - First year after birth - Aging and death	Erythrocyte sedimentation rate (ESR)

References:

1. Seeleys ***anatomy and physiology*** (eleven edition) Cinnamon L. VanPutte , Jennifer L. Regan , and Andrew F. Russo (2017)
2. ***Essentials of Human Anatomy & Physiology***, Global Edition Suzanne Keller Elaine Marieb (2017)
3. ***Human Anatomy and Physiology***, Global Edition [Sep 14, 2015] Erin, C. Amerman
4. Study Guide to Human Anatomy and Physiology 1 (2012) Michael Harrell M.S.

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الأول	البايولوجي	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Biology	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. Understand the level of organization among living organisms.
2. Be able to recognize and describe cell morphology and components.
3. Understand the Nucleic acid structure and role.

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	Introduction to Biology -History and General concepts of Biology -Cell theory -Comparing Prokaryotic and Eukaryotic Cells	Identification of parts and functions of the light Microscope
2	Introduction to the Chemistry of Life -Cells chemistry and Chemical bonds -Water -pH, Salts and ions	Using the light Microscope to observe Prokaryotic Cells
3	Biologically Important Molecules: -Carbohydrates -Lipids -Proteins -Nucleic Acids	Using the light Microscope to observe (or Slides) Eukaryotic Cells
4	Introduction to Cell Structure and Function - Plasma Membrane , Passive transport, active transport, factors effect on permeability - Cytoplasm	Identification of different stages of mitosis using microscopic slides
5	Introduction to Cell Structure and Function - Cytoskeleton -Microfilaments, Intermediate Filaments, Microtubules, Flagella and Cilia	Identification of different stages of meiosis using microscopic slides
6	Eukaryotic cell organelles: - Mitochondria (morphology, structure), -lysosomes (types, function).	Using slides to study and distinguish morphological features and types of human cells
7	Eukaryotic cell organelles:	Use of slides to

	- Golgi complex (morphology, function)	understand the structure of cellular components: mitochondria, Golgi apparatus, Endoplasmic reticulum
8	Eukaryotic cell organelles: -Endoplasmic reticulum (smooth & rough) and their function. -Vesicles and Vacuoles -Ribosome (protein synthesis).	Use of slides to understand the structure of nucleus, nucleoplasm, nucleolus and nuclear envelope
9	Eukaryotic cell organelles: - The nucleus, nuclear envelope.	Use of potato strips to observe osmosis
10	Eukaryotic cell organelles: Chromosome structure - changes (duplication, translocation, inversion)	Studying osmosis: using of vinegar for dissolving egg shell
11	DNA Replication and protein synthesis -The structure of the DNA	Use of slides to understand the types of chromosomes based on the position of centromere
12	DNA Replication and protein synthesis -Transcription	Experiment for DNA extraction from Banana
13	DNA Replication and protein synthesis -Translation	Use of slides to understand DNA transcription steps and factors involve in each step
14	Introduction to Reproduction at the Cellular Levels -The Cell Cycle -Mitosis	Use of slides to understand DNA translation steps and factors involve in each step
15	Introduction to Reproduction at the Cellular Levels -Meiosis -Prokaryotic Cell Division	Use of slides to understand cell cycle steps and positions of checkpoints

References:

1. Elizabeth o Grady, Jason Cashmore, Marsha, Carol Wismer(2018). ***Principles of Biology- An introduction to Biological Concepts*** . second Edition.
2. Peter Raven (2016) ***Biology***. Elven Edition.
3. VJ. Bekish, Yu.T. Nikulin (2006) ***Practical Book on Medical Biology***.

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الأول	الكيمياء العامة	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		General chemistry	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. To introduce the student to the science of chemistry
2. how to deal with chemical materials
3. to detect and separate materials and prepare standard materials
4. skills for developing Algorithmic (math) problem solving
5. Concept analysis and construction
6. Writing objective reports and statements
7. Use of laboratory equipment/safety

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	• The atom • molecular structure • electronically distribution • Chemical bonding	Laboratory instructions, Laboratory instruments & glass ware
2	• Liquid mixture, • Buffer solutions-types	Preparation of standard solutions , percentage solutions, molar solutions & dilution methods
3	Quantitative & qualitative analysis methods.	Normal solutions.
4	Molar & normal concentrations & method. Problems & discussion.	Buffer- acid, base.
5	Acids, base –examples.	Perception titration. .
6	Oxidation & reduction.	Oxidation titration,
7	Principles of organic chemistry • Hydrocarbons • Alkenes • preparation properties reactions.	Separation & purification of organic compounds
8	Alcohols – Ketones - Aldehydes - Carboxylic acids classification & properties	Aldehyde & ketoses identification, reactions Alcohols- identification, reactions
9	Aromatic hydrocarbons	Reactions of carbohydrates & identification of types.
10	Carbohydrates –classification & reactions	
11	Amines aryl amines	Lipids-identifications& reactions.
12	Introduction to biochemistry, and the machinery of life	
13	Biochemistry and nutrition	Identification of protein.
	Sugars, starches and fibers	Blood glucose

14	Isomers, classifications	Unknown test
15	Electrolytes, electrochemistry	Determination of some elements Ca^{+} , Cl^{-}

References:

4. *Solutions for General Chemistry: Principles and Modern Applications* 11th
Ralph H. Petrucci, F. Geoffrey Herring, Jeffry D. Madura, Carey Bissonnette

5. *Solutions for CHEMISTRY: The Molecular Nature of Matter and Change* 7th
Martin S. Silberberg, Patricia G. Amateis

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الأول	مبادئ الحاسوب (1)	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Computer Fundamentals(1)	باللغة الانكليزية	
2	3	2	1		العربية	لغة التدريس	

الهدف العام : اكساب الطالب مهارات التعامل مع التطبيقات المكتبية الأساسية وانشاء الملفات والمستندات المكتبية.
و استخدام نظام التشغيل فضلا عن اساسيات العمل ضمن البيئة الرقمية.
الهدف الخاص : اكساب الطالب المعرفة في ادارة واستخدام تطبيقات الحاسوب المختلفة .
المفردات

الأسبوع	عناوين المفردات النظرية	عناوين المفردات العملية
الأول	اساسيات الحاسوب Computer Fundamentals مفهوم الحاسوب ، اطوار دورة حياة الحاسوب تطور اجيال الحاسوب	- امثلة عملية حول تصفح وفتح واغلاق النوافذ ومربعات الحوار والطريقة الصحيحة للتعامل مع لوح المفاتيح والمؤشر والاجهزة الاخرى.
الثاني	مزايا الحاسوب ومجالات استخدامه تصنيف الحاسوب من حيث الغرض والحجم ونوع البيانات	-امثله عملية حول التخصيص والتعامل مع الايقونات وتغيير دقة الشاشة.
الثالث	مكونات الحاسوب Computer Components مكونات الحاسوب الاجزاء المادية للحاسوب الكيانات البرمجية	- تدريب الطالب على انشاء مستخدم جديد وتكبير النوافذ و اظهار لوح المفاتيح التعرف على مكونات المادية للحاسبة.
الرابع	حاسوبك الشخصي مفهوم امن الحاسوب وتراخيص البرامج	- تدريب الطالب على التعامل مع تراخيص برامج الحاسوب وانواعها والتعامل مع المنشأ الاصلي للبرامج .
الخامس	امان الحاسوب وتراخيص البرامج Computer Safety & Software Licences	تدريب الطالب على التعامل مع امان الحاسوب.
السادس	اخلاق العالم الالكتروني، اشكال التجاوزات، امن الحاسوب، خصوصية الحاسوب	تدريب الطالب على التعامل مع خصوصية الحاسوب
السابع	تراخيص برامج الحاسوب وانواعها، الملكية الفكرية، الاختراق الالكتروني، برمجيات خبيثة، اهم الخطوات اللازمة للحماية من عمليات الاختراق، اضرار الحاسوب على الصحة	تدريب الطالب على التعامل مع الاختراق الالكتروني وأنواعه انواع وصفات الفايروسات، كيفية عمل صورة (Backup) للحاسوب

للحماية		
تدريب الطالب على التعامل نظم التشغيل ، تهيئة وتقسيم القرص الصلب (Hard) داخليا وخارجيا	تعريف Operating Systems نظم التشغيل نظام التشغيل، الوظائف ، الاهداف ، التصنيف امثلة لبعض نظم التشغيل	الثامن
-تدريب الطالب على تنصيب وندوز 7 .	نظم التشغيل نظام التشغيل ويندوز 7	التاسع
- تدريب الطالب على قائمة ابدأ أوامر Run شريط المهام وتكوين ملف وخزنه باسم الطالب على سطح المكتب. التعامل من النوافذ للبرنامج واشرطة التمرير .-تدريب الطالب على استخدامات F1,F2,...,F12 في لوحة المفاتيح	مكونات سطح المكتب قائمة ابدأ شريط المهام	العاشر
-انشاء مجلد باسم معين وتدريب حول تغيير الاسم والاختفاء والاسترجاع والحذف والمسار له.	المجلدات والملفات الايقونات	الحادي عشر
تدريب الطالب على اجراء عمليات على النوافذ خلفيات سطح المكتب	اجراء عمليات على النوافذ خلفيات سطح المكتب	الثاني عشر
تدريب الطالب على استخدام لوحة التحكم	لوحة التحكم لوحة تحكم ويندوز " Control Panel" مجموعات (Category)	الثالث عشر
تدريب الطالب على حذف برنامج معين وتنصيبه مرة اخرى.	من لوحة التحكم Defragment_ تنظيم الملفات داخل الحاسوب ، تنصيب البرامج وحذفها	الرابع عشر
تدريب الطالب على الإعدادات الشائعة في الحاسوب تنصيب الطابعة وكيفية التعامل معها ، ضبط الوقت والتاريخ ، صيانة الاقراص الاولى Partitions C,D,E,F	بعض الحالات والإعدادات الشائعة في الحاسوب ،ادارة الطابعة ضبط الوقت والتاريخ ، صيانة الاقراص الاولى	الخامس عشر

الملاحظات:

تكون لغة التدريس باللغة العربية و تكون اسماء المصطلحات والمسارات والقوائم ومربعات الحوار باللغة الانكليزية.

المصادر : اساسيات الحاسوب وتطبيقاته المكتبية (الجزء الاول)

أ.م. د. زياد محمد عبود، أ. د. غسان حميد عبدالمجيد، أ.م. د. د. أمير حسين مراد، م. بلال كمال احمد



المقررات الدراسية / الكورس الأول

اسم المادة	لغة التدريس	النظري	العملي	عدد الوحدات
حقوق الإنسان والديمقراطية Human Rights and Democracy	اللغة العربية	2	-	2

أهداف المادة:-

الهدف العام: يتعرف الطالب على التطور التاريخي لحقوق الإنسان في الفصل الدراسي الأول والديمقراطية انواعها وانواع الحريات .

الهدف الخاص: يتعرف الطالب على التطور التاريخي لحقوق الإنسان ودور المنظمات الدولية في ضمان حماية واحترام حقوق الإنسان في الفصل الأول والديمقراطية انواعها واثرها على دول العالم الثالث وانواع ومستقبل الحريات. تمكن طالب قسم تقنيات الأسنان من معرفة حقوق الإنسان ومبادئ الديمقراطية

المقررات الدراسية / الكورس الأول (النظرية)	
الأسبوع	التفاصيل
الأول	مفهوم حقوق الإنسان - تعريف حقوق الإنسان - تعريف الحق - تعريف الإنسان
الثاني	اهم الصفات الاساسية لحقوق الإنسان
الثالث	أنواع حقوق الإنسان - من حيث الاهمية - من حيث الاشخاص - من حيث الموضوع
الرابع	فئات حقوق الإنسان - الجيل الأول: الحقوق المدنية والسياسية - الجيل الثاني: الحقوق الاقتصادية والاجتماعية والثقافية - الجيل الثالث: الحقوق البيئية والثقافية والتنموية
الخامس	حقوق الانسان في الحضارات القديمة - حضارة وادي الرافدين - الحضارة الهندية والصينية - حضارة مصر الفرعونية - الحضارة اليونانية - الحضارة الرومانية
السادس	حقوق الانسان في العصور الوسطى
السابع	حقوق الانسان في الإسلام والادين السماوية

حقوق الإنسان في مجتمعات عصر النهضة ▪ الوثيقة الكبرى ، أو العهد الأعظم (الماجنا كارتا عام 1215) ▪ عريضة الحقوق عام 1628 ▪ وثيقة أو قانون الاحضار عام 1679 ▪ اعلان الحقوق ▪ مساهمة المفكرين (هوبز ، جون لوك ، روسو ، فولتير ، مونتسكيو ، وغيرهم): ▪ وثيقة اعلان الاستقلال في الولايات المتحدة الأمريكية ▪ الثورة الفرنسية و اعلان حقوق الإنسان	الثامن
حقوق الإنسان في العصور الحديثة ▪ ثورة أكتوبر الاشتراكية في روسيا عام 1917 (الثورة البلشفية) ▪ ميثاق عصبة الأمم وحقوق الإنسان ▪ الاعلان العالمي لحقوق الإنسان عام 1948	التاسع
حقوق الإنسان في العصور الحديثة ▪ ميثاق الأمم المتحدة عام 1954 ▪ العهديين الدوليين الخاصين بحقوق الإنسان ▪ المواثيق الاقليمية لحقوق الانسان	العاشر
المنظمات غير حكومية وحقوق الانسان ▪ اللجنة الدولية للصليب الاحمر . ▪ منظمة العفو الدولية . ▪ منظمة مراقبة حقوق الانسان ، ▪ المنظمات الوطنية لحقوق الانسان	الحادي عشر
ضمانات احترام وحماية حقوق الانسان على الصعيد الوطني والدولي ▪ الدستور والقوانين ▪ حرية الصحافة والرأي العام ▪ منظمات المجتمع المدني ▪ المنظمات الاقليمية (الجامعة العربية . الاتحاد الاوربي . منظمة الدول الامريكية) ▪ الأمم المتحدة ووكالاتها المتخصصة	الثاني عشر
الوعي المعاني والبيئي في العراق ▪ المفهوم العام للوعي ▪ وسائل تحقيق الوعي ▪ ابعاد الوعي المعاني ▪ استخدامات الوعي المعاني	الثالث عشر
الوعي المعاني والبيئي في العراق ▪ التحديات التي تواجه الوعي المعاني ▪ اجراءات مقترحة لحل ازمة نقص المياه العذبة	الرابع عشر
مفهوم المساواة ▪ التطور التاريخي لمفهوم المساواة ▪ التطور الحديث لفكرة المساواة ▪ المساواة بين الجنسين ▪ المساواة بين الافراد حسب معتقداتهم	الخامس عشر

المرحلة الأولى

الفصل الثاني

ت	اسم المادة	ن	ع	الوحدات	مستوى المادة	لغة التدريس
1	تشريح أجهزة الجسم	2	3	3	تخصصية	انكليزي
2	فيزياء الذرة	2	3	3	مساعدة	انكليزي
3	علم الفسلجة الوظيفي	2	3	3	مساعدة	انكليزي
4	البايولوجي الاشعاعي	2	4	4	مساعدة	انكليزي
5	اسس التمريض	2	4	4	مساعدة	انكليزي
6	مبادئ الحاسوب 2	1	2	2	مساعدة	انكليزي
7	المصطلحات الطبية	2	-	2	مساعدة	انكليزي
8	اللغة العربية	2	-	2	عامة	عربي
		15	19	23		

عدد الساعات النظري = 15 / عدد الساعات العملي = 19 / مجموع الساعات الأسبوعية = 34 / عدد الوحدات = 23 وحدة

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	تشريح أجهزة الجسم	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Anatomy of body systems	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

At the end of the course, the student will be able to know:

1. The general anatomy of the central nervous system.
2. The general anatomy of the respiratory system.
3. The general anatomy of the cardiovascular system.
4. The general anatomy of the digestive system.
5. The general anatomy of the liver, biliary system, pancreas, and spleen.
6. The general anatomy of the urinary system.
7. The general anatomy of the breast.
8. The general anatomy of the male reproductive system.
9. The general anatomy of the female reproductive system.

Theoretical & pratical syllabus	
Week	Detiales
1	The mid brain, cerebral hemisphere, ventricles of the brain.
2	The hind brain: Cerebellum, pons and medulla oblongata.
3	Meninges, and spinal meninges.
4	The cranial nerves.
5	Lumber and sacral plexuses.
6	Respiratory system: lung, bronchial tree, vascular supply.
7	Cardiovascular system: heart, heart chambers, major vessels.
8	Digestive system: pharynx, esophagus, and stomach.
9	Digestive system: small intestine, and blood supply to abdominal wall.
10	Digestive system: Large intestine.
11	Liver, biliary system, pancreas, and spleen.
12	Urinary system: Kidney, ureter, urinary bladder, urethra & blood supply.
13	The breast: general anatomy, lobular structures.
14	Male reproductive system.
15	Female reproductive system.

References:

1. VanPutte, C. L., Regan, J. L., Russo, A. F., Seeley, R. R., Stephens, T., & Tate, P. (2017). *Seeley's anatomy & physiology*. McGraw-Hill. (Eleventh edition).
2. Abrahams, P. H., Spratt, J. D., Loukas, M., & VanSchoor, A. (2018). *Abrahams' and McMinn's Clinical Atlas of Human Anatomy*.
3. Netter, F. H. (2018). *Atlas of Human Anatomy*.
4. Drake, R., Vogl, A. W., & Mitchell, A. W. (2014). *Gray's anatomy for students*. (Third edition).
5. Marieb. Wihelm. Mallat. *Human anatomy*. Eighth edition.
6. S. Hombach-Klonish, T. Klonish, J. Peeler. *Sobota clinical atlas of human anatomy*. First edition.

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	فيزياء الذرة	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Physics of atom	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. Define the atomic and Nuclear Structure.
2. Learn the types of the ionization radiation.
3. Know the mechanism of radiation interaction with matter.
4. Define the interaction scatter radiation with matter.
5. Discuss the types of attenuation coefficient.
8. Define nanotechnology science, types of nanomaterials synthesis, and their applications.
9. To inform students as to the importance of renewable energy in the energy mix required for generation within nations.
10. The students will acquire sharp knowledge on nanotechnology based alternate source of energy.
11. The students may work on advanced materials for renewable and green energy.
12. The students will get a clear understanding of Solar technology.
14. They will also understand the importance of energy storage techniques.
15. They will be clear about the role of nanotechnology in improving the efficiency in energy usage.

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	• Atomic and Nuclear Structure. – Fundamental particles – Nuclear Binding energy – Nuclear Stability – Auger electrons	Activity of a Gamma Source
2	– Radioactive Decay – Radioactive materials – Activity – Half life	Beta decay of nuclei
3	• Types of radiation – Alpha particles – Beta particles – Gamma radiation – Others, Decay models	Influence of a magnetic field on α , β and γ radiation
4	• Classification of Radiation – Electromagnetic radiation – Particulate radiation – Ionizing and non-ionizing radiations • Electromagnetic Energy – Velocity and Amplitude – Frequency and Wavelength	– Deflection of beta particles – The beta spectrum (simple version)

5	• Wave Model: Visible Light Particle Model: Quantum Theory • Matter and energy • Interactions of photons with matter • Mechanisms of Energy Loss – Photoelectric effect – Thomson scattering – Coherent (Rayleigh) scattering	– The interaction between cosmic rays and matter – Interaction of Gamma rays with matter
6	– Incoherent scattering – Pair and triplet production – Compton scattering by free electrons – Scattering and energy transfer coefficients – stopping power	– Photoelectric Absorption and Compton Scattering – Compton scattering of Gamma rays – Calculations of Stopping Power, and Range of Ions Radiation (Alpha Particles)
7	• Photon Attenuation Coefficients – Linear attenuation coefficient – Exponential attenuation – Mass attenuation coefficient – Energy-Absorption coefficient	Calculations of: - Linear attenuation coefficient - Mass attenuation coefficient - Energy-Absorption coefficient
8	• Interactions of electrons with matter – Ionizational (collisional) interactions – Radiative Interactions – stopping power	– The interaction of electrons with matter – Pair Production and Annihilation – Interaction with Different Materials and Human Body Parts
9	• Introduction of Nanomaterials – Properties of nanoparticles – Types of nanoparticles	– Nanoparticles lab safety – Notes for liquid handling and micropipetting
10	– Synthesis Routes – Bottom-Up Approaches – Top-Down Approaches – Applications of nanomaterials in medicine & biology	Synthesis of Gold-Silver Nanoparticles and Investigation of Their Optical Properties
11	• Nanotechnology in renewable energy systems – Energy transport, conversion and storage – Nano, micro and meso scale phenomena and devices. • Energy sector products using nanomaterials – Light emitting diodes – Batteries – Catalytic reactors Capacitors, Super capacitors	Use of Nanoparticles as: – Biosensor – Cancer detection – Drug and gene delivery – Energy products
12	• Nanotechnology to Hydrogen Production – Photocatalytic Water Splitting Reaction – Nano Semiconductor Materials for Photocatalytic Water Splitting	– Nanotechnology and the Generation of Sustainable Hydrogen – Hydrogen from Miscellaneous Sources and Nanotechnology

	– Photolytic H₂ Evolution Based on Nanoenhanced Materials	
13	• Nanomaterials for the Conversion of Carbon Dioxide into Renewable Fuels and Value-Added Products – Theoretical Potentials for Electrochemical Reduction of CO₂ – Effect of Particle Size on Electrode Performance in Electrochemical CO₂ Reduction Reaction	– Fossil Hydrocarbon Decarbonization and Nanotechnology – Nanomaterials in the advancement of hydrogen energy storage – Hydrogen Fuel Cells and Nanotechnolog
14	• Nanomaterials and Direct Air Capture of CO₂ – Capture or Separation Technologies – New Roads into CO₂ Capture: Direct Air Capture and Nanomaterials	– The role of nanotechnology on post-combustion CO₂ absorption in process industries
15	• Solar energy technology – Availability of solar radiation – Photovoltaic devices – Dye sensitized solar cells – Photoelectrochemical cells for hydrogen production	– Exploring Solar Panels – Variables Affecting Solar Panel Output

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1. Perry Sprawls, *“Physical principles of medical imaging”*, 2nd Edition 1996.
2. Allisy-Roberts PJ, Williams J. Farr's *“physics for medical imaging”*. Elsevier Health Sciences; 2007 Nov 14.
3. Chris Guy & Dominic ffytche *“An Introduction to The Principles of Medical Imaging”* Revised Edition, Imperial College Press, London, (2005).
4. Sang Hyun Cho, Sunil Krishnan, MD, *“Cancer Nanotechnology Principles and Applications in Radiation Oncology”*, In: Imaging in medical diagnosis and Therapy, William R. Hendee Series Editor ; Taylor & Francis Group, LLC (2013).
5. 1. Twidell. J, Weir. T, *“Renewable Energy Resources”*, E & F N Spon Ltd, 2nd Edition.
6. 2. Baldev Raj, Marcel Van de Voorde , Yashwant Mahajan,” *Nanotechnology for Energy Sustainability*”, ISBN: 978-3-527-34014-9 2017.
7. 3. Kreith.J.F, *Solar Energy Handbook*., McGrawHill.

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	علم الفسلجة الوظيفي	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Systemic physiology	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. Understand the fundamental mechanisms that operate in human body and how they interact.
2. Understand the functions of important physiological systems including the cardio, respiratory, renal, reproductive and digestive systems.

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	Physiology of cardiovascular system: Components of CVS and their functions Systole, diastole, peripheral resistance	Examination of Arterial Pulse
2	Physiology of Respiratory system: Pulmonary ventilation, elastic recoil, pressure changes during inspiration and expiration, pulmonary volumes, alveolar ventilation, respiratory control centers, factors influence breathing	Film about Stethography: recording normal movement of respiration
3	Physiology of Digestive system: stomach, gastric juice, regulation of stomach secretion, inhibition of secretion by nervous system, small intestine secretion	Film about Stethography: modified movements of respiration
4	Physiology of Pancreas and small and large intestine: pancreatic juice contains and function , regulation of pancreatic secretion, duodenum function , intestinal juice contents, large intestine	Film about determining vital capacity and effect of posture on vital capacity
5	Physiology of liver and gallbladder: liver functions, gallbladder function	Thermometer & its uses
6	Physiology of renal system: Parts of urinary system, function of urinary system, urine formation process, glomerular filtration	Arterial blood pressure estimation
7	Selective process of urine formation: Tubular reabsorption, Regulation of urine concentration and volume, tubular secretion, urine movements	Examination of Heart sounds

8	Micturition: Micturition reflex regulation and urination	Electrocardiogram (ECG)
9	Female reproductive system: Puberty in females, menstrual cycle, menopause, female fertility and pregnancy	Pulmonary volume estimation
10	Male reproductive system: Function, testosterone, puberty in males, regulation of male reproduction system, hormonal and neural mechanisms	Artificial respiration
11	Physiology of nervous system: General organization , CNS, PNS, nerve fiber, brain parts, brainstem function, cerebrum function, nerve impulses, action potential, relax Arc, Motor system: Sensory system	General urine examination (GUE)
12	Tract of spinal cord: Descending, ascending, intersegmental	Experiments on movement coordination
13	Physiology of spinal cord sections: Hemi section and complete section	Film about muscles
14	Endocrine control mechanism: Adrenal gland hormones role and function	Film about joints
15	Endocrine control mechanism: Pituitary gland hormones role and function	Taste sensation examination

References:

1. *Seeleys anatomy and physiology* (eleven edition) Cinnamon L. VanPutte , Jennifer L. Regan , and Andrew F. Russo (2017)
- 2-*Essentials of Human Anatomy & Physiology*, Global Edition Suzanne Keller Elaine Marieb (2017)
- 3-*Human Anatomy and Physiology*, Global Edition [Sep 14, 2015] Erin, C. Amerman
- 4-*Study Guide to Human Anatomy and Physiology* 1 (2012) Michael Harrell M.S.

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	البايولوجي الاشعاعي	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Radiobiology	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

- 1- Understand the radiobiological effect of radiation on cells, tissues.
- 2- Understand the different responses of normal and tumor cells to radiation effect.
- 3- Study the effect of ionization radiation in radiotherapy.

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	• Introduction to Radiobiology - Radiation chemistry: - Initial physical event - Radiolysis of water - Direct Effect of Radiation - Indirect Effect of Radiation	Examination of Eukaryotic Cells Structure and Types
2	• - Oxygen Effect (OER) - Radiosensitizers - RadioProtectors (DMF) • Irradiation-induced damage and the DNA damage response - The DNA damage response - Sensors of damage	Examination the Effects of Radiation on Cells (Water and DNA)
3	• Cell death after irradiation: - programmed cell death - Apoptosis - Autophagy - Necrosis, Senescence - mitotic catastrophe	Representation of Cell Cycle Phases and Checkpoints
4	• Molecular Repair of DNA Damage - Base Excision Repair - Homologous Recombination - Nonhomologous and Joining • Target theory - Single target -Single hit, - Multiple target- single hit	Stages of Mitosis stages
5	• Cell survival curves - Recovery - Cell-Cycle Effects - Radiation Effect Modification	Examination of DNA Damage Repair

6	• Types of Cellular Damage due to Radiation - Lethal Damage - Potential Lethal Damage	Examination of Target Theory and Survival Curves
7	• Radiobiology of Tissue and Organs Response to Radiation - The Most Sensitive - Sensitive - Moderately Sensitive - Less Sensitive	Examination of Cellular Damage due to Radiation
8	• The severity of radiation effect: - Subacute Effects - Acute Effects - Chronic Effects	Examination of Different Responses of tissue and Organs to Radiation
9	• Tumor Response to Radiation - Therapeutic index (combined radiation and drug treatments) - Tumor control probability - Normal Tissue complication Probability	
10	• Introduction to Biosafety and Security - Key components of Biorisk Management - Components of safety in all laboratories - Universal safety precautions	
11	• Biosafety barriers in laboratories - Personal protective equipment(PPE) - Facility Design	
12	• Biological Agents - Routs of infection - Basis for control Measures - Hazard group classification system - A Biosafety cabinet (BSC)	
13	• Biorisk and biohazards - Control of substances hazardous to health - Assessing risk for work with human blood and tissues hazards - Control measures for work with human blood and tissue - Containment level	
14	• Types of biological wastes - Categories of biological wastes - Decontamination of biological wastes	
15	• Transportation of biological wastes - International Transport Regulations - The Basic Triple Packaging System	

References:

1. Beyzaoglu, M, ;Ozyigit, G. and Ebruli, C. (2010). **Basic Radiation Oncology**. Springer, Berlin, Heidelberg.
2. Elizabeth o Grady, Jason Cashmore, Marsha, Carol Wismer (2018) **Principles of Biology- An introduction to Biological Concepts**, second edition.
3. international Atomic Energy Agency. **Radiation Biology** : A Hand book for Teacgers and students (2010). Series no.42.

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	اسس تمريض	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Principles of Nursing	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

1. To introduce the students to the most important ways of dealing with patients.
2. To inform them how maintain the health of the patient and providing care for them.
3. To prepare the patients for different radiographic examinations, first aid methods and civil defense.

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	Nursing, its importance and development among societies, the qualifications of nurse	
2	Temperature measurement routs , heart pulse characteristics and measurement sits	Clinical thermometer types , temperature and pulse measurement routs technique
3	Respiratory rate and respiratory types, blood pressure and blood pressure types	Respiratory rate and blood pressure measurement routs technique
4	Body mechanism , Patient positions types (erect,supine, dorsal recumbent, fowler's, lateral, pron, sim's, lithotomy, knee-chest, semi-fowler's , trendelenberge and reverse trendelenberge positions)	Patient positions types technique
5	Drug administration routs (mouth, inhalation , rectum & vagina , injection) drugs storage , weights and measures	Drug administration routs technique
6	Basic principles of medical and surgical sterilization and disinfection	Hand washing technique , cap, mask , surgical gloves and gown wearing technique
7	Urinary catheterization and enema types	Urinary catheter and enema techniques
8	Gastric lavage and artificial feeding	Gastric lavage and artificial feeding techniques
9	Role of nurse in patient preparation for general radiography and special GIT and urinary system radiography	General radiography , special GIT and urinary system radiography techniques
10	Fundamental and application of first aid, artificial respiration types and CRP	artificial respiration and CRP techniques
11	• Wounds and hemorrhage types, arterial pressure points • Dressing and bandages types and uses , surgical sutures types	First aid methods for wounds and hemorrhage in various sites in the body , determination of arterial pressure points
12	• Poisoning , asphyxia and foreign bodies	Techniques of simple dressing , suturing,

	types • Fractures and burns types, electrical shock • War injuries types and principles of the civil defense	removing sutures and clips, bandages uses techniques. First aid methods for poisoning , asphyxia and foreign bodies. Fractures , burns and electrical shock first aids
13	• Introduction to Biosecurity - Risks Characterization in biosecurity - Vulnerability assessment¹³ - Component of Laboratory Biosecurity¹⁵ • Biosafety level - Risk Assessment Strategy - Hazard groups, biosafety levels, practices and equipment - Standard practices required in biology laboratories.	
14	• Biorisk management system - Assess the capability of the laboratory staff to control hazards - Relation of risk groups to biosafety levels , practices of and equipment - Mitigation Control Measures - Sustainability of the bio-risk management system - Strengthening biorisk management	
15	• Accident response - spill cleanup procedure - Investigation of an accident inside the laboratory. • Biosafety training	

References:

1. **Mosby's Pocket Guide to Nursing Skills & Procedures (2015).** Eighth Edition. Anne Griffin Perry & Patricia A. Potter. Mosby's Elsevier Inc.
2. **Drug Guide for Nursing Students (2015).** Eleventh Edition . Linda Skidmore-Roth. Mosby's Elsevier Inc.
3. **Study Guide for Fundamentals of Nursing the Art and Science of Nursing Care (2011).** Seventh Edition . Carol R. Taylor, Carol Lillis, Priscilla LeMone, Pamela Lynn & Marilee LeBon. Wolters Kluwer Lippincott Williams & Wilkins.
4. **Fundamentals of Nursing Standards & Practice (2010).** Fourth Edition. Sue C. DeLaune & Patricia K. Ladner. Delmar Cengage Learning Inc.

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	مبادئ الحاسوب (2)	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Computer Fundamentals(2)	باللغة الانكليزية	
2	3	2	1		العربية	لغة التدريس	

الهدف العام : اكساب الطالب مهارات التعامل مع التطبيقات المكتبية الأساسية وانشاء الملفات والمستندات المكتبية.
واستخدام نظام التشغيل فضلا عن اساسيات العمل ضمن البيئة الرقمية.
الهدف الخاص : اكساب الطالب المعرفة في ادارة واستخدام تطبيقات الحاسوب المختلفة .
المفردات :

الأسبوع	عناوين المفردات النظرية	عناوين المفردات العملية
الأول	مايكروسوفت وورد 2010 تشغيل برنامج مايكروسوفت وورد 2010	-كتابة نصوص كثيرة وتدريب الطالب على اجراء تلك الفعاليات.
الثاني	واجهة برنامج مايكروسوفت وورد 2010	- تدريب الطالب على عمل نصوص بتنسيقات مختلفة وسحبها على الطابعة.
الثالث	تبويب ملف، تبويب الصفحة الرئيسية	-تدريبات عملية على نصوص ضمن المستند. -اعطاء اسماء لشركات او طلاب وتدريب الطالب على البحث عن اسم معين واستبداله.
الرابع	تبويب تخطيط الصفحة، تبويب عرض	تدريب الطالب على تخطيط الصفحة، تبويب عرض التدريب على كتابة نصوص
الخامس	ادراج الكائنات في مايكروسوفت وورد 2010	اعطاء امثلة عملية حول ادراج الكائنات التدريب على كتابة نصوص بطريقة اكثر احترافية
السادس	تبويب ادراج Insert Tab مجموعة صفحات Pages	اعطاء امثلة عملية حول مجموعة صفحات تبويب ادراج
السابع	مجموعة الجداول Tables	اعطاء امثلة عملية مجموعة الجداول Tables

اعطاء امثلة عملية اخرى مجموعة الجداول Tables	مجموعة الجداول Tables	الثامن
تدريب الطالب على مجموعة رسومات توضيحية	مجموعة رسومات توضيحية	التاسع
-ادراج صورة معينة وتكليف الطالب بأجراء تلك الفعاليات.	مجموعة ارتباطات، مجموعة رأس وتذييل Header& Footer	العاشر
-تدريب الطالب على كتابة نصوص تضم رموز العملة و الحروف الخاصة ورموز علمية وغيرها.	مجموعة نص Text، مجموعة رموز Symbols	الحادي عشر
-تدريب الطالب على كتابة معادلات تضم صيغ الجمع والضرب والرفع للأسس والمصفوفات بأشكال مختلفة. -تدريب الطالب على انشاء جداول مختلفة مع ادخال البيانات	مهام إضافية لمايكروسوفت وورد 2010	الثاني عشر
-تدريب على فتح ملف جديد و تخزينه على سطح المكتب. -اضافة وتحرير شرائح (شريحة عنوان ،عنوان مع محتوى ،عنوان فرعي، محتويين ، مقارنة، عنوان فقط، شريحة فارغة، محتوى مع تعليق، صورة مع تعليق). - اضافة وتحرير انواع شريحة المحتوي (جدول ، رسم بياني، اشكال ومخططات، صور، صور من الانترنت ،ملفات فيديو).	مايكرو سوفت بوربوينت 2010 فتح ملف جديد و تخزينه على سطح المكتب. -اضافة وتحرير شرائح (شريحة عنوان ،عنوان مع محتوى ،عنوان فرعي، محتويين ، مقارنة، عنوان فقط، شريحة فارغة، محتوى مع تعليق، صورة مع تعليق).	الثالث عشر
-تدريب على حذف الشرائح ونقلها واعادة ترتيبها. -اضافة نسق theme . -تطبيق فعالية Master slide -اضافة حركات وضبط الوقت والتكرار لكامل الشرائح وبشكل مختلف لكل شريحة.	اضافة نسق theme . -مجموعة العرض الرئيسية Master views -اضافة حركات وضبط الوقت والتكرار لكامل الشرائح وبشكل مختلف لكل شريحة.	الرابع عشر
-اضافة لكل جزء من الشريحة حركية دخول واستقرار وخروج وحركات اخرى مع ضبط التكرار والوقت وبقية الخيارات. وحفظ ملف العرض بصيغة Adobe ..PDF	اضافة الحركات للشرائح	الخامس عشر

الملاحظات:

تكون لغة التدريس باللغة العربية و تكون اسماء المصطلحات والمسارات والقوائم ومربعات الحوار باللغة الانكليزية.

المصادر : اساسيات الحاسوب وتطبيقاته المكتبية (الجزء الثاني)

أ.م. د. زياد محمد عبود، أ. د. غسان حميد عبدالمجيد، أ.م. د. أمير حسين مراد، م. بلال كمال احمد

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	المصطلحات الطبية	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Medical Terminology	باللغة الانكليزية	
2	2	---	2		الانكليزية	لغة التدريس	

Objectives:

1. Identify the four word elements used to build medical words.
2. Divide medical words into their component parts.
3. Apply the basic rules to define and build medical words.
4. Locate the pronunciation guidelines chart and interpret pronunciation marks.
5. Pronounce medical terms
6. Determine how to link combining forms and word roots to various types of suffixes
7. List and identify the terms related to direction, position, and planes of the body.
8. Describe pathological conditions, diagnostic and therapeutic procedures, and other terms related the body system.

Theoretical syllabus	
Week	Detiales
1	Structural analysis: Basic Elements of a Medical Word
2	suffixes
3	Prefixes
4	Roots , Word terminals , Conditions
5	Terms concerning Body Structure
6	Terms concerning Integumentary System
7	Terms concerning Digestive System
8	Terms concerning Respiratory System
9	Terms concerning the skin & its appendages
10	Terms concerning Cardiovascular System
11	Terms concerning Blood, Lymph, and Immune Systems
12	Terms concerning Musculoskeletal System
13	Terms concerning the endocrine system
14	Terms concerning the special senses
15	Terms concerning the oncology

References:

1. David Andersson, *Medical Terminology: The Best and Most Effective Way to Memorize, Pronounce and Understand Medical Terms*: Second Edition
2. Barbara A. Gyls *Medical Terminology Systems: A Body Systems Approach* Eighth Edition.

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الأولى / الفصل الثاني	اللغة العربية	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Arabic language	باللغة الانكليزية	
2	2	---	2		العربية	لغة التدريس	

الموضوعات	الأسابيع
مقدمة عن الأخطاء اللغوية - التاء المربوطة والطويلة والتاء المفتوحة	الأسبوع الأول
قواعد كتابة الالف الممدودة والمقصورة - الحروف الشمسية والقمرية	الأسبوع الثاني
الضاد والظاء	الاسبوع الثالث
كتابة الهمزة	الأسبوع الرابع
علامات الترقيم	الأسبوع الخامس
الاسم والفعل والتفريق بينهما	الأسبوع السادس
المفاعيل	الأسبوع السابع
العدد	الأسبوع الثامن
تطبيقات الأخطاء اللغوية الشائعة	الأسبوع التاسع والعاشر
النون والتنوين - معاني حروف الجر	الاسبوع الحادي عشر
الجوانب الشكلية للخطاب الإداري	الاسبوع الثاني عشر
لغة الخطاب الإداري	الأسبوع الثالث عشر والرابع عشر
نماذج من المراسلات الإدارية	الأسبوع الخامس عشر

المرحلة الثانية

المرحلة الثانية

الفصل الأول

ت	اسم المادة	ن	ع	الوحدات	مستوى المادة	لغة التدريس
1	تقنيات الاجهزة الشعاعية التقليدية	2	5	4	تخصصية	انكليزي
2	تقنيات التصوير الشعاعي للاطراف العليا	2	5	4	تخصصية	انكليزي
3	فحوصات شعاعية خاصة للجهاز الهضمي والعظام	2	5	4	تخصصية	انكليزي
4	التشريح الشعاعي للاطراف العليا	2	4	4	تخصصية	انكليزي
5	اساسيات الفيزياء الشعاعية	2	3	3	مساعدة	انكليزي
6	اساسيات الوقاية من الاشعاع	2	3	3	مساعدة	انكليزي
		12	25	22		

عدد الساعات النظري = 12 / عدد الساعات العملي = 25 / مجموع الساعات الأسبوعية = 37 / عدد الوحدات = 22 وحدة

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الأول	تقنيات الاجهزة الشعاعية التقليدية	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Conventional Radiological Equipment techniques	باللغة الانكليزية	
4	6	5	2		الانكليزية	لغة التدريس	

Objectives:

1. Identify the components of the x-ray imaging system operating console.
2. Explain the operation of the high-voltage generator.
3. Define the essential components of X-ray tube.
4. Explain the important techniques types used in radiographic imaging.
5. Determine the methods of scatter control in x-ray imaging system.

Theoretical & practical syllabus	
Week	Details
1	X-Ray machine system: • Operating console: – line compensation, – autotransformer, – KVP adjustment, – mA control – Exposure timer
2	• High voltage generators: – transformers, – voltage rectification, – phase power types, – x-ray circuits – Effect of waveform on radiation output & image quality
3	• X-ray tube: – Basic design – Line focus principle – Heel effect
4	X-ray tube failure: – Causes of X-ray Tube Failure – Results – Remedy
5	• Construction of film, Intensifying screens, cassette. • Processing the latent image: – Manually – Automatically
6	• Filters – Types – Half-value layers

	• Control of scatter radiation: – Beam restrictors, – The grid (Characteristics of grid construction, grid ratio, grid frequency)
7	• Grid types: – linear, crossed, focused, moving grids
8	• Digital radiography: Computed Radiography (CR): – System apparatus, – mechanism of work – Image processing
9	• Direct to digital radiography (DDR): • Flat Panel Detectors (DR): • Indirect conversion detector (a-Si) • Direct conversion detector (a-Se)
10	• Image quality: – Contrast – Resolution – Noise
11	– Unsharpness – Magnification – Distortion – Artefacts
12	• Mammography: – Imaging system equipments, – Types of mammography systems. - Film-screen system
13	– Digital mammography (FFDM) – CEDM – Breast tomosynthesis – Computer-aided detection (CAD) – Scintimammography
14	• Fluoroscopy: – Traditional imaging system apparatus & Image Intensification – Digital Fluoroscopy – Digital subtraction angiography
15	• Bone density scan (DEXA scan): – Imaging system apparatus – Mechanism • Orthopantomogram (OPG): – Types, – Mechanism

References:

1. Stewart Carlyle Bushong, ***“Radiologic Science for Technologists Physics, Biology, and Protection”*** Elsevier, Inc. , 7th edition, 2017.
2. Chris Guy & Dominic ffytche, ***“An Introduction to The Principles of Medical Imaging”*** , Imperial College Press, 2005.
3. Perry Sprawls, ***“Physical principles of medical imaging”***, 2nd Edition 1996.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الاول	تقنيات التصوير الشعاعي للاطراف العليا	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Radiographic techniques for upper limbs	باللغة الانكليزية	
2	5	6	4		الانكليزية	لغة التدريس	

Objectives:

1. To teach the students how to direct the patient in particular way to photograph to see diseases in the best way for upper limbs

Theoretical & practical syllabus	
Week	Details
1	• Terminology, • body planes,section, • lines, body position special projections
2	• Image quality - exposure factor, - brightness, - contrast , - resolution , - distortion , noise
3	Shoulder joint, AP, lateral , supero- inferior & oblique
4	Glenohumeral joint positions
5	Acromioclavicular joints
6	Clavicle positions
7	Sternoclavicular joints
8	Scapula & Coracoid process positions
9	Humerus distal and proximal fracture
10	Forearm , radius and ulna, type of fracture
11	Elbow joint , AP, Lateral, oblique , shown structure
12	Hand positions, shown structures
13	Thumb& fingers positions
14	Scaphoid bone positions, shown structures
15	Wrist positions, shown structures

References:

1. Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., & Hoadley, G. (2015). *Clark's Positioning in Radiography* 13E. crc Press.
2. Bontrager, K. L., & Lampignano, J. (2013). *Bontrager's handbook of radiographic positioning and techniques*. Elsevier Health Sciences.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الاول	فحوصات شعاعية خاصة للجهاز الهضمي والعظام	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Special radiological procedures of gastrointestinal tract and bones	باللغة الانكليزية	
4	6	5	2		الانكليزية	لغة التدريس	

Objectives:

1. To teach the students how to use the contrast media and perform the radiological examination of the gastrointestinal tract and bones

Theoretical & practical syllabus	
Week	Details
1	• Intravascular contrast media • Adverse effect of Intravenous (IV) water soluble contrast media on specific organs
2	Contrast Agents in Magnetic Resonance Imaging • Mechanism of Action • Gadolinium Gastrointestinal Contrast Agents
3	Methods of imaging of Gastrointestinal tract (GIT) with barium water soluble contrast agents
4	Barium examination: swallow and meal Barium examination: follow through, small bowel anema.
5	Barium examination: barium enema, instant enema, air enema.
6	Reduction of intussusception
7	Computed Tomography of the Gastrointestinal Tract
8	Magnetic Resonance Imaging of the Gastrointestinal Tract
9	Imaging modalities of bones & joints.
10	Musculoskeletal MRI –general points
11	Arthrography – general points
12	Arthrography of the knee & hip
13	Arthrography of the shoulder & elbow
14	Arthrography of the wrist & ankle
15	Radionuclide bone scan

References:

1. Watson, N. & Jones, H. Chapman & Nakielnys “*Guide to Radiological procedures*”, 7th edition, Elsevier Health Sciences, 2017.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الاول	التشريح الشعاعي للاطراف العليا	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Radiological anatomy of upper limbs	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

At the end of the course, the student will be able to know:

1. The general anatomy and radiological features of the upper limbs.
2. The general anatomy and radiological features of the upper limbs joints.
2. The general anatomy and radiological features of the arterial blood supply of upper limbs as well as venous drainage.

Theoretical & practical syllabus	
Week	Details
1	Bones of the upper limb: - shoulder girdle (scapula bone). - Radiological features of the scapula bone. - Ossification center.
2	Shoulder girdle (clavicle bone). Radiological features of the clavicle bone. Ossification center.
3	Normal anatomy of the humerus, - radiological features of the humerus. - Ossification center.
4	Normal anatomy of the radius bone, radiological features of the radius bone. Ossification center.
5	Normal anatomy of the ulna bone, - radiological features of the ulna bone. - Ossification center.
6	Normal anatomy of the hand, - radiological features of the hand. - Ossification centers.
7	Shoulder joint: - components, - type of joint, - articulating surfaces, - joint capsule & labrum.
8	Shoulder joint: - ligaments of shoulder joint, - radiological features of shoulder joint.
9	Elbow joint: - components, articulating surfaces, - ligaments & radiological feature of the elbow joint.
10	Wrist joint:

	- components, - articulating surfaces, ligaments & radiological features of the wrist joint.
11	Blood supply of upper limbs: - arteries of the upper limb, - Radiological features of the upper limb arteries.
12	• Veins of the upper limb, • Radiological features of the upper limb veins.
13	The bones of the skulls, radiological features of the skull.
14	The facial bones, radiological features of the facial bones.
15	- Normal anatomy of nasal cavity & paranasal sinuses. - Radiology of the nasal cavity and paranasal sinuses.

References:

1. Kelley, L. L., & Petersen, C. (2018). *Sectional Anatomy for Imaging Professionals*. Third & fourth edition.
2. Ryan, S., McNicholas, M., & Eustace, S. (2011). *Anatomy for diagnostic imaging*.
3. Lazo, D. L. (2015). *Fundamentals of sectional anatomy: an imaging approach*.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الأول	اساسيات الفيزياء الشعاعية	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Fundamentals of Radio-physics	باللغة الانكليزية	
2	3	5	3		الانكليزية	لغة التدريس	

Objectives:

1. Explain the method of production the tube voltage.
2. Define the effect of heating & cooling the x-ray tube.
3. Explain the methods of x-ray production.
4. State the interaction processes of x-rays.
5. Define factors affecting on electron beam.
6. Determine the factors influencing x-ray output and image contrst.
7. Explain the quality assurance of exposure parameters.

Theoretical & practical syllabus	
Week	Details
1	• Generating the tube voltage – Exposure timing – Falling load – Filament voltage
2	• Limitation of the x-ray tube – Line focus – Rotation anode tube – Heat rating
3	• X-Ray Tube Heating and Cooling – Heat production – Heat capacity • Factors affecting the heat capacity – Focal spot area – Focal spot size – Rotating anode speed – Anode body
4	• X-Ray Production – Characteristic radiation – Bremsstrahlung radiation • Emission spectrum • Bremsstrahlung – Importance in Imaging and Dose – Influence of Electron Energy

	– Influence of Target Material – Influence of Filtration
5	• Characteristic Radiation – Importance in Imaging and Dose – Influence of Electron Energy – Influence of Target Material – Influence of Filtration
6	• Luminescence phenomenon – X-ray fluorescence – X - ray phosphorescence
7	• Electron tube energy • Factors affecting electron emission spectrum – mA and mAs – kVp – Voltage Waveform – Target Material – Added Filtration
8	• X-ray Emission: Factors Influencing x-ray spectra and output - X-ray quantity – X-ray intensity – Factors affecting x-ray quantity
9	- X-ray quality – Penetrability – Photon range – filtration – Half-Value Layer
10	• The Linear X-ray Attenuation Coefficient • Interaction X-ray with matter processes – Photoelectric Absorption – Compton process (Modified scatter) – Effect of the angle of scattering • Unmodified scatter
11	• Factors affecting image contrast – Linear attenuation coefficient of subject – Photon energy (KVp) – Soft Tissue Radiography – Calcium – Iodine and Barium Contrast Media – Scatter Radiation and Contrast
12	• Attenuation of X-ray by: – The patient – Contrast media
13	• Differential absorption – Dependence on Atomic Number – Dependence on Mass Density
14	• Quality assurance of exposure parameters

	• X-ray tube output factors – X-ray tube output – kilovoltage – milliamperere-seconds – automatic exposure control – Filtration – Focal spot measurement
15	• Equipment tests – Speed of film processor

References:

1. M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi "***Radiation Physics and its applications in diagnostic radiological techniques***", Middle Technical University (MTU), Iraq, (2015)
2. W. R. Hendee and E. R. Ritenour "***Medical Imaging Physics***", 4th Edition, Wiley-Liss, Inc., (2002).
3. Allisy-Roberts PJ, Williams J. Farr's "***physics for medical imaging***". Elsevier Health Sciences; 2007 Nov 14.
4. Stewart Carlyle Bushong, "***Radiologic Science for Technologists Physics, Biology, and Protection***" Elsevier, Inc. , 7th edition, 2017.
5. Perry Sprawls, "***Physical principles of medical imaging***", 2nd Edition 1996.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الأول	أساسيات الوقاية من الأشعاع	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Fundamentals of radiation protection	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. Explains the basic concepts of ionizing radiation.
2. Define the Radiation Measurement Units & International SI Units.
3. List the principles of radiological protection (ALARA concept).
4. Explain the meaning of the concept of dose limits, and name the recommended dose limits for radiation workers and the public.
5. Discuss the dose management for pregnancy & obese peoples
6. Describe the types of radiation detectors and measurement.
7. Explain how to estimate the radiation dose in CT & fluoroscopy.

Theoretical & practical syllabus	
Week	Details
1	• Classification of ionizing radiation • Sources of ionization Radiation (background radiation) – Natural sources – Human-made (artificial) sources • Comparison of Radiation Doses
2	• Radiation Measurement Units & International SI Units – Activity – Exposure – Absorbed dose – Kerma – Equivlant dose – Effective dose – Committed Equivlant & effective dose
3	• The Principles of Radiological Protection – Justification of a practice – Optimisation of Protection (ALARA principles) ❖ Time ❖ Distance ❖ Shielding
4	– Dose limits – Maximum Permissible Occupational Doses – Maximum Permissible public Doses – Maximum Permissible patient Doses – Whole-Body Dose Limits

	– Dose Limits for Tissues and Organs
5	• Radiation protection for classification of exposure: – Occupational – Medical – Public • Whole body non-occupational exposure • Partial-body occupational exposure
6	• Occupational Radiation Exposure in: – Fluoroscopy – Mammography – Computed Tomography – Surgery
7	• Patient Radiation Dose Descriptions – Entrance Skin Exposure (ESE) – Mean Marrow Dose (MMD)
8	• Dose and management principles in Special cases: – X-ray and pregnancy ❖ Pregnancy patient ❖ Pregnancy technologist – X-ray and obesity ❖ Obese patient ❖ Obese technologist
9	• Design of Protective Barriers in X-Ray Installations – Design of Primary Protective Barrier – Design of Secondary Protective Barrier ❖ Leakage Radiation ❖ Scattered Radiation
10	• Factors That Affect Barrier Thickness
11	• Radiation Detection and Measurement – Ionization gases detectors (Gas-Filled Detectors) ❖ Geiger Counters ❖ Proportional counting ❖ Ion Chambers
12	– Scintillation detectors ❖ Organic Scintillators ❖ Inorganic Scintillators – Semiconductor Detectors • Instrument Calibration
13	• Personnel Dosimeters – Film Badges – Thermoluminescence Dosimeters (TLDs) – Optically stimulated luminescence (OSL) – Pocket Dosimeters – Direct Ion Storage (DIS) – Radiophotoluminescence – Electronic personal dosimeter (MOSFET dosimeters)
14	• CT Dose Metrics and Calculation – CT dose index (CTDI) – dose-length product(DLP)

	– Effective Dose • Factors affecting dose in CT
15	• Fluoroscopy dose: – To patient – To staff • methods of minimizing fluoroscopy dose

References:

1. M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi "***Radiation Physics and its applications in diagnostic radiological techniques***", Middle Technical University (MTU), Iraq, (2015)
2. W. R. Hendee and E. R. Ritenour "***Medical Imaging Physics***", 4th Edition, Wiley-Liss, Inc., (2002)
3. Allisy-Roberts PJ, Williams J. Farr's "***physics for medical imaging***". Elsevier Health Sciences; 2007 Nov 14.
4. Stewart Carlyle Bushong, "***Radiologic Science for Technologists Physics, Biology, and Protection***" Elsevier, Inc. , 7th edition, 2017.

المرحلة الثانية

الفصل الثاني

ت	اسم المادة	ن	ع	الوحدات	مستوى المادة	لغة التدريس
1	تقنيات أجهزة التصوير المقطعي المحوسب	2	5	4	تخصصية	انكليزي
2	تقنيات التصوير الشعاعي للاطراف السفلى	2	5	4	تخصصية	انكليزي
3	فحوصات شعاعية خاصة للجهاز الصفراوي والتناسلي	2	5	4	تخصصية	انكليزي
4	التشريح الشعاعي للاطراف السفلى	2	4	4	تخصصية	انكليزي
5	فيزياء التصوير المقطعي المحوسب	2	3	3	مساعدة	انكليزي
		10	22	19		

عدد الساعات النظري = 10 / عدد الساعات العملي = 22 / مجموع الساعات الأسبوعية = 32 / عدد الوحدات = 19 وحدة

التدريب الصيفي 1 لمدة شهر (30 يوم) خلال العطلة الصيفية بواقع 180 ساعة عملي

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الثاني	تقنيات أجهزة التصوير المقطعي المحوسب	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Computed Tomography Equipment Techniques	باللغة الانكليزية	
4	7	5	2		الانكليزية	لغة التدريس	

Objectives:

1. List and describe the various generations of computed tomography (CT) imaging systems.
2. Relate the CT imaging system components to their functions. Discuss image reconstruction via interpolation, back projection, and iteration.
3. Explain the helical imaging & multidetector-row CT.
4. Describe CT image characteristics of image matrix.
5. Determine the common CT image artefacts.
6. Discuss image quality as it relates to spatial resolution, contrast
7. Identify other technical applications of CT Imaging.

Theoretical & practical syllabus	
Week	Details
1	• History of Computed Tomography – Limitations of conventional radiography
2	• Basic principles of CT Scanners : Generations of CT – First-generation – Second-generation – Third-generation – Fourth-generation – Fifth-generation CT , electron beam (EBCT)
3	• Helical/spiral CT Scanners: Requirements for Volume Scanning: – slip-ring technology – dual source
4	– Interpolation Algorithms – Pitch
5	Multislice Computed Tomography (MSCT) (multidetector-row) CT
6	• CT system design: (SSCT & MSCT) – X-Ray imaging system (gantry): – X-Ray Tube , X-Ray tubes in MSCT (Straton x-ray tube)
7	– Collimation, – Filtration

	– Detector: Detector Characteristics & types
8	• Control Console • Computer system: image display, recording, storage, and communication system. • Patient Table or Couch
9	CT image: Windowing
10	CT image quality: • Resolution – spatial & contrast resolution: – sensitivity
11	• Noise • Blur
12	• CT image artefacts: – Definition – types & causes
13	– Common Artifacts – Correction techniques
14	CT quality control
15	• Other technical applications of CT Imaging: – Cardiac CT Imaging – CT Angiography – CT fluoroscopy

References:

4. Stewart Carlyle Bushong, ***“Radiologic Science for Technologists Physics, Biology, and Protection”*** Elsevier, Inc. , 7th edition, 2017.
5. Chris Guy & Dominic ffytche, ***“An Introduction to The Principles of Medical Imaging”*** , Imperial College Press, 2005.
6. Perry Sprawls, ***“Physical principles of medical imaging”***, 2nd Edition 1996.
7. J. Hsieh, ***“Computed Tomography: Principles, Design, Artifacts, and Recent Advances”***, 2nd ed. Wiley Inter-science, Bellingham, Washington, USA, (2009)
8. Euclid Seeram, ***“Computed tomography : physical principles, clinical applications, and quality control”*** 4th edition, Elsevier Inc. 2016.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الثاني	تقنيات التصوير الشعاعي للاطراف السفلى	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Radiographic techniques for lower limbs	باللغة الانكليزية	
4	7	5	2		الانكليزية	لغة التدريس	

Objectives:

1. To teach the students how to direct the patient in particular way to photograph to see diseases in the best way for lower limbs

Theoretical & practical syllabus	
Week	Details
1	Pelvis
2	Ilium
3	Symphysis pubis
4	Sacro-iliac joints
5	Acetabulum
6	Femur
7	hip joint, AP, Lateral , frog-leg infro-superior view , shown structure
8	Tibia & fibula ,AP, Lateral
9	Knee joint AP, lateral,skyline for patella, erect AP
10	Patella positions
11	Foot , AP, lateral, oblique , shown structure,
12	Metatarsal-phalangeal sesamoid bones
13	Ankle joint , AP, lateral, oblique ,oblique & AP with inversion
14	Subtalar joints
15	Calcaneum positions

References:

1. Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., & Hoadley, G. (2015). Clark's Positioning in Radiography 13E. crc Press.
2. Bontrager, K. L., & Lampignano, J. (2013). *Bontrager's handbook of radiographic positioning and techniques*. Elsevier Health Sciences.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الثاني	فحوصات شعاعية خاصة للجهاز الصفراوي والتناسلي	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Special radiological procedures of biliary and reproductive system	باللغة الانكليزية	
4	7	5	2		الانكليزية	لغة التدريس	

Objectives:

1. To teach the students how to perform the radiological examination of the biliary and reproductive system.

Theoretical & practical syllabus	
Week	Details
1	Methods of imaging of hepatobiliary system
2	U/S of the liver, gall bladder and biliary system
3	CT for the liver biliary tree.
4	MRI of the liver
5	Intraoperative & postoperative T- tube, cholangiography
6	Biliary drainage
7	Methods of imaging of urinary tracts Excretion urography
8	CT urinary tract
9	MRI of the urinary tract.
10	Micturating cystourethrography
11	Ascending urethrography in the male
12	Retrograde pyelourethrography Hysterosalpingography
13	Percutaneous nephrostomy & nephrolithotomy.
14	Methods of imaging of male & female reproductive system.
15	CT & MRI of the reproductive system.

References:

1. Watson, N. & Jones, H. Chapman & Nakielny "Guide to Radiological procedures", 7th edition, Elsevier Health Sciences, 2017.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الثاني	التشريح الشعاعي للاطراف العليا	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Radiological anatomy of lower limbs	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

At the end of the course, the student will be able to know:

1. The general anatomy and radiological features of the lower limbs.
2. The general anatomy and radiological features of the lower limbs joints.
3. The general anatomy and radiological features of the arterial blood supply of lower limbs as well as venous drainage.

Theoretical & practical syllabus	
Week	Details
1	Bones of the lower limb: - bony pelvis (pelvic girdle): (sacrum, coccyx & hip bones). - Pelvic inlet & pelvic outlet.
2	Bony pelvis: - Differences between male & female pelvis, - Radiological features of the pelvic bones.
3	Normal anatomy of the femur, - radiological features of femur bone. - Ossification centers.
4	Normal anatomy of the tibia bone, radiological features of tibia bone. Ossification centers.
5	Normal anatomy of the fibula bone, - radiological features of fibula bone. Ossification center of fibula. Normal anatomy of patella, - radiological features of patella & ossification center of patella.
6	Normal anatomy of the foot: - components: tarsals, - metatarsals & phalanges.
7	Foot: Buhler's angle. Radiological features of the foot: tarsal, metatarsal & phalanges.
8	Hip joint: - type of joint, - articular surfaces, - capsule & ligaments of hip joints.
9	Hip joint: - Radiological features of hip joint. - Dislocation of hip joint.
10	Knee joint:

	- type of joint, articular surfaces, - capsule, ligaments of knee joint.
11	Knee joint: - Internal structures of knee joint. - Radiological features of knee joint.
12	Ankle joint: - type of joint, articular surfaces, capsule.
13	Ankle joint: - ligaments of the ankle joint. Radiological features of ankle joint.
14	Blood supply of lower limbs: - arteries of the lower limb, - Radiological features of the lower limb arteries.
15	Veins of the lower limb, Radiological features of the lower limb veins.

References:

1. Kelley, L. L., & Petersen, C. (2018). *Sectional Anatomy for Imaging Professionals*. Third & fourth edition.
2. Ryan, S., McNicholas, M., & Eustace, S. (2011). *Anatomy for diagnostic imaging*.
3. Lazo, D. L. (2015). *Fundamentals of sectional anatomy: an imaging approach*.

عدد الساعات الاسبوعية				المرحلة الثانية / الفصل الثاني	فيزياء التصوير المقطعي المحوسب	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Physics of Computed Tomography	باللغة الانكليزية	
2	3	5	3		الانكليزية	لغة التدريس	

Objectives:

1. Describe and illustrate the basic physics of the ray projection.
2. Describe the scan-and step slice acquisition method and the general characteristics of the data sets it produces.
3. Describe the helical/spiral volume acquisition method and the general characteristics of the data set it produces.
4. Describe and illustrate the general concept of the back-projection method of image reconstruction.
5. Explain the reconstruction methods.
6. Illustrate the concept of voxels that are formed during image reconstruction.
7. Describe and illustrate the general range of CT numbers for tissue and materials in a human body.
8. Explain how windowing contributes to high contrast sensitivity.

Theoretical & practical syllabus	
Week	Details
1	Introduction and overview
2	• Basic Physics: - Ray projection - Radiation attenuation
3	- CT numbers: Accuracy & uniformity - Hounsfield unit
4	• Data Acquisition, - basic concepts for data acquisition
5	• Data Acquisition Geometries: Data acquisition in: - first generation Scanners - second generation Scanners - third generation Scanners - fourth generation Scanners
6	- fifth generation Scanners - Spiral-Helical Geometry - Dual source CT Scanner
7	- Multislice Computed Tomography (MSCT)
8	• Data Processing: - Image reconstruction - Views
9	• Reconstruction methods: - Backprojection reconstruction

	- Filtered Backprojection
10	- Iterative reconstruction
11	Measurement & samples
12	• Image format: size of, - Image matrix - Pixel - Voxel
13	• Field Of View (FOV) in CT: - Display field of view (DFOV) - Scan field of view (SFOV)
14	• CT numbers and Energy Dependence
15	• Multiplanar Reformation

References:

1. M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi "***Radiation Physics and its applications in diagnostic radiological techniques***", Middle Technical University (MTU), Iraq, (2015).
2. W. R. Hendee and E. R. Ritenour "***Medical Imaging Physics***", 4th Edition, Wiley-Liss, Inc., (2002).
3. Stewart Carlyle Bushong, "***Radiologic Science for Technologists Physics, Biology, and Protection***" Elsevier, Inc. , 7th edition, 2017.
4. Chris Guy & Dominic ffytche, "***An Introduction to The Principles of Medical Imaging***" , Imperial College Press, 2005.
5. Perry Sprawls, "***Physical principles of medical imaging***", 2nd Edition 1996.
6. Euclid Seeram, "***Computed tomography : physical principles, clinical applications, and quality control***" 4th edition, Elsevier Inc. 2016.

المرحلة الثالثة

المرحلة الثالثة

الفصل الأول

ت	اسم المادة	ن	ع	الوحدات	مستوى المادة	لغة التدريس
1	تقنيات أجهزة الرنين المغناطيسي	2	4	4	تخصصية	انكليزي
2	تقنيات التصوير الشعاعي للرأس والعمود الفقري	2	4	4	تخصصية	انكليزي
3	فحوصات شعاعية خاصة للرأس والثدي والجهاز التنفسي	2	4	4	تخصصية	انكليزي
4	التشريح الشعاعي للرأس والعمود الفقري	2	2	3	تخصصية	انكليزي
5	علم الأمراض العام	2	2	3	مساعدة	انكليزي
6	فيزياء الرنين المغناطيسي	1	3	2	مساعدة	انكليزي
7	مخاطر الإشعاع البيولوجية	2	3	3	مساعدة	انكليزي
8	تطبيقات الحاسوب1	1	2	2	عامة	انكليزي
		14	24	25		

عدد الساعات النظري = 14 / عدد الساعات العملي = 24 / مجموع الساعات الأسبوعية = 38 / عدد الوحدات = 25 وحدة

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الأول	تقنيات أجهزة الرنين المغناطيسي	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Equipment techniques of magnetic resonance imaging	باللغة الانكليزية	
2	4	6	4		الانكليزية	لغة التدريس	

Objectives:

1. Name the major components of a magnetic resonance imaging (MRI) system and the subassemblies of each.
2. List the three types of MRI systems and describe features of each.
3. Explain the concepts of the spatial characterization.
4. Identify the principal controls on the MRI operating console.
5. Describe the MR image quality and artefact.
6. List & explain the important imaging methods & Pulse Sequences.

Theoretical & practical syllabus	
Week	Details
1	• Magnetic Resonance Imaging System Components Introduction And Overview
2	• Magnets: Magnet Types: - Permanent magnets - Resistive Magnets - Superconducting magnets
3	Gradient Coils: types & function
4	• Radio-freecuncy system: - Transmitter & receiver coils. - RF Coils types: ❖ Surface coils ❖ Volume RF coils
5	• Shimming & magnetic field shielding: coiles types - Active - Passive
6	• MRI computer system: types & functions - Acquisition Control - Image Reconstruction - Image Storage and Retrieval - Viewing Control and Post Processing • MRI system electronics : - Frequency Synthesizer - Radio Frequency Amplifier - Magnet Power Supply

	- Sequencing System
7	• Data Acquisition: Spatial encoding - Frequency encoding - Phase encoding • Slice encoding - Slice selection - Slice location - Slice thickness
8	• Image reconstruction: - K-space - decoding the signal, - Fourier Transformation (FT)
9	• MR image quality: - Resolution ❖ Matrix size ❖ Field of view (FOV) ❖ - Slice thickness
10	- Noise ❖ Noise Sources ❖ Signal-to-Noise Ratio (SNR) considerations: types & factors
11	- Artefacts: ❖ Motion-Induced artifacts ❖ Radiofrequency artefacts ❖ Distortion artefacts ❖ Aliasing artefacts ❖ Sequence specific artefacts
12	• Imaging Methods: Pulse Sequences - spin echo pulse sequence ❖ single-, multi-, and fast spin echo - Inversion recovery sequences ❖ short tau inversion recovery (STIR) ❖ fluid attenuated inversion recovery (FLAIR) ❖ phase-sensitive inversion recovery (PSIR)
13	- Gradient echo sequences ❖ Coherent gradient echo ❖ Incoherent Coherent gradient echo ❖ - Steady state free precession
14	- Echo planar imaging (EPI) - Hybrid fast imaging technique (GRASE)
15	• Diffusion-weighted imaging

References:

1. Stewart Carlyle Bushong, Geoffrey Clarke, "*Magnetic resonance imaging : Physical and Biological Principles*", Mosby, Inc., an affiliate of Elsevier Inc., 4th edition, 2015.
2. Perry Sprawls "*Magnetic Resonance Imaging, Principles, Methods, and Techniques*", Medical Physics Publishing, Madison, Wisconsin, 2000.
3. Perry Sprawls, "*Physical principles of medical imaging*", Medical Physics Publishing Madison, Wisconsin 2nd edition, 1995.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الاول	تقنيات التصوير الشعاعي للراس والعمود الفقري	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Radiographic techniques for head and spinal cord	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

1. To teach the students how to direct the patient in particular way to photograph to see diseases in the best way for head and chest

Theoretical & practical syllabus	
Week	Details
1	Lines & planes of projection of the skull
2	Skull AP , Lateral ,townes and basal view
3	Sella turcica & Optic foramina and jugular foramina
4	Petrous & temporal bones
5	Mastoid positions
6	Face & sinuses , and nose PA and lateral projection , shown structure
7	Mandible PA and oblique projection, shown structure, main finding
8	TMJ view, maxillary bone
9	Paranasal sinuses, waters view & lateral view, shown structure main finding
10	Vertebral level & Cervical spine ,AP , lateral , AP for C1-C3 ,
11	Cervical spine for C3- C7, shown structure
12	Cervico-thoracic region position
13	Thoracic spine , AP , Lateral, lateral decubitus , shown structure
14	Lumber spine , AP , Lateral, oblique projection, shown structure
15	Lumbo-sacral junction& Sacrum and Coccyx projections

References:

1. Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., & Hoadley, G. (2015). *Clark's Positioning in Radiography* 13E. crc Press.
2. Bontrager, K. L., & Lampignano, J. (2013). *Bontrager's handbook of radiographic positioning and techniques*. Elsevier Health Sciences.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الأول	فحوصات شعاعية خاصة للرأس والثدي والجهاز التنفسي	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Special radiological procedures of the head, breast and respiratory system	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

1. To inform the students the essential concepts of how to perform the radiological examination of the head, breast and respiratory system.

Theoretical & practical syllabus	
Week	Details
1	Method of imaging the brain
2	CT & MRI of the brain
3	Cerebral & lumbar myelography
4	Methods of imaging the spine
5	Cervical & lumbar myelography
6	Methods of imaging of the salivary glands
7	Methods of imaging the thyroid & parathyroid glands with CT & MRI of the thyroid and parathyroid glands
8	Sonogram, retrograde ileogram, colostomy enema, loopogram, herniogram & Evacuating proctogram
9	Methods of imaging of the breast & mammary glands • Mammography • Ultrasound • Magnetic Resonance Imaging • Radionuclide Imaging
10	Image-Guided Breast Biopsy Preoperative Localization
11	Methods imaging of respiratory system
12	C.T of respiratory system
13	Guided lung biopsy CT scan
14	Methods of imaging pulmonary embolism .
15	Pulmonary arteriography and pet-CT scan for respiratory system

References:

1. Watson, N. & Jones, H. Chapman & Nakielny's "Guide to Radiological procedures", 7th edition, Elsevier Health Sciences, 2017.

عدد الساعات الأسبوعية				المرحلة الثالثة / الفصل الأول	التشريح الشعاعي للرأس والعمود الفقري	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Radiological anatomy of head and spinal cord	باللغة الانكليزية	
2	2	4	3		الانكليزية	لغة التدريس	

Objectives:

❖ The student will be able to know

1. The general anatomy and radiological features of cerebrum, cerebellum, brainstem, basal ganglia, ventricular system and spinal cord.
2. The general anatomy and radiological features of the vertebral column.
3. The arterial blood supply of brain and vertebral column as well as venous drainage.

Theoretical & practical syllabus	
Week	Details
1	Normal anatomy of brain: • cerebrum, cerebral hemispheres, • cerebral cortex, • lobes of brain, • radiological features of the cerebral cortex
2	Normal anatomy of corpus callosum, Radiological features of corpus callosum
3	Normal anatomy of basal ganglia, radiological features of the basal ganglia
4	Normal anatomy of thalamus, hypothalamus, pituitary and pineal glands, radiological features of the thalamus, hypothalamus, pituitary and pineal gland
5	Normal anatomy of brainstem, radiological features of the brainstem
6	Normal anatomy of cerebellum, radiological features of the cerebellum
7	Normal anatomy of ventricles, cisterns, CSF production and flow ventricles, radiological features of the ventricular system
8	Blood vessels of the brain
9	Normal anatomy of the vertebral column, cervical vertebrae, thoracic vertebrae, lumbar vertebrae, sacrum and coccyx
10	Radiological features of vertebral column
11	Normal anatomy of joints and ligaments of the vertebral column, radiological features of the joints and ligaments of the vertebral column, myelography
12	The intervertebral discs, radiological features of the intervertebral discs
13	Normal anatomy of spinal cord, cross section of the spinal cord, spinal meninges
14	Radiological features of the spinal cord
15	Blood vessels of the vertebral column and spinal cord

References:

1. *Anatomy for Diagnostic Imaging* by Stephanie Ryan, 3rd edition, 2010.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الاول	علم الأمراض العام	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		General Pathology	باللغة الانكليزية	
3	4	2	2		الانكليزية	لغة التدريس	

Objectives:

1. Understand the concepts of Apoptosis and necrosis
2. Understand subcellular response to injury
3. Understand the concepts of genetic diseases, Homodynamic disorders, Red Blood Cells Disorder, bone disease

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	Necrosis and Cell death . Cellular injury (reversible and irreversible) . Atrophy . Hypoxia . Cell Death (apoptosis) . Necrosis pattern	Slides Examination of Necrosis and Cell death versus normal
2	Inflammation .Cardinal Signs of inflammation .Acute Inflammation .Chronic Inflammation .Neutrophil and Macrophages role and arrival at site of inflammation	Slides Examination of Inflammation and cellular steps in inflammation
3	Wound Healing .Wound Healing and regeneration .Repair .Normal and aberrant wound healing	Slides Examination of cellular steps in inflammation
4	Carcinogenesis .Introduction to basic principles of Carcinogenesis .Oncogenes .Tumor suppressor genes .Tumor progression (invasion and spread)	Slides Examination of Benign and Malignant tumors
5	Neoplasia .Clinical features of Neoplasia .Histological features of Neoplasia .Serum tumor marker .Grading and staging of cancer	Slides Examination of Dysplasia

6	Genetic diseases .Genetic Disorders .Single gene disorders .Glycogen storage Diseases .Structural protein defects .Receptor protein defects .Lysosomal Storage Disease .MultiFactorial Inheritance Disorders	Slides Examination of Genetic diseases
7	Homodynamic disorders .Hyperemia and Congestion .Edema .Hemorrhage .Homeostasis and thrombosis .Prothrombotic properties of Injured or activated endothelium	Slides Examination of Homodynamic disorders
8	Homodynamic disorders .Disorders of primary Homeostasis .Disorders of Secondary Homeostasis	Slides Examination of Hepatic Ascities, Hyperemia, congestion, pulmonary edema, chronic congestion in lung and liver, cerebral edema
9	Homodynamic disorders .Thrombosis basic principles .Disruption in normal Blood Flow .Endothelial cell Damage	Slides Examination of Hemorrhage, Hematoma, Vascular event after Injury, platelets types
10	Embolism .basic principle of Embolism .Pulmonary Embolism .Systemic Embolism .Infarction .Shock	Slides Examination of occlusive arterial thrombus and infarction
11	Red Blood Cells Disorder .Anemia .Microcytic Anemia .Iron Deficiency Anemia .Anemia of chronic Disease	Slides Examination of Microcytic Anemia, Anemia of chronic Disease
12	Red Blood Cells Disorder .Sideroblastic Anemia .Thalassemia .Macrocytic and nonmacrocytic Anemia .Anemia due to underproduction(Aplastic Anemia)	Slides Examination of Aplastic Anemia, sickle cell anemia
13	Bone Diseases .Bone cells and bone types .Malformation and diseases caused by defects in nuclear proteins and transcription Factors .Diseases caused by defects in hormones and signal transduction mechanisms .Diseases associated with defects in extracellular structural protein .Diseases associated with Defects in folding	Slides Examination of Mucopolysaccharidoses, osteogenesis Imperfecta, Thanatophoria, Polydactyly, Syndactyly

	and degeneration of macromolecules	
14	Diseases associated with defects in metabolic pathways .Diseases associated with decrease bone mass .Disease caused by osteoclast dysfunction .Diseases associated with abnormal mineral homeostasis	Slides Examination of Osteopetrosis, Osteoporosis, Paget disease, brown tumor, Osteitic Fibrosa Cystica
15	Fractures .Fracture phases .Osteonecrosis .Osteomyelitis .Pott's Disease .Saber Shins	Slides Examination of Osteonecrosis, Osteomyelitis, Pott's Disease, Saber Shins

References:

- 1.Kumar Vinay, Abul K. Abbas, Jon C. Aster (2017). **Robbins basic pathology**. Tenth Edition.
2. Edward F. Goljan (2013). **Rapid Review Pathology** . Fourth Edition
3. Edward Klatt and Vinay Kumar (2009). **Robbins and Cotran Review of Pathology**. Fourth Edition.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الأول	فيزياء الرنين المغناطيسي	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Physics of magnetic resonance imaging	باللغة الانكليزية	
1	3	4	2		الانكليزية	لغة التدريس	

Objectives:

1. Familiar with the concepts of MRI
2. Understand the basic magnetic resonance scanner
3. Explain the principles of MRI
4. Understand the MR imaging features
5. Explain how different tissues have different T1 relaxation times and how this affects the overall image that is created.
6. Define the meaning of TR (repetition time) and TE (echo delay time).
7. Discuss the differences between T1-weighted images, proton density-weighted images, and T2-weighted images.

Theoretical & practical syllabus	
Week	Details
1	• Magnetism • Nuclear Magnetic Resonance - Magnetic properties of the atomic nucleus - Magnetic Nuclei
2	- The spinning proton - Angular and magnetic momentum - magnetic vectors - Tissue Concentration of Elements
3	• Radio Frequency Energy: - RF pulses for excitation, inversion and refocusing
4	• Nuclear Magnetic Interactions - Nuclear Alignment - Precession and Resonance - Excitation - Relaxation
5	• Resonance - Larmor Frequency - Field Strength - Chemical Shift
6	• Tissue Magnetization - Magnetic Direction

	- Magnetic Flipping - Flip Angle - The 90° Pulse, Saturation and Excitation
7	• Relaxation and tissue contrast - T1 relaxation (Spin-lattice relaxation) ❖ Factors affects on T1 ❖ T1-weighted images
8	❖ T2 (Spin-spin relaxation) ❖ Factors affects on T2 ❖ Free induction decay ❖ T2 weighted images
9	- T2* relaxation - T1 and T2 values
10	• Magnetic Susceptibility - Contrast Agents - Diamagnetic Materials - Paramagnetic Materials - Superparamagnetic Materials - Ferromagnetic Materials
11	• T1 Measurement - Saturation Recovery - Inversion Recovery • T2 Measurement
12	• The MR Image - Tissue Characteristics and Image Types ❖ Proton Density (PD) Images ❖ Magnetic Relaxation Times T1 and T2 Images
13	• Fluid Movement and Image Types - Vascular Flow - Perfusion and Diffusion - Spectroscopic and Chemical Shift
14	• NMR Spectroscopy
15	• Essential concepts of imaging cycle - TR - TE - The Echo Event and Signals

References:

1. Perry Sprawls ***“Magnetic Resonance Imaging, Principles, Methods, and Techniques”*** , Medical Physics Publishing, Madison, Wisconsin, 2000.
2. M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi " ***Radiation Physics and its applications in diagnostic radiological techniques***", Middle Technical University (MTU), Iraq, (2015).
3. W. R. Hendee and E. R. Ritenour ***“Medical Imaging Physics”***, 4th Edition, Wiley-Liss, Inc., (2002)
4. Allisy-Roberts PJ, Williams J. Farr's ***“physics for medical imaging”***. Elsevier Health Sciences; 2007 Nov 14.

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الأول	مخاطر الاشعاع البايولوجية	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Biological Radiation hazards	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. Know the biological effects of ionization radiation.
2. Estimate of and explain the basis for possible risk of injury, illness, or death resulting from occupational radiation exposure.
3. Describe the physical & chemical factors that affect radiation response.
4. Estimate of radiation risk and comparisons with other types of risk
5. Define the Stochastic & Deterministic effects of the ionizing radiation.
6. Discuss the radiation-induced malignancy.
7. Explain the effect of ionization radiation the Embryo, Fetus & Central Nervous System.

Theoretical & practical syllabus	
Week	Details
1	• Law of Bergonie and Tribondeau • Physical factors that affect radiosensitivity – Relative Biological Effectiveness (RBE) – Linear energy transfer (LET) – Protraction and Fractionation
2	• Biological factors that affect radiosensitivity – Oxygen Effect – Age – Recovery – Chemical Agents – Hormesis
3	• Radiation Dose-Response Relationships – Linear – Non-linear – Constructing a Dose-Response relationship
4	• The Biological Effects of Radiation – Stage 1 : The Atomic Level – Stage 2 : Chemical Interactions – Stage 3 : Cellular and Whole Animal Changes
5	• Deterministic Effects of ionizing radiation – Acute Radiation Lethality – Local Tissue Damage

	– Somatic effects – Effects on the Skin – Effects on the Gonads – Hematologic Effects
6	• Cytogenetic Effects – Normal Karyotype – Single-Hit chromosome aberrations – Multi-Hit chromosome aberrations – Kinetics of chromosome aberration
7	• Stochastic Effects of ionizing radiation – Local Tissue Effects ❖ Skin ❖ Chromosomes ❖ Cataracts ❖ Bone marrow ❖ Thyroid ❖ Breast ❖ Gonadal – Life Span Shortening
8	– Effects on Fertility – In-Utero Effects – Genetic effects
9	• Risk Estimates – Relative risk – Excess risk – Absolute risk
10	• Radiation-Induced Malignancy – Leukemia – Cancer
12	• Factors determine biological effects of radiation – Nature of tissue irradiated – Irradiated area – Rate of dose – Age of the patient – Type of irradiation – Others
13	• Effects of Radiation on the Embryo and Fetus – Lethal effects – Malformations (Teratogenic effects) – Growth disturbances
14	• Effects of radiation on Central Nervous System
15	• Hereditary effects of ionizing radiation

References:

1. Stewart Carlyle Bushong, **“Radiologic Science for Technologists Physics, Biology, and Protection”** Elsevier, Inc. , 7th edition, 2017.
2. D.L. Bailey & J.L. **“HummNuclear medicine physics Nuclear medicine physics : a handbook for students and teachers”** International Atomic Energy Agency, 2014.
3. A. H. W. Nias, **“An Introduction to Radiobiology”**, Wiley, 2nd Edition, 2000.

المرحلة الثالثة

الفصل الثاني

ت	اسم المادة	ن	ع	الوحدات	مستوى المادة	لغة التدريس
1	تقنيات أجهزة السونار	2	4	4	تخصصية	انكليزي
2	تقنيات التصوير الشعاعي للصدر والبطن	2	4	4	تخصصية	انكليزي
3	فحوصات شعاعية خاصة لجهاز القلب والأوعية الدموية والجهاز العصبي	2	4	4	تخصصية	انكليزي
4	التشريح الشعاعي للصدر والبطن	2	2	3	تخصصية	انكليزي
5	علم الأمراض الوظيفي	2	2	3	مساعدة	انكليزي
6	فيزياء الامواج فوق الصوتية	1	3	2	مساعدة	انكليزي
7	تطبيقات الحاسوب2	1	2	2	عامة	انكليزي
		12	21	22		

عدد الساعات النظري = 12 / عدد الساعات العملي = 21 / مجموع الساعات الأسبوعية = 33 / عدد الوحدات = 22 وحدة

التدريب الصيفي 2 لمدة شهر (30 يوم) خلال العطلة الصيفية بواقع 180 ساعة عملي

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الثاني	تقنيات أجهزة السونار	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Ultrasound equipment techniques	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

1. Familiar with the concepts of MRI
2. Understand the Ultrasound Equipment Techniques
3. Understand the transducers features
4. Explain componints of transducer .
5. Explain functions of componint of transducer .
6. Discuss the beam-stepping arrays.

Theoretical & practical syllabus	
Week	Details
1	• Common features of all transducers and transducer elements – Piezoelectric plate
2	– Backing layer – Matching layer(s)
3	– Lens – Developments in transducer technology
4	• Linear- and curvilinear-array transducers (beam-stepping arrays) – Active group of elements
5	• Beam shape control in the scan plane – Scan plane focusing in transmission – Scan plane dynamic focusing and aperture in reception
6	– Grating lobes – Slice thickness
7	• Phased-array transducers (beam-steering arrays)
8	• Image quality variation across the field of view – Dependence of beam width and sensitivity on angle – Grating lobes
9	• Hybrid beam-stepping/beam-steering transducers
10	• 3D/4D transducers
11	• Time-saving techniques for array transducers
12	• B-mode instrumentation Signal amplitude processing

	– Amplification
13	• Transmit power control – Time – gain compensation
14	– Dynamic range of echoes – Analogue-to-digital conversion – Harmonic imaging
15	• Colour flow and tissue imaging

References:

1. M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi " *Radiation Physics and its applications in diagnostic radiological techniques*", Middle Technical University (MTU), Iraq, (2015).
2. Hoskins PR, Martin K, Thrush A, editors. *Diagnostic ultrasound: physics and equipment*. CRC Press; 2019 Apr 29.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الثاني	تقنيات التصوير الشعاعي للصدر والبطن	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Radiographic techniques for thorax and abdomen	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

1. To teach the students how to direct the patient in particular way to photograph to see diseases in the best way for spinal cord and abdomen

Theoretical & practical syllabus	
Week	Details
1	Thorax: pharynx and larynx
2	Trachea (including thoracic inlet)
3	Lungs , AP ,lateral , apical view , shown structure, interpretation system
4	lordotic position
5	Heart and aorta, main branches
6	Bones of the thorax (upper ribs)
7	Bones of the thorax (lower ribs)
8	Sternum
9	Abdomen Planes & regions and Image parameters
10	Abdomen , AP supine, PA erect , lateral view positions
11	Urinary tract – kidneys– ureters–bladder positions
12	Urinary bladder
13	Mammography Positioning terminology
14	Radiological considerations of mammography
15	Mammography main position, finding, image interpretation

References:

1. Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., & Hoadley, G. (2015). *Clark's Positioning in Radiography* 13E. crc Press.
2. Bontrager, K. L., & Lampignano, J. (2013). *Bontrager's handbook of radiographic positioning and techniques*. Elsevier Health Sciences.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الثاني	فحوصات شعاعية خاصة لجهاز القلب والأوعية الدموية والجهاز العصبي	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Special radiological procedures of the cardiovascular and central nervous system	باللغة الانكليزية	
2	4	6	4		الانكليزية	لغة التدريس	

Objectives:

1. To teach the students the basics and methods of performing the radiological examinations of the cardiovascular and central nervous system.

Theoretical & practical syllabus	
Week	Details
1	Methods of imaging of the heart and angiocardiology
2	Coronary arteriography & cardiac CT including coronary angiography
3	Methods of imaging the arterial system & introduction to catheter techniques
4	Femoral ,brachial & axillary punctures for catheterization
5	General complications of catheter techniques.
6	Ascending aortography and lower limb arteriography
7	Balloon angiography
8	Vascular embolization
9	CT & MRI angiography
10	Methods of imaging the venous system & peripheral venography.
11	Central venography
12	Portal venography
13	Position emission tomography imaging
14	18f-FDG PET scanning
15	Lymph node imaging

References:

1. Watson, N. & Jones, H. Chapman & Nakielny "Guide to Radiological procedures", 7th edition, Elsevier Health Sciences, 2017.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الأول	التشريح الشعاعي للصدر والبطن	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Radiological anatomy of thorax and abdomen	باللغة الانكليزية	
2	2	4	3		الانكليزية	لغة التدريس	

Objectives:

- ❖ The student will be able to know
 1. The general anatomy and radiological features of thoracic cage, trachea, bronchi and lungs.
 2. The arterial blood supply of trachea, bronchi and lungs.
 3. The general anatomy and radiological features of the abdominal organs.
 4. Aorta branches and arterial blood supply of the each organ as well as venous drainage.

Theoretical & practical syllabus	
Week	Details
1	Normal anatomy of thoracic cage, sternum radiological features of the thoracic cage and sternum
2	Normal anatomy of lungs, - trachea and bronchial tree and pulmonary vessels, - bronchial vessels, - radiological features of the lung, - trachea and bronchial tree
3	Radiological features of the lung, trachea and bronchial tree
4	Normal anatomy of heart, - the pericardium, - radiological features of the heart and pericardium
5	Normal anatomy of the liver and biliary system, - peritoneal covering, - anatomical relations of the liver, - lobes and segments of the liver, - hepatic ducts and blood supply of the liver
6	Radiological features of the liver and biliary system
7	Normal anatomy of pancreas, - peritoneal covering, anatomical relations of the pancreas, - blood supply of pancreas
8	Radiological features of the pancreas
9	Normal anatomy of spleen, - peritoneal covering, - anatomical relations of the pancreas, - blood supply of spleen, - radiological features of the spleen

10	Normal anatomy of kidney, - site, peritoneal covering and anatomical relations of the kidneys, - fascial spaces around the kidneys, - Internal structures, arterial supply and venous drainage of the kidney
11	Radiological features of kidneys
12	Normal anatomy of esophagus, - peritoneal covering, - anatomical relations of the esophagus, - blood supply of esophagus, - radiological features of esophagus
13	Normal anatomy of stomach, - peritoneal covering, - anatomical relations of the stomach, - blood supply and venous drainage of the stomach, - Radiological features of the stomach
14	Normal anatomy of small intestine, - peritoneal covering, anatomical relations of the small intestine, - blood supply, - venous drainage and lymphatic drainage of the small intestine, - radiological features of small intestine
15	Normal anatomy of large intestine, - peritoneal covering, - anatomical relations of the large intestine, - blood supply, - venous drainage and lymphatic drainage of the large intestine, - radiological features of large intestine

References:

1. *Anatomy for Diagnostic Imaging* by Stephanie Ryan, 3rd edition, 2010.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الثاني	فيزياء الأمواج فوق الصوتية	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Physics of Ultrasound	باللغة الانكليزية	
1	3	4	2		الانكليزية	لغة التدريس	

Objectives:

1. Name and describe the basic physical characteristics of an ultrasound pulse that have an effect on it's imaging properties.
2. Describe the basic function of a transducer and how it forms an ultrasound pulse.
3. Describe the general relationship between wavelength and image quality.
4. Describe the factors that determine the intensity of a reflected pulse.
5. State the Physical and Medical Definition of ultrasound.
6. Explain how the operator Piezoelectric.
7. Identify the Properties of Ultrasound.
8. Briefly describe the Piezoelectric Materials
9. Explain the Piezoelectric Effect and reverse Piezoelectric Effect.

Theoretical & practical syllabus	
Week	Details
1	• Introduction • Waves - Transverse waves - Sound waves
2	• Frequency, speed and wavelength - Frequency - Speed - Wavelength - Phase
3	- Pressure, - Intensity - Power
4	• Speed of sound - Frequencies and wavelengths used in diagnosis
5	• Reflection of ultrasound waves - Acoustic impedance
6	- Reflection - The law of reflection
7	- Scattering - Diffuse reflection

8	- Refraction
9	- Attenuation - Absorption - Dependence on frequency
10	• Ultrasound beams - Interference of wave
11	- Diffraction - Ultrasound beams from practical sources
12	• The plane disc source - Focusing - The ultrasound pulse - The pulse spectrum
13	• Basic principles of Doppler - Doppler Effect - Doppler techniques - Spectral Doppler
14	• Aliasing - Color flow Doppler ultrasound - Continuous wave Doppler ultrasound
15	- Pulse wave Doppler ultrasound - Spectral Doppler ultrasound

References:

1. M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi "*Radiation Physics and its applications in diagnostic radiological techniques*", Middle Technical University (MTU), Iraq, (2015).
2. Peter Hoskins, Kevin Martin, Abigail Thrush, *Diagnostic Ultrasound: Physics and Equipment*", Second Edition, Cambridge university press, New York, 2010.

عدد الساعات الاسبوعية				المرحلة الثالثة / الفصل الثاني	علم الامراض الوظيفي	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Systemic Pathology	باللغة الانكليزية	
3	4	2	2		الانكليزية	لغة التدريس	

Objectives:

1. Understand the etiology and risk factors, pathogenesis, morphology and clinical features of systemic diseases.
2. Understand the functional alterations and outcomes of systemic diseases.

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	Bone and cartilage Tumors .Osteoma .Osteoid Osteoma .Osteoblastoma .Osteochondroma .Chondroma .Chondroblastoma	Examination slides of Bone and cartilage Tumors
2	Joint Diseases .Degenerative Arthritis .Goat and Pseudogoat Disease .Infectious Arthritis	Slide Examination of Joint Diseases
3	Liver Disease .Hepatic Injury patterns .Cirrhosis .Liver Failure .Jaundice .Types of Neonatal Jaundice	Slide Examination of hepatic injury and Cirrhosis
4	Liver Disease .Cholestasis .Viral Hepatitis and Nonviral Hepatitis .Metabolic liver Disease .Hepatic, Bile Duct and Gall Bladder Disease .Stones .Pharyngian Cap	Slide Examination of Cholestasis and Metabolic liver Disease

	.Cholelithiasis	
5	Kidney Disease .Diseases of Glomerulus .Diseases of Tubules .Disease of Blood Vessels .Obstruction	Slide Examination of Kidney Disease
6	Heart Disease .Heart Failure .Congenital Heart Disease .Ischemic Heart Disease .Hypertensive Heart Disease .Valvular Heart Disease .Cardiomyopathy Heart Disease .Pericardium Heart Disease	Slide Examination of Heart disease
7	Gastrointestinal Diseases -Diseases of Esophagus -Diseases of Stomach -Diseases of small/ large Bowel -Appendix	Slide Examination of Gastrointestinal Diseases
8	Pancreas Diseases .Congenital .Inflammatory(Acute, Chronic, Cyst) .Neoplasms	Slide Examination of Pancreas Diseases
9	Lung Diseases .Congenital .Atelectasis .Acute Pulmonary Injury .Obstructive Pulmonary Disease .Vascular Pulmonary Diseases	Slide Examination of Lung diseases
10	Lower urinary tract diseases . Ureters Anomalies . Bladder Anomalies . Urethra Anomalies	Slide Examination of Lower urinary tract diseases
11	Female Reproductive System Diseases .Vulva Disease .Vagina Disease .Cervix Disease .Uterus Disease .Tubes Disease .Ovaries and placenta	Slide Examination of Female Reproductive System Diseases
12	Endocrine Diseases .pituitary Disorders Thyroid Disorders .Parathyroid Disorders	Slide Examination of Endocrine Diseases
13	Diseases of Lymphatic System .lymph nodes .lymphadenitis .lymphomas .Follicular lymphoma	Slide Examination of lymphatic system diseases
14	Brain and Central Nervous System Diseases .Acute Neuronal Injury	Slide Examination of Brain and Central

	.Cerebral edema .Hydrocephalus .CNS malformation (spina bifida, Polymicrogyria, Holoprosencephaly)	Nervous System Disorders
15	Breast Diseases .Glands Atrophy .Intraductal Inflammatory Cells (Acute Mastitis) .Ductesia .Neoplasia (Benign and Malignant) of epithelial and stromal .Gynecomastia	Slide Examination of Breast Diseases

References:

1. Kumar Vinay, Abul K. Abbas, Jon C. Aster (2017). ***Robbins basic pathology***. Tenth Edition.
2. Edward F. Goljan (2013). ***Rapid Review Pathology*** . Fourth Edition
3. Edward Klatt and Vinay Kumar (2009). ***Robbins and Cotran Review of Pathology***. Fourth Edition.

المرحلة الرابعة

الفصل الأول

ت	اسم المادة	ن	ع	الوحدات	مستوى المادة	لغة التدريس
1	التصوير المقطعي المحوسب للرأس والعمود الفقري	2	5	4	تخصصية	انكليزي
2	مبادئ التصوير بالرنين المغناطيسي وفحوصات الرأس	2	5	4	تخصصية	انكليزي
3	التصوير بالموجات فوق الصوتية للبطن	2	5	4	تخصصية	انكليزي
4	طب الامراض الباطنية	2	3	3	مساعدة	انكليزي
5	الأحصاء الحيوي وتطبيقات الحاسوب	2	4	4	مساعدة	انكليزي
		10	22	19		

عدد الساعات النظرية = 10 / عدد الساعات العملية = 22 / مجموع الساعات الأسبوعية = 32 / عدد الوحدات = 19 وحدة

عدد الساعات الأسبوعية				المرحلة الرابعة / الفصل الأول	التصوير المقطعي المحوسب للرأس والعمود الفقري	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Computed tomography imaging of head and spinal cord	باللغة الانكليزية	
4	7	5	2		الانكليزية	لغة التدريس	

Objectives:

1. Describe the basic principles and concepts of computed tomography.
2. Incorporate scanning techniques learned to best demonstrate anatomy and pathology.
3. Explain the CT scanning protocols and patient preparation for many head and spine tests.
4. Describe techniques in manipulating CT parameters to optimize image quality.
5. Recognize CT artifacts and describe techniques to minimize their occurrence.
6. Compare the advantages and disadvantages of various CT scanner configurations.

Theoretical & practical syllabus	
Week	Details
1	Review about CT machines: - Internal and external structures - Types of CT machines
2	Role of the CT Technologist in: - Patient Management - Patient Screening - Patient safety and radiation protection
3	Radiographic Technique - Milliamperage, Kilovoltage, Helical Pitch - Rotation Time - Slice Thickness - Matrix Size and Reconstruction Algorithms Window setting: - Different levels - Different organs and exams
4	Contrast Media usage: - Types of contrast media - Clinically; adverse reactions to CM CT injectors: - Injector preparation - Types of injectors

	Administration of contrast agents
5	CT scan of brain: - Brain intravenous contrast medium - CT venography - CT scan for the Stroke
6	CT scan of petrous bone: - Indications - Patient Positioning - Technical Considerations - Scanning Protocols
7	CT scan of orbit: - Technique and position - Scanning Protocols
8	CT scan of paranasal sinus: - Indications - Patient Positioning - Technical Considerations - Scanning Protocols
9	CT scan of skull and facial bone: - Patient Preparation & Positioning - Scanning Protocols
10	CT scan of the neck: - Patient Preparation & Positioning - Scanning Protocols
11	CT scan of the pituitary gland: - Patient Preparation & Positioning - Scanning Protocols
12	CT scan of the spine: - cervical spine - dorasal spine
13	- lumber spine - whole spine - Myelography
14	CT artifacts: - Detection - Remedies
15	Role of CT Compared with Other Imaging Modalities

References:

1. Lois Romans, *Computed Tomography for Technologists: Exam Review* , 2nd Edition.
2. Euclid Seeram.P, "*Computed tomography: physical principles, clinical applications, and quality control*". 4th edition, Elsevier Inc. 2016.
3. Matthias Hofer, "*CT Teaching Manual Book* ".

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الأول	مبادئ التصوير بالرنين المغناطيسي وفحوصات الرأس	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Magnetic resonance imaging principles and head exam	باللغة الانكليزية	
4	7	5	2		الانكليزية	لغة التدريس	

Objectives:

1. Apply knowledge of anatomy, physiology, positioning, and MRI sequence parameters to accurately demonstrate anatomical structures.
2. Determine imaging parameters to achieve optimum imaging.
3. Evaluate images for appropriate positioning, coil selection, and image quality.
4. Apply the principles of ferromagnetic safety and contrast application for the protection of the patient, technologist, and others.
5. Recognize emergency patient conditions and initiate life-saving first aid and basic life-support procedures.
6. Evaluate the performance of MRI systems, know the safe limits of equipment operation, and report malfunctions to the proper authority.
7. Participate in MRI quality assurance programs.
8. Provide care and comfort in regard to the holistic health of the patient, technologist, and others.
9. Provide patient education related to MRI procedures.

Theoretical & practical syllabus	
Week	Details
1	Review about MRI machines: - Components of MRI system - Types of MRI machines Role of the MRI Technologist in: - Precaution to be taken - Patients' contraindication and preparation - patient safety
2	Review about MRI pulse sequences - Types - Choosing the appropriate sequence for the required examination -Overview of imaging protocol
3	Tissue characterization: - Role of MRI in diseases - Intensities of normal anatomical structures Pathological changes and effect of relation time
4	MRI artifact during the exam : Types, Remedies
5	Technical Factors Influencing MRI Image quality
6	MRI Contrast Media: - Positive and Negative contrast media - Administration of Contrast Agent

	- Magnetization transfer contrast (MTC) - Clinical Applications of MRI Contrast Media
7	MRI of the Brain: - patient position - coil selection - indications - the suitable sequences for each indication
8	MRI of the Temporal Lobes: - patient position - coil selection - indications - the suitable sequences for each indication
9	MRI of the Internal Auditory Meatus : - patient position - coil selection - indications - the suitable sequences for each indication
10	MRI of the Pituitary: - patient position - coil selection - indications - the suitable sequences for each indication
11	MRI of the Orbits: - patient position - coil selection - indications , the suitable sequences for each indication
12	MR Angiography and MR Venography: - patient position - coil selection - indications , the suitable sequences for each indication
13	MRI of the Chest: - patient position - coil selection - indications - the suitable sequences for each indication
14	MRI of the Breast: - patient position - coil selection - indications - the suitable sequences for each indication
15	- Recent Advances in Pulse Sequences and protocols

References:

1. Mark A. Brown, Richard C. Semelka «**MRI: Basic Principles and Applications**
2. Catherine Westbrook, John Talbot, **MRI in Practice**, 5th Edition .
3. Torsten Bert Moeller, Emil Reif, **MRI Parameters and Positioning**.

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الأول	التصوير بالموجات فوق الصوتية للبطن	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Abdominal Ultrasound imaging	باللغة الانكليزية	
4	7	5	2		الانكليزية	لغة التدريس	

Objectives:

- ❖ The student will be able to know
 1. Principle of ultrasound machine, terms, types of ultrasound probes and its uses
 2. Preparation of the patients
 3. Indications of ultrasound for each scan
 4. Sonographic features of normal and abnormal of abdominal organs
 5. Differential diagnosis of the diseases and lesions of the abdominal organs
 6. Sonographic features of normal and abnormal of the thyroid gland
 7. Differential diagnosis of the thyroid diseases and lesions.

Theoretical & practical syllabus	
Week	Details
1	Principle of ultrasound and its terms
2	Normal appearance of the liver
3	Abnormal liver: - Enlarged liver/hepatomegaly: - homogeneous pattern, Enlarged liver: - non-homogeneous pattern, - Small liver/shrunken liver
4	Cystic lesions in normal or large liver
5	Differential diagnosis of liver masses, Trauma of the liver
6	Normal appearance gallbladder and biliary tract
7	abnormal gallbladder and biliary tract: - distended gallbladder, - Acute cholecystitis, - Echoes within the gallbladder
8	Thick gallbladder walls, Small gallbladder, Gallbladder in jaundice
9	Normal and abnormal appearance of the pancreas
10	Normal and abnormal appearance of the spleen

11	- Normal appearance of the kidney and ureters, - considerations of the absent kidney, - abnormal kidney: large kidney
12	Renal cysts, Renal masses
13	- Small kidney, - Renal calculi, - Trauma, - Perirenal fluid
14	Normal and abnormal appearance of the urinary bladder
15	Normal and abnormal appearance of the thyroid gland

References:

1. P.E.S. Palmer, *"Manual of diagnostic ultrasound"*, 2000.

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الاول	طب الامراض الباطنية	باللغة العربية	اسم المادة
نظري	عملي	المجموع	عدد الوحدات		Medicine of internal diseases	باللغة الانكليزية	
2	3	5	3		الانكليزية	لغة التدريس	

Objectives:

1. To understand and teach the students the basics concepts of the internal diseases of the human body.

Theoretical & practical syllabus	
Week	Details
1	Headache - Types - Imaging of headache
2	Cerebrovascular accident(CVA):imaging in CVA
3	Bone disease: - Infection - Tumor
4	Respiratory tract diseases: - Infections , - Chest trauma, - Lung masses
5	- Pulmonary embolism, - pneumothorax, - pleural effusion
6	Urinary tract infection: imaging in UTI
7	GIT: diseases of esophagus
8	Diseases of the stomach: - Gastric mass, - Ulcer
9	- GIT: diseases of esophagus
10	Diseases of duodenum : Duodenal ulcer (DU)
11	Diseases of jejunum & ileum
12	Diseases of colon
13	Liver : Hepatitis, Jaundice,
14	Cholecystitis, Portal hypertension
15	Diseases of vascular system

References:

1. O. James Garden & Rowan W Parks , “*Principles and Practice of Surgery*” 7th Edition, Elsevier; 2017.
2. Stuart H. Ralston, “*Davidson Principles & Practice of Medicine*”, 23rd edition, Elsevier 2018.

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الاول	الاحصاء الحيوي وتطبيقات الحاسوب	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Biostatistics and computer applications	باللغة الانكليزية	
4	6	4	2		الانكليزية	لغة التدريس	

Objectives:

1. Understanding statistical methods used for presenting and organizing data.
2. Apply and analyze data using different statistical methods.
3. Understand how to interpret the results.

Theoretical & practical syllabus		
Week	Theoretical	Practical
1	Introduction to Biostatistics -Important Terms in Biostatistics -Types of Data - Data presentation . Frequency Table Presentation . Two way cross classification Tables .Histogram .Frequency Polygon . Pie Chart . Scatter Plot	Introduction about Excel
2	Arithmetical Description Measures -Central Tendency Measures (Mean, Median, Mode, Geometric Mean, Harmonic Mean, Root Mean Square)	Introduction about SPSS
3	Dispersion Measures -Range and Interquartile -Mean deviation, standard deviation, Variance, Coefficient of Variation -Finding Outliers	Using Excel and SPSS to Present Data in Tables and Charts
4	Kurtosis and Skewness -Moments -Kurtosis Measures -Skewness Measures	Using Excel and SPSS to Compute mean, median, mode, standard deviation.

5	Hypothesis Testing -Null and Alternatives Hypothesis -Region and Nonrejection area -Decision Making Error (Type1 and Type2)	-Basic concepts for understanding probability - Exercises about Probability rules
6	Hypothesis Testing -A Single Population Mean -Testing Ho by Means of a Confident Interval -One Sided Hypothesis Tests	Exercises about Discrete and Continuous Probability Distribution
7	Hypothesis Testing -- t distribution -Sampling From Normally Distributed Population: Population Variance Unknown -Paired Comparisons(Student Test)	Exercises about Binomial distribution
8	Hypothesis Testing -The Difference between Two Population Means - Sampling From Normally Distributed Population: Population Variance known - Sampling From Normally Distributed Populations: Population Variance Unknown	Exercises on sampling distribution (Sampling from normally and n Distributing Populations
9	Normal Distribution - Normal Distribution and Standard Normal Distribution - p value, level of Significant	Exercises about Computing Correlation using SPSS and Excel
10	Diagnostic Accuracy Tests -prevalence -Accuracy -specificity -Sensitivity -Positive and Negative predictive Value - Comparing Accuracy between Two test	Exercises about computing Regression using SPSS and Excel
11	Correlation and regression -Simple Linear Regression (Least Square Method) -Correlation Coefficient (r) - r^2 - Testing significance of correlation	Exercises about computing Chi Square value using SPSS
12	Chi Square test -Characteristic features of Chi Square -Chi Square methods (Goodness of fit, test of independence, homogeneity) - Examples on calculating expecting values -Hypothesis testing using Chi Square Test	Interpreting results of Chi Square value analyzed using SPSS
13	One Way Anova -Testing for the difference among the means of more than Two Groups -Understand the summary Table of Anova results	Exercises about computing One Way Anova (F value) using SPSS
14	Estimation	Interpreting results of

	- Estimation usage and types -Confident intervals using T distribution - Confident interval for the difference between two population Means variance known - Confident interval for the difference between two population Means variance unknown	One Way Anova (F value) analyzed using SPSS
15	Vital Statistics -Delivery rates -Deaths rates	Exercises about Computing t value using SPSS Interpreting results

References:

1. DANIEL, W. W. "*Biostatistics: a foundation for analysis in the health sciences* ", Eleven Edition, 2018.
2. David M Levine and David F. Stephan, *Even you can learn statistics : a guide for everyone who has ever been afraid of statistics*, Eleven Edition, 2011.
3. James T McClave and Terry Sincich. *Statistics*, Tenth Edition, 2005.

الفصل الثاني

عدد الساعات النظري = 10 / عدد الساعات العملي = 22 / مجموع الساعات الأسبوعية = 34 / عدد الوحدات = 21 وحدة

وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
كلية التقنيات الصحية والطبية - بغداد
القسم: تقنيات الأشعة

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الثاني	التصوير المقطعي المحوسب للصدر والبطن والحوض	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Computed tomography imaging of chest, abdomen and pelvis	باللغة الانكليزية	
4	7	5	2		الإنكليزية	لغة التدريس	

Objectives:

1. Describe the basic principles and concepts of computed tomography.
2. Incorporate scanning techniques learned to best demonstrate anatomy and pathology.
3. Explain the CT scanning protocols and patient preparation for many of chest, abdomen and pelvis tests.
4. Describe techniques in manipulating CT parameters to optimize image quality.
5. Recognize CT artifacts and describe techniques to minimize their occurrence.
6. Compare the advantages and disadvantages of various CT scanner configurations.

Theoretical & practical syllabus	
Week	Details
1	CT of the Chest: - Cardiac CT - High Resoulution CT
2	CT Angiography, - Indications - Patient Positioning and Preparation - Technical Considerations - Scanning Protocols
3	CT of the esophagus and stomach: - CT in Esophageal - CT of the stomach
5	- CT of the small intestine - CT of the large bowel
6	Computed Tomography of the liver : - intravenous and native studies - early phase
7	- late phase - delay phase

8	Computed Tomography of the pancreas:
9	CT scan of the urinary system: - native scan - ct urography
10	CT scan of pelvis: - Male exams and preparation - Female exams and preparation
11	CT scan of Trauma - Clinical consideration
12	Role of CT in interventional Applications - Abscess Drainage - Biopsy
13	CT scan of Musculoskeletal System
14	CT artifacts: - Detection - Remedies
15	Cone Beam CT - Technique and position Role of CT Compared with Other Imaging Modalities

References:

- Lois Romans, *Computed Tomography for Technologists: Exam Review* , 2nd Edition.
- Euclid Seeram.P, "*Computed tomography: physical principles, clinical applications, and quality control*". 4th edition, Elsevier Inc. 2016.
- Matthias Hofer, "*CT Teaching Manual Book* ".

وزارة التعليم العالي والبحث العلمي

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الثاني	التصوير بالرنين المغناطيسي للجهاز العضلي والعظمي والبطن والحوض	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Magnetic resonance imaging of musculoskeletal system, abdomen and pelvis	باللغة الانكليزية	
4	7	5	2		الإنكليزية	لغة التدريس	

الجامعة التقنية الوسطى

كلية التقنيات الصحية والطبية - بغداد

القسم: تقنيات الأشعة

Objectives:

1. Apply knowledge of anatomy, physiology, positioning, and MRI sequence parameters to accurately demonstrate anatomical structures.
2. Determine imaging parameters to achieve optimum imaging.
3. Evaluate images for appropriate positioning, coil selection, and image quality.
4. Apply the principles of ferromagnetic safety and contrast application for the protection of the patient, technologist, and others.
5. Recognize emergency patient conditions and initiate life-saving first aid and basic life-support procedures.
6. Evaluate the performance of MRI systems, know the safe limits of equipment operation, and report malfunctions to the proper authority.
7. Participate in MRI quality assurance programs.
8. Provide care and comfort in regard to the holistic health of the patient, technologist, and others.
9. Provide patient education related to MRI procedures.

Theoretical & practical syllabus	
Week	Details
1	MRI of the Cervical Spine: . patient postion . coil selection . indications . the suitable sequences for each indication
2	MRI of the Dorsal Spine: . patient postion . coil selection . indications . the suitable sequences for each indication
3	MRI of the Lumbar Spine: . patient postion . coil selection . indications . the suitable sequences for each indication

4	Brachial Plexus: . patient position . coil selection . indications . the suitable sequences for each indication
5	MRI of the female Pelvis: . patient position . coil selection . indications . the suitable sequences for each indication
6	MRI of the Prostate: . patient position . coil selection . indications, the suitable sequences for each indication
7	MRI of the Endorectal: . patient position . coil selection . indications, the suitable sequences for each indication
8	MRI of the Shoulder: . patient position . coil selection . indications, the suitable sequences for each indication
9	MRI of the Wrist and Hand: . patient position . coil selection . indications . the suitable sequences for each indication
10	MRI of the Hips: . patient position . coil selection . indications . the suitable sequences for each indication
11	MRI of the Knee: . patient position . coil selection . indications . the suitable sequences for each indication
12	MRI of the neck: . patient position . coil selection . indications . the suitable sequences for each indication
13	Magnetic resonance cholangiopancreatography and liver: - patient position - coil selection - indications - the suitable sequences for each indication
14	MRI of the Kidney and MRU:

	. patient position . coil selection . indications - the suitable sequences for each indication
15	MRI of adrenal gland: . patient position . coil selection . indications - the suitable sequences for each indication

References:

1. Mark A. Brown, Richard C. Semelka «***MRI: Basic Principles and Applications***
2. Catherine Westbrook, John Talbot, ***MRI in Practice***, 5th Edition .
3. Torsten Bert Moeller, Emil Reif, ***MRI Parameters and Positioning***.

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الثاني	التصوير بالموجات فوق الصوتية للأمراض النسائية والتوليد	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Obstetrics and gynecologic ultrasound imaging	باللغة الانكليزية	
4	7	5	2		الانكليزية	لغة التدريس	

Objectives:

- ❖ The student will be able to know:
 1. Indications of ultrasound in gynecology and obstetrics
 2. Preparation of patient
 3. Sonographic appearance of normal and abnormal uterus, ovaries and ovarian follicles
 4. Differential diagnosis of the uterine lesions
 5. Differential diagnosis of the ovarian cysts
 6. Differential diagnosis of the pelvic inflammatory diseases
 7. Normal appearance of the embryo and yolk sac
 8. Sonographic features of the normal pregnancy, ectopic pregnancy and multiple pregnancy
 9. Abnormal appearance of the pregnancy in the first trimester
 10. Estimation of the fetal size and age
 11. Normal appearance of the testis and epididymis, sonographic features of abnormal testis and epididymis

Theoretical & practical syllabus	
Week	Details
1	Gynaecology (non-pregnant female pelvis): normal appearance of the uterus
2	Intrauterine contraceptive device, fluid in the posterior cul-de-sac
3	The endometrium, - position of the uterus - ovaries
4	Ovaries: - normal appearance of the ovary - ovarian follicles
5	Abnormal uterus: myomas, malignant disease
6	Appearance of the uterine endometriosis
7	Abnormal ovary: - Ovarian cysts, - pelvic hydatid cysts, - solid ovarian masses

8	Pelvic inflammatory disease, - pelvic abscess, pelvic varices, - fallopian tubes
9	Obstetrics: Introduction to obstetrics
10	Early pregnancy, ectopic pregnancy
11	The appearance of the embryo, - yolk sac - multiple pregnancy
12	Abnormalities in the first trimester of the pregnancy
13	Estimation of fetal size and age (fetal biometry)
14	Normal and abnormal appearance of the testis: - Unilateral swelling, - Small or absent testis
15	Normal and abnormal appearance of epididymis, - trauma, - torsion of the testis, - hernia and varicocele

References:

1. P.E.S. Palmer, *“Manual of diagnostic ultrasound”*, 2000.

عدد الساعات الاسبوعية				المرحلة الرابعة / الفصل الثاني	طب الامراض الجراحية	باللغة العربية	اسم المادة
عدد الوحدات	المجموع	عملي	نظري		Medicine of surgical diseases	باللغة الانكليزية	
3	5	3	2		الانكليزية	لغة التدريس	

Objectives:

1. To teach and inform the students the essential concepts of the surgical diseases of the human body.

Theoretical & practical syllabus	
Week	Details
1	Head injury: the role of imaging in head injury
2	Paranasal sinuses: imaging in paranasal sinuses diseases
3	The orbit: imaging in orbital diseases
4	The spine : imaging of spinal lesions
5	The neck : role of imaging in neck masses
6	Bone fracture: types & imaging
7	Urinary tract obstruction: - causes, - clinical features - imaging.
8	Renal & vesical tumors: types, features, imaging.
9	• Cystic diseases of kidney, • congenital anomalies of urinary tract.
10	Hepatic masses: role of imaging
11	Breast masses: benign & malignant
12	Female reproductive system: - infertility - causes & role of imaging
13	Tumors of uterus & ovaries
14	Male reproductive system: infertility, causes & role of imaging
15	Prostate : - Diseases, prostate enlargement - Methods of treatments

References:

3. O. James Garden & Rowan W Parks , *"Principles and Practice of Surgery"* 7th Edition, Elsevier; 2017.
4. Stuart H. Ralston, *"Davidson Principles & Practice of Medicine"*, 23rd edition, Elsevier 2018.

