هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Basics of Radiotherapy**
Course Code:	**374329-2**
Program:	**Bachelor in Radiological Sciences**
Department:	**Department of Radiological Sciences**
College:	**College of Applied Medical Sciences**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 2
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: **8thLevel / 3rdYear**
4. Pre-requisites for this course (if any)**:** None.
5. Co-requisites for this course (if any)**:** None.

1. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	30	100%
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Distance learning**	-	-
5	**Other**	-	-

2. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

The course concerns with basic facts about the cell and tumors and how they are developed. It also enables the students from basics of radiation therapy physics and different radiation therapymodalitiesused in the treatment of tumors, with reference to the steps that follow in the treatment process.

2. Course Main Objective

The course is designed to enable the student to:

1. Recognize the different tumors and their staging, grading, and classifications.
2. Identify clinical treatment planning, dosimetry, and volume definition,
3. Know the different uses of each radiation therapymodalities.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and understanding**	
1.1	Recallthe basic information of oncology.	K1

CLOs		AlignedPLOs
1.2	Explain the principles and physics of radiation therapy.	K1
1.3	Identify radiation therapy instrumentations.	K2
2	**Skills:**	
2.1	Distinguish different radiotherapy modalities used in tumors treatment.	S4
3	**Values:**	
-	-	-

C. Course Content

No	List of Topics	Contact Hours
1	**Tumors overview (1):** (Chapter 1, page No 1-20 of the Principles and Practice of Radiation Therapy) a. Cells and the nature of disease. b. Etiology. c. Nomenclature of the tumors. d. Benign and malignant tumors.	3
2	**Tumors overview (2):** (Chapter 3, page No 42-55of the Principles and Practice of Radiation Therapy) a. Classification of cancer: o Staging. o Grading. b. Physical examination. c. Medical imaging.	3
3	**Treatment Planning (1):** (Chapter 9-11, page No 133-169 of the Khan's the Physics of Radiation Therapy) a. Dose Distribution. b. Dosimetric Calculations. c. Determination and Definition of Treatment Volume.	3
4	**Treatment Planning (2):** (Chapter 12-13, page No 170-255 of the Khan's the Physics of Radiation Therapy) a. I: Isodose Distributions. b. II: Patient Data Acquisition, Treatment Verification, and Inhomogeneity Corrections. c. III: Field Shaping, Skin Dose, and Field Separation.	3
5	**Electron Beam Therapy:** (Chapter 15, page No 309-347 of the Khan's the Physics of Radiation Therapy) a. LowDoseRate Brachytherapy. b. HighDoseRateBrachytherapy.	3
6	**Simulation in radiotherapy (1):** (Chapter 21, page No 429-450 of the Principles and Practice of Radiation Therapy a. Conventional Simulator. b. CT (3D)-Simulator. c. MR Simulator.	3
7	**Simulation in radiotherapy (2):** (Chapter 22, page No 451-479 of the Principles and Practice of Radiation Therapy a. PET/CT Simulator.	3

	b. Multi-Modality Imaging. c. Simulation Process. d. Patient Positioning and Immobilization.	
8	**Radiotherapy Machines (1):** (Chapter 19-20, page No 413-453 of the Khan's the Physics of Radiation Therapy) a. Three - Dimensional Conformal Radiation Therapy. b. Intensity-Modulated Radiation Therapy.	3
9	**Radiotherapy Machines (2):** (Chapter 21-22, page No 454-474 of the Khan's the Physics of Radiation Therapy) a. Stereotactic Radiotherapy and Radiosurgery. b. Stereotactic Body Radiation Therapy.	3
10	**Radiotherapy Machines (3):** (Chapter 26-27, page No 510-535 of the Khan's the Physics of Radiation Therapy) a. Image-Guided Radiation Therapy. b. Proton Beam Therapy.	3
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge and understanding**		
1.1	Recallthe basic information of oncology.	Lectures	Direct assessment: -Midterm exam. -Final exam. Indirect assessment: -Survey.
1.2	Explain the principles and physics of radiation therapy.		
1.3	Identify radiation therapy instrumentations.		
2.0	**Skills:**		
2.1	Distinguish different radiotherapy modalities used in tumors treatment.	Small group discussion	Direct assessment: -Assignments. Indirect assessment: Survey.
3.0	**Values:**		
-	-	-	-

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm written exam	4^{th} - 5^{th}	30%
2	Assignment	7^{th}	10%
3	Final written exam	11^{th}- 12^{th}	60%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for the availability of faculty and teaching staff for individual student consultations and academic advice:

Faculty members are available for individual consultation. They usually dedicate 12 hours weekly for office hours and students are encouraged to visit them for help. Appointments can also be made in person with the faculty through email or phone. The faculty provides a range of academic and course management advice. Each student has an academic adviser, who offers personal, academic, psychological, and professional counseling, as well as group counseling to support the academic, behavioral, emotional, psychological, and social growth of students.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Khan's the Physics of Radiation Therapy** Khan M. Faiz and Gibbons P. John 5th Edition WOLTERS KLUWER ISBN: 978-1-4511-8245-3
Essential References Materials	**Principles and Practice of Radiation Therapy** Washington, M. Charles and Leaver, Dennis 4th Edition Elsevier ISBN: 978-0-323-28752-4 **Technical Basis of Radiation Therapy: Practical Clinical Applications** Seymour H. Levitt • James A. Purdy, Carlos A. Perez • Philip Poortmans 5th Edition Springer ISBN: 978-3-642-11571-4
Electronic Materials	1. http://www.arrt.org 2. https://www.asrt.org/asrt.htm 3. http://www.auntminnie.com 4. http://www.air.asn.au 5. http://user.shikoku.ne.jp/tobrains/exam/Angio/Angio-e.html 6. http://chorus.rad.mcw.edu/ 7. http://www.emory.edu/X-RAYS/Sprawls/
Other Learning Materials	None.

2. Facilities Required

Item	Resources
Accommodation	Classroom with 30 seats.

Item	Resources
(Classrooms, laboratories, demonstration rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	Blackboard, Projector, and SmartBoard.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Program Leaders	Direct
Extent of achievement of course learning outcomes	Faculty	Direct
Quality of learning resources	Student, Faculty	Indirect
Course management and planning	Students	Indirect
Teaching and interaction with students	Students	Indirect
Effectiveness of Evaluation and exams	Students, peer review	Direct, Indirect

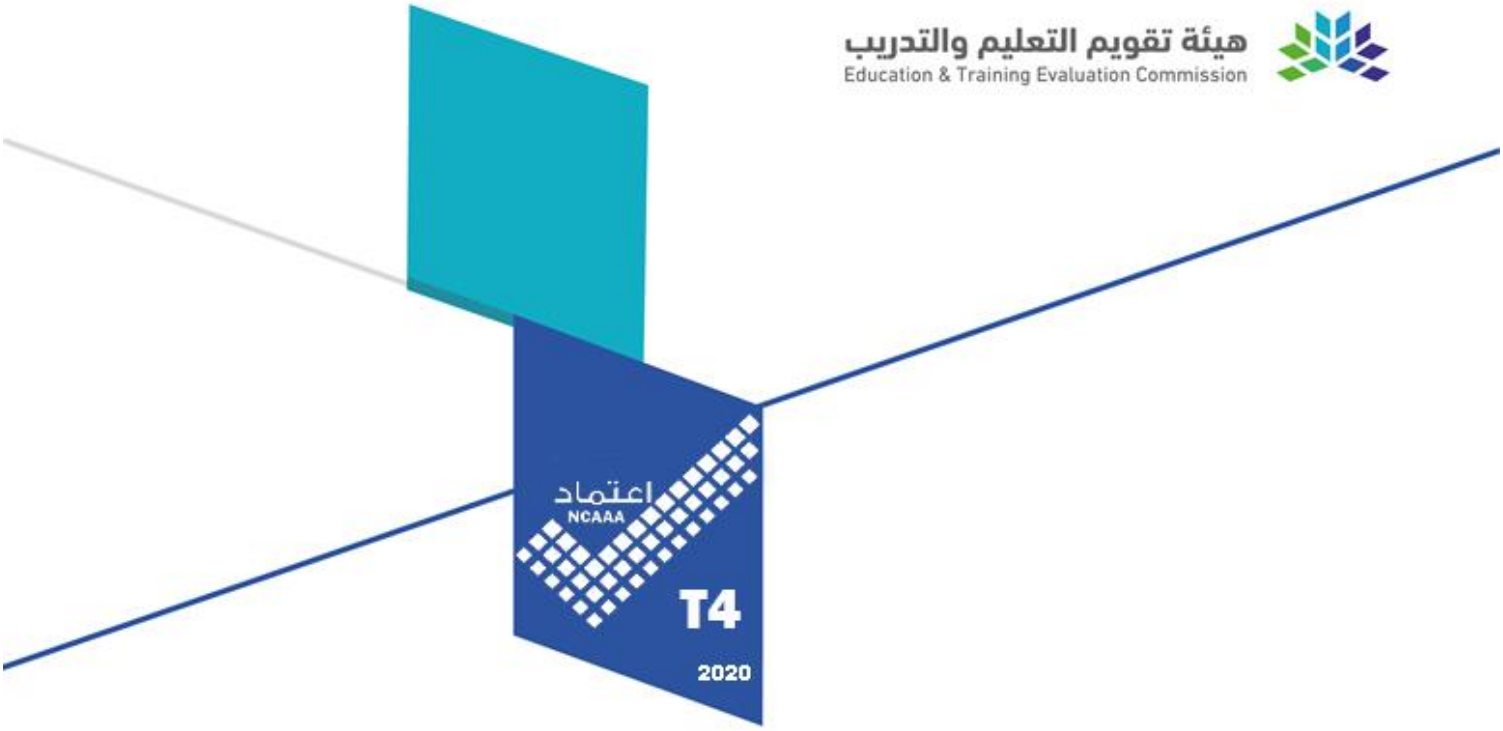
Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	**DEPARTMENT COUNCIL**
Reference No.	**11TH**
Date	**24TH MAY 2022**

قسم الأشعة
Radiology Department
TU
جامعة الطائف
TAIF UNIVERSITY

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Nuclear Medicine Physics and Instrumentation**
Course Code:	**374322-3**
Program:	**Bachelor in Radiological Sciences**
Department:	**Department of Radiological Sciences**
College:	**College of Applied Medical Sciences**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 3 (2+1)
2. Course type **a.** University ☐ College ☐ Department √ Others ☐ **b.** Required √ Elective ☐
3. Level/year at which this course is offered: 8th Level / 3rd Year
4. Pre-requisites for this course (if any)**:** Diagnostic Radiography Instrumentation (374226-3).
5. Co-requisites for this course (if any)**:** None.

1. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
ß	**Traditional classroom**	60	100 %
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Distance learning**	-	-
5	**Other**	-	-

2. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The course provides subjects that describe the basic principles of radioactivity, radionuclides, and radiopharmaceuticals. The course also describes the basic principles of different nuclear medicine instrumentations.

2. Course Main Objective

The course is designed to provide student with the basic principles of nuclear medicine physics and instrumentation.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and understanding**	
1.1	Define the theoretical physics of nuclear medicine imaging technology.	K1
1.2	Describe the structure of different nuclear medicine instrumentations (Gamma Camera, SPECT and PET).	K2

CLOs		Aligned PLOs
1.3	Identify radioisotopes used in diagnostic and therapeutic nuclear medicine studies.	K1
2	**Skills:**	
2.1	Develop knowledge of safe handling nuclear medicine instruments.	S2
2.2	Develop knowledge of safe handling nuclear medicine radioisotopes.	S1
2.3	Operate properly the nuclear medicine imaging instrumentations.	S5
3	**Values:**	

C. Course Content

No	List of Topics	Contact Hours
1	• Basic isotope notation. • Radionuclide production. • Radioactive decay. Chapter 1, Pages 1-5	6
2	• Radionuclide generator systems. • Radionuclides for imaging. • Radio pharmacy quality control. Chapter 1, Pages 5- 19	6
3	Unsealed radionuclides used for therapy. Chapter 1, 19- 20	6
4	• Geiger- Mueller Counter. • Ionization chamber. • Sodium iodide well counter. • Single-probe counting system. • Dose calibrator. Chapter 2, 23-27	6
5	Gamma scintillation camera (1) Chatper 2, Pages 28- 32	6
6	Gamma scintillation camera (2) Chapter 2, Pages 32- 38	6
7	• Single photon emission tomography. • SPECT/CT. Chapter 2, Pages 38- 42	6
8	• Positron Emission Tomography PET. • PET/CT. • PET/MRI. Chapter 2, Pages 43- 54	6
9	Instrumentation Quality Control Chapter 2, Pages 55- 62	6
10	Technical Artifacts Chapter 2, Pages 62- 69	6
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**		
1.1	Define the theoretical physics of nuclear medicine imaging technology.	Lectures	Quizzes Midterm exam Final exam
1.2	Describe the structure of different nuclear medicine instrumentations (Gamma Camera, SPECT and PET).	Lectures	
1.3	Identify radioisotopes used in diagnostic and therapeutic nuclear medicine studies.	Lectures	
2.0	**Skills:**		
2.1	Develop knowledge of safe handling nuclear medicine instruments.	Problem-solving	Practical Exam
2.2	Develop knowledge of safe handling nuclear medicine radioisotopes.	Problem-solving	
2.3	Operate properly the nuclear medicine imaging instrumentations.	Self-learning	
3.0	**Values:**		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Examination	5th	30 %
2	Quiz	8th	10 %
3	Final Examination	11th	60 %

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Faculty members are available for individual consultation. They usually dedicate 12 hours weekly for office hours and students are encouraged to visit them for help. Appointments can also be made in person with the faculty through email or phone. Faculty provide a range of academic and course management advice. Each student has an academic adviser who offers personal, academic, psychological, and professional counseling, as well as group counseling to support the academic, behavioral, emotional, psychological and social growth of students.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Essentials of nuclear medicine imaging Fred A. Mettler Jr., Milton J. Guiberteau. 6th Edition

	2012 Saunders ISBN: 978-1-4557-0104-9
Essential References Materials	Nuclear Medicine and Pet/CT: Technology and Techniques David Gilmore, Kristen M. Waterstram-Rich Mosby August 29th, 2016 ISBN: 9780323356220
Electronic Materials	1. http://www.radiography.com/ 2. http://www.radiologyinfo.org/glossary/ 3. http://www.aeirs.org/resources.html 4. http://www.emory.edu/X-RAYS/Sprawls/ 5. http://www.dimag.com/
Other Learning Materials	https://www.radiologycafe.com/frcr-physics-notes/molecular-imaging/gamma-camera/

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room with 30 seats. • Equipment LAB. • Hot LAB.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• Radioactive generators. • Radioactive sources. • Radiation Detectors. • Gamma camera components. • Nuclear medicine imaging simulator.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Program Leaders	Direct
Extent of achievement of course learning outcomes	Faculty	Direct
Quality of learning resources	Student, Faculty	Indirect
Course management and planning	Students	Indirect
Teaching and interaction with students	Students	Indirect
Effectiveness of Evaluation and exams	Students, peer review	Direct, Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**DEPARTMENT COUNCIL**
Reference No.	**11TH**
Date	**24TH MAY 2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Radiation Biology**
Course Code:	**374227-2**
Program:	**Bachelor in Radiological Sciences**
Department:	**Department of Radiological Sciences**
College:	**College of Applied Medical Sciences**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 2
2. Course type **a.** University ☐ College ☐ Department √ Others ☐ **b.** Required √ Elective ☐
3. Level/year at which this course is offered: 8th Level / 3nd year
4. Pre-requisites for this course (if any)**:** Radiation Protection and Dosimetry (374212-2).
5. Co-requisites for this course (if any)**:** None.

1. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	30	100%
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Distance learning**	-	-
5	**Other**	-	-

2. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course is mainly studying the effects of ionizing radiation on biological tissue, to use radiation more safely in diagnosis and more effectively in therapy.

2. Course Main Objective

The course is designed to enable the student to focus on understanding the effects of ionizing radiation on the living cells, the mechanisms by which they produce these effects on the different types of tissue and to differentiate between the various types of tissues according to their radio sensitivities.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and understanding**	
1.1	List and describe the molecular composition of the human body.	K1
1.2	Define the direct, indirect, deterministic and stochastic radiation effects.	K1

CLOs		Aligned PLOs
1.3	Describe acute radiation syndromes, factors affecting radiation response and lethality.	K3
2	**Skills:**	
2.1	Analyze the radiation dose-response relationships.	S2
2.2	Differentiate parts, functions, and processes of the human cells division.	S2
2.3	Estimates of radiation risk.	S2
3	**Values:**	
-	-	-

C. Course Content

No	List of Topics	Contact Hours
1	**1.** Human Biology: a. Human Radiation Response.453 b. Composition of the Body.456 Chapter 29 (pages 466 – 477)	3
2	**1.** Fundamental Principles of Radiobiology: a. Law of Bergonie and Tribondeau. b. Physical and biological factors that affect radiosensitivity and radiation dose-response relationships. Chapter 30 (pages 480 – 486)	3
3	**1.** Molecular Radiobiology: a. Irradiation of Macromolecules. b. Direct and Indirect Effects. Chapter 31 (pages 488 – 492)	3
4	**1.** Cellular Radiobiology: a. Target Theory. b. Cell-Survival Kinetics and Cell-Cycle Effects. Chapter 32 (pages 494– 502)	3
5	**1.** Deterministic Effects of Radiation: a. Local Tissue Damage. • Effects on the Skin. • Effects on the Gonads. b. Hematologic Effects: • Hemopoietic System. • Hemopoietic Cell Survival. Chapter 33 (pages 504 – 516)	3
6	**1.** Deterministic Effects of Radiation: a. Cytogenetic Effects: • Normal Karyotype. • Single-Hit Chromosome. • Aberrations. • Multi-Hit Chromosome.	3

	• Aberrations. • Kinetics of Chromosome. • Aberration. b. The Human Genome. Chapter 33 (pages 504 – 516)	
7	**1.** Stochastic Effects of Radiation: a. Local Tissue Effects: • Skin. • Chromosomes. • Cataracts. b. Lifespan Shortening. Chapter 34 (pages 519 – 536)	3
8	**1.** Stochastic Effects of Radiation: a. Risk Estimates: • Relative Risk. • Excess Risk. • Absolute Risk. b. Radiation-Induced Malignancy: • Leukemia. • Cancer. Chapter 34 (pages 519 – 536)	3
9	**1.** Stochastic Effects of Radiation: a. Total Risk of Malignancy: • Nuclear Reactor Incidents. • BEIR Committee. Chapter 34 (pages 519 – 536)	3
10	**1.** Stochastic Effects of Radiation: a. Radiation and Pregnancy: • Effects on Fertility. • Irradiation in Utero. • Genetic Effects. Chapter 34 (pages 519 – 536)	3
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**		
1.1	List and describe the molecular composition of the human body.	Lectures	Quizzes Midterm exam Final exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Define the direct, indirect, deterministic and stochastic radiation effects.	Lectures	Quizzes Midterm exam Final exam
1.3	Describe acute radiation syndromes, factors affecting radiation response and lethality.	Lectures	Quizzes Midterm exam Final exam
2.0	**Skills:**		
2.1	Analyze the radiation dose-response relationships.	Small group discussion	Assignments
2.2	Differentiate parts, functions, and processes of the human cells division.	Small group discussion	Assignments
2.3	Estimates of radiation risk.	Small group discussion	Assignments
3.0	**Values:**		
-	-	-	-

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz	3rd	15%
2	Mid-term exam	6th	30%
3	Assignments	9th	15%
4	Final Exam	11th - 12th	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Faculty members are available for individual consultation. They usually dedicate 12 hours weekly for office hours and students are encouraged to visit them for help. Appointments can also be made in person with the faculty through email or phone. Faculty provide a range of academic and course management advice. Each student has an academic adviser who offers personal, academic, psychological, and professional counseling, as well as group counseling to support the academic, behavioral, emotional, psychological, and social growth of students.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Radiologic Science for Technologists: Physics, Biology, and Protection Bushong S. 8th Edition St. Louis, Mo: Mosby 2001. ISBN 0323013376

Essential References Materials	• Dowd S, Tilson E. Practical Radiation Protection and Applied Radiobiology. 2nd ed. Philadelphia, Pa: WB Saunders; 1999. ISBN 0721675239 • Forshier S. Essentials of Radiation: Biology and Protection. Albany, NY: Delmar Publishers; 2002. ISBN 0766813304 • Nias AH. An Introduction to Radiobiology. 2nd ed. Chichester, NY: Wiley; 1998. ISBN 0471975907
Electronic Materials	1. http://google.com 2. http://hotbot.lycos.com/ 3. http://www.cs.washington.edu/research/projects/WebWare1/www/metacrawler/ 4. http://web.webcrawler.com/d/search/p/webcrawler/
Other Learning Materials	None.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show. Blackboard.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Program Leaders	Direct
Extent of achievement of course learning outcomes	Faculty	Direct
Quality of learning resources	Student, Faculty	Indirect
Course management and planning	Students	Indirect
Teaching and interaction with students	Students	Indirect
Effectiveness of Evaluation and exams	Students, peer review	Direct, Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**DEPARTMENT COUNCIL**
Reference No.	**11TH**
Date	**24TH MAY 2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Ultrasound Physics and Instrumentation**
Course Code:	**374312-3**
Program:	**Bachelor in Radiological Sciences**
Department:	**Department of Radiological Sciences**
College:	**College of Applied Medical Sciences**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours:	3
2. Course type	
a.	University ☐ College ☐ Department √ Others ☐
b.	Required √ Elective ☐
3. Level/year at which this course is offered:	8th Level / 3rd year
4. Pre-requisites for this course (if any)**:**	Diagnostic Radiography Instrumentation (374226-3).
5. Co-requisites for this course (if any)**:**	**None.**

1. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Distance learning**	-	-
5	**Other**	-	-

2. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course introduces principles of ultrasound physics and instrumentation, transducers construction and characteristics, sound beam formation, characteristics and interaction with matter,2D image formation and display, Doppler principles, artifacts, biological effects and quality control of ultrasound machines.

2. Course Main Objective

The course is designed to enable the student to outline and discuss the basics physics of medical ultrasound instrumentation including knobology, operation and basic principles quality control of ultrasound machines.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and understanding**	
1.1	Explain the basic principles of sound wave, interaction of sound with matter, pulsed and continuous doppler, beam intensity and potential bioeffects.	K1
1.2	Outline the various types and functions performed by the transducers and how to manipulate them for the best ultrasound image quality.	K2
1.3	Identify acoustic artifacts on 2D and doppler images, and the processes involved in performing quality assurance tests on ultrasound system.	K3
2	**Skills:**	
2.1	Operate properly all types of ultrasound machines and transducers for different ultrasound imaging examinations.	S5
3	**Values:**	
3.1	Commit to the ethical and professional standards to ensure patient and equipment safety and proper usage of ultrasound machines.	V1

C. Course Content

No	List of Topics	Contact Hours
1	**1. Introduction:** a. Sound. b. Sound waves. c. Pulse and echo. Chapter; 1. Pages 1-3. (Textbook-1)	6
2	**1. Principles of ultrasound physics (1):** a. Acoustic variable. b. Parameters of Sound. c. Pulse wave and duty factor. Chapter; 1. Pages 4-13. (Textbook-1)	6
3	**1. Principles of ultrasound physics (2)** a. Wave interference. b. Attenuation. c. Absorption. d. Reflection and refraction. Chapters; 1 Pages 14-23 (Textbook-1)	6
4	**1. Principles of ultrasound physics (cont.)** a. Acoustic interfaces and terminology. b. Sound beam and resolution. Chapter; 2. Pages 32-34. (Textbook-1)	6
5	**1. Pulse echo imaging:** a. A-Mode. b. B-Mode. c. M-Mode. Chapter; 3.	6

	Pages 65-83. (Textbook-1)	
6	**1. Ultrasound instrumentations:** a. Image optimization (Knobology). b. Transducers. Chapter; 2. Pages 37-57. (Textbook-1)	6
7	Basic principles of ultrasound images artifacts. Chapter; 3 Pages 83-93. (Textbook-1)	6
8	Principles of Doppler ultrasound. Chapter; 4. Pages 95-112. (Textbook-1)	6
9	Biological effects of ultrasound. Chapter; 6 PageS 155-161. (Textbook-1)	6
10	Quality control tests. Chapter; 5 PageS 137-143. (Textbook-1)	6
Total		**60**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**		
1.1	Explain the basic principles of sound wave, interaction of sound with matter, pulsed and continuous doppler, beam intensity and potential bioeffects.	Lectures Brainstorming	Midterm exam Final exam
1.2	Outline the various types and functions performed by the transducers and how to manipulate them for the best ultrasound image quality.	Lectures Brainstorming	Midterm exam Final exam
1.3	Identify acoustic artifacts on 2D and doppler images, and the processes involved in performing quality assurance tests on ultrasound system.	Lectures Brainstorming	Midterm exam Final exam
2.0	**Skills:**		
2.1	Operate properly all types of ultrasound machines and transducers for different ultrasound imaging examinations.	Problem-based learning	Practical exam
3.0	**Values:**		
3.1	Commit to the ethical and professional standards to ensure patient and equipment safety and proper usage of ultrasound machines.	Collaborative Learning	Presentation

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Presentation	4th	10%
2	Midterm written exam	6th	30%
3	Final practical exam	10th	10%
4	Final written Exam	11th - 12th	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Faculty members are available for individual consultation. They usually dedicate 12 hours weekly for office hours and students are encouraged to visit them for help. Appointments can also be made in person with the faculty through email or phone. Faculty provide a range of academic and course management advice. Each student has an academic adviser who offers personal, academic, psychological, and professional counseling, as well as group counseling to support the academic, behavioral, emotional, psychological, and social growth of students.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	- Examination Review for Ultrasound: Sonography Principles and Instrumentation (Sonographic Principles and Instrumentation (Spi). Steven M. Penny, Traci B. Fox, Cathy H. Godwin, RDMS. 1st Edition. 2011 Chapters; 1-5. Pages;1-137. Lippincott Williams and Wilkins. ISBN-13: 978-1608311378. - Essentials of ultrasound physics James A.Zagzebski. 1st edition 1996. Chapters; 1-5. Pages; 1-220. Mosby. ISBN-13: 978-0815198529.
Essential References Materials	- Diagnostic Ultrasound: Principles and Instruments. Fredrick W. Kremkau, 7th Edition. 2010. Saunders. Chapters; 1-3. Pages;1-125.

	Elsevier. ISBN 13: 978-0721631929
Electronic Materials	1. http://www.radsciresearch.org 2. http://www.radiography.com/
Other Learning Materials	None.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom. Ultrasound lab contains ultrasound scanners equipped with color doppler, printers, phantoms and acoustic gel for practical sessions.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show. Phantoms for teaching purposes. LCD screen for practical sessions demonstration.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Program Leaders	Direct
Extent of achievement of course learning outcomes	Faculty	Direct
Quality of learning resources	Student, Faculty	Indirect
Course management and planning	Students	Indirect
Teaching and interaction with students	Students	Indirect
Effectiveness of Evaluation and exams	Students, peer review	Direct, Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**DEPARTMENT COUNCIL**
Reference No.	**11TH**
Date	**24TH MAY 2022**