



Course Specification

— (Bachelor)

Course Title: **Computerized Tomography Physics and Instrumentation**

Course Code: **374222-3**

Program: **Program of Bachelor in Radiological Sciences -374000-Level 6**

Department: **Department of Radiological Sciences**

College: **College of Applied Medical Sciences**

Institution: **Taif University**

Version: **3**

Last Revision Date: **4th September 2023**



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	6
E. Learning Resources and Facilities	6
F. Assessment of Course Quality	7
G. Specification Approval	7



A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. University College Department Track Others
B. Required Elective

3. Level/year at which this course is offered: (Level 4\2nd Year)

4. Course general Description:

Course content is designed to impart understanding of evolution of computed tomography (CT), physical principles and instrumentation involved in computed tomography, the characteristics of X-radiation, data acquisition and manipulation, image reconstruction algorithms, such as filtered back-projection and transform, components of CT scanner; gantry assembly (patient aperture, rotating frame, X-ray tube, collimator, and detectors), Patient table, operator console, CT computer and workstations

5. Pre-requirements for this course (if any):

Radiation physics (374211-2).

6. Co-requirements for this course (if any):

None

7. Course Main Objective(s):

This course aims to describe the physical principles of Computed Tomography scanner, recognize CT generations and the instrumentations, image artifacts and evaluate image quality. As well the students should perform CT image windowing (manipulation).

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	64	100%
2	E-learning	-	-
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	-	-
4	Distance learning	-	-



3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	32
2.	Laboratory/Studio	32
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		64

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with course	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Explain the physical principles of Computed Tomography.	K1	Lecture	Direct method Written exams
1.2	Recognize Computed Tomography instrumentations.	K2	Lecture	Direct method Written exam Assignment
2.0	Skills			
2.1	Explain different CT generations, CT components and image processing.	S2	Lecture Small group discussion	Direct method Written exam Practical exam Indirect method (Survey)
2.2	Examine CT image artifacts, image quality and image reconstruction algorithms.	S5	Lecture Small group discussion	Direct method Written exam Practical exam Indirect method (Survey)
3.0	Values, autonomy, and responsibility			
3.1	-	-	-	-



C. Course Content

No	List of Topics	Contact Hours
1.	1. Historical Perspectives for CT scanner 2. Conventional Tomography versus Computed Tomography. 3. Computed Tomography versus MRI. 4. Practical session. Chapter: 1, Pages: 1-29 (Textbook-1).	4
2.	1. Computed Tomography Generations-1. 2. Capabilities and limitations. 3. Practical session. Chapter: 4, Pages: 84-92 (Textbook-1).	4
3.	1. Computed Tomography Generations-2. 2. Capabilities and limitations. 3. Practical session. Chapter: 4, Pages: 84-92 (Textbook-1).	4
4.	1. Components of CT scanner (1): a. Gantry assembly. 2. Practical session. Chapter: 7, Pages: 151-160 (Textbook-1).	4
5.	1. Components of CT scanner (2): a. Detector assembly. b. Detector electronics. c. Patient couch. d. Image display system. 2. Practical session. Chapter: 8, Pages: 160-168 (Textbook-1).	4
6.	1. Physical principles of CT. 2. Steps of production CT images: a. Data acquisition. b. Image reconstruction. 3. Practical session. Chapter: 4, Pages: 92-97 (Textbook-1).	4
7.	1. Physical principles of CT. 2- Image displa. a. Manipulation. b. Storage. c. Communications. d. Recording. 3. Practical session. Chapter: 4, Pages: 92-97 (Textbook-1).	4
8.	1. Image Manipulation and post processing technique: - Image Reformation. 2. Practical session. Chapter: 9, Pages: 188-200 (Textbook-1).	4
9.	1. Image Manipulation and post processing technique: - Application of visualization tools. 2. Practical session. Chapter: 9, Pages: 188-200 (Textbook-1).	4





10.	1. Image quality in CT – 1. 2. Quality Parameters. 3. Practical session. Chapter: 9, Pages: 201-213 (Textbook-1).	4
11.	1. Image quality in CT – 2. 2. Quality Parameters. 3. Practical session. Chapter: 9, Pages: 201-213 (Textbook-1).	4
12.	1. CT artifacts-1. 2. Practical session. Chapter: 9, Pages: 213-218 (Textbook-1).	4
13.	1. CT artifacts-2. 2. Practical session. Chapter: 9, Pages: 213-218 (Textbook-1).	4
14.	1. Radiation concepts and measuring dose in CT. 2. Practical session. Chapter: 10, Pages: 219-335 (Textbook-1).	4
15.	1. Multislice Spiral/Helical Computed Tomography: Physical Principles and Instrumentation, 2. Practicle session. Chapter: 12, pages: 266-300 (Textbook-1).	4
16.	Revision	4
Total		64

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Activity (Quiz)	5 th	10%
2.	Mid-term written exam	8 th	30%
3.	assignment	10 th	10%
4.	Final practical exam	17 th	10%
4	Final written exam	18 th	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<p>Computed tomography: physical principles, clinical applications, and quality control. Euclid Seeram. 3rd edition. Publisher: Elsevier ISBN: 978-1-4160-2895-6 Published Date: 2009</p>
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Supportive References	Computed Tomography for Technologist: a comprehensive text Lois E. Romans. 1st Edition Publisher: Wolters Kluwer Health Lippincott Williams & Wilkins ISBN: 978-0-7817-7751-3 Published Date: 2011
Electronic Materials	<ul style="list-style-type: none"> - Link for the course at Blackboard Learn Portal on Taif university webpage (https://lms.tu.edu.sa/webapps/login/) - Saudi Digital Library (SDL) on Taif University website (through the Electronic Services portal - academic systems services).
Other Learning Materials	- None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom. Laboratory.
Technology equipment (projector, smart board, software)	Data show. Internet access
Other equipment (depending on the nature of the specialty)	CT simulator machine.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders	Direct
Effectiveness of Students assessment	Faculty	Direct
Quality of learning resources	Student, Faculty	Indirect
The extent to which CLOs have been achieved	Students	Indirect
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	11TH
DATE	24TH MAY 2022





Course Specification

— (Bachelor)

Course Title: **Diagnostic radiography Instrumentation**

Course Code: **374226-3**

Program: **Program of Bachelor in Radiological Sciences -374000-Level 6**

Department: **Department of Radiological Sciences**

College: **College of Applied Medical Sciences**

Institution: **Taif University**

Version: **3**

Last Revision Date: **4th September 2023**



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	7
E. Learning Resources and Facilities	7
F. Assessment of Course Quality	8
G. Specification Approval	8



A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. University College Department Track Others
 B. Required Elective

3. Level/year at which this course is offered: (4th Level/ 2nd year)

4. Course general Description:

Theoretical and practical course designed to provide students with rich information about radiographic instrumentation in diagnostic department, as well as construction and functions of these equipment and their safe usage, plus instrumentation specifications.

5. Pre-requirements for this course (if any):

Digital imaging and display 374217-2

6. Co-requirements for this course (if any):

None

7. Course Main Objective(s):

- State radiographic equipment specifications and department requirements of instrumentations.
- Describe the basic X-ray components and electrical circuits.
- Explain fluoroscopic components.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	64	100%
2	E-learning	-	-
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	-	-
4	Distance learning	-	-





3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	32
2.	Laboratory/Studio	32
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		64

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with course	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Define the basic X-ray machine components, accessories and electrical circuits.	K2	Lecture	Direct method written exam (mid, final exam and quiz) Indirect method (Survey)
1.2	Recognize fluoroscopic and conventional instrumentation components.	K2	Lecture	
2.0	Skills			
2.1	Contrast different connection of X-ray machines to main power supply.	S5	Lecture/Small group discussion	Direct method Practical report Indirect method (Survey)
2.2	Apply communication skills when dealing with different instrumentation problems.	S4	Problem based learning	
2.3	Operate medical X-ray and fluoroscopic apparatus properly.	S5	Lecture/Small group discussion	
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate professionalism in working safely with different X-ray machines.	V1	Group work	Direct method Presentation Indirect method (Survey)





C. Course Content

No	List of Topics	Contact Hours
1.	<p>Course overview and importance of course and it's relation with the specialty of radiology also distribution of CS</p> <p>X-ray Circuit</p> <p>A. Electricity and main power supply</p> <ol style="list-style-type: none"> 1. Potential difference 2. Current <p>Type of current</p> <ol style="list-style-type: none"> a. Direct b. Alternating <ol style="list-style-type: none"> 3. Power and energy <p>Practical of connection. Chapter one p 1-11</p>	4
2.	<ol style="list-style-type: none"> a. Protective electrical devices <ol style="list-style-type: none"> i. Earth ii. Fuses and switches used in the electrical circuits b. Transformers <ol style="list-style-type: none"> i. Step-up ii. Step-down iii. Auto transformer c. Diagnostic x-ray machines types <p>Practical of cession Chapter one p 1-11</p>	4
3.	<p>Diagnostic X-Ray Tubes</p> <ol style="list-style-type: none"> A. Electrical and radiation safety B. Focal spot size and anode heel effect C. Heat dissipation and heat units <p>Types of X-ray tubes Practical cession Chapter two 11-18 plus chapter five-page 56-68</p>	4
4.	<p>Transformer</p> <p>Types functions and construction Practical cession Chapter 2 page 22-25</p>	4
5.	<p>X-ray generator's construction / function and types</p> <p>1. Single phase</p> <ol style="list-style-type: none"> a. Self-rectified <p>Full rectified X-ray generator Practical cession Chapter four 44-50</p>	4
6.	<p>X-ray generator (cont)</p> <p>1. Three phases</p> <ol style="list-style-type: none"> a. six ripples b. twelve ripples <p>High frequency characteristics and diagram Practical cession Chapter four 50-56</p>	4
7.	<p>Exposure timer and switches Types of X-ray exposure timer</p>	4





	Automatic exposure control (AEC) Types-constructions-usages-back up timer Grid and collimator types and construction Practical session Chapter four Page 57-62	
8.	Fluoroscopic equipment Brief history of development Fluoroscopy: Image Intensifier A. Construction Design, Function B. Intensification principles/characteristics C. Brightness gain D. Flux gain E. Minification gain F. Conversion factor and brightness gain Practical session Chapter six 101-110	4
9.	Fluoroscopic unit (cont) 1. Automatic brightness control (ABC) 2. Multi-field intensifiers 3. Magnification 4. Control of radiation Dose- Image intensifier Viewing and recording systems Practical session Chapter six 101-110	4
10.	Digital fluoroscopy. Practical discussion. Chapter six 101-117	4
11.	Mobile Radiographic Equipment Electrical energy source - Mains-dependent mobile equipment Practical session Chapter seven 118-129	4
12.	Mobile unit cont Conventional generators Capacitor discharge unit -Battery-powered generators- C-arm unit: Physical constructions and Features Practical Cession Chapter seven 118-129	4
13.	Equipment for Dental Radiography Intra-oral radiography and extra oral radiography = Cephalostat Orthopantomography OPG Practical session Chapter Eight Page 131-139	4
14.	X-ray Lay out Collimator/Grid/ Couch and Bucky and different Installation	4
15.	Mammographic unit. Construction X-ray tube and machines specifications Chapter nine 140-153	4
16.	Introduction to tomography and emergency equipment Chapter 10 Page 154-160	4
Total		64





D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Activity (Quiz,)	5 th	10%
2.	Mid-term Examination	7 th - 8 th	30%
3.	Activity (presentation).	14 th	10%
4.	practical report	16 th	10%
5.	Final Examination.	17 th -19 th	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ul style="list-style-type: none"> Chesneys' Equipment for Student Radiographers P. H. Carter and A. M. Paterson 1994 4th Edition Wiley-Blackwell ISBN: 978-0-632-02724-8
Supportive References	<ul style="list-style-type: none"> Equipment for Diagnostic Radiography E. Forster 5th Edition 1998 ISBN 978-0-85200-928-4
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with at least 30 seats X- ray Lab with different X -Ray tools
Technology equipment (projector, smart board, software)	Data show Internet access
Other equipment (depending on the nature of the specialty)	None



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders	Direct
Effectiveness of Students assessment	Students, Peer review	Direct, Indirect
Quality of learning resources	Student, Faculty	Indirect
The extent to which CLOs have been achieved	Students	Indirect
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	11TH
DATE	24TH MAY 2022





Course Specification

— (Bachelor)

Course Title: **General Radiographic Techniques and Radiographic Anatomy (1)**

Course Code: **374221-4**

Program: **Program of Bachelor in Radiological Sciences -374000-Level 6**

Department: **Department of Radiological Sciences**

College: **College of Applied Medical Sciences**

Institution: **Taif University**

Version: **3**

Last Revision Date: **4th September 2023**



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	6
E. Learning Resources and Facilities	6
F. Assessment of Course Quality	7
G. Specification Approval	7





A. General information about the course:

1. Course Identification

1. Credit hours: (4)

2. Course type

A. University College Department Track Others
B. Required Elective

3. Level/year at which this course is offered: (4th Level/ 2nd Year)

4. Course general Description:

Demonstrate routine radiographic procedures with standard terminologies of positioning and identify the basic and alternative skeletal radiographic examinations for the upper and lower extremity, shoulder, and pelvis girdle then State and project to identify the anatomical structures of the upper and lower extremity, shoulder and pelvis girdle, bony thorax and the vertebral column on radiographs

5. Pre-requirements for this course (if any):

- Human Anatomy (374210-4).
- Digital image acquisition and display (374217-2).

6. Co-requirements for this course (if any):

None

7. Course Main Objective(s):

Theoretical and practical course of General Radiographic Techniques and Radiographic Anatomy (1) is designed to enable the students to know how to make the optimal diagnostic images.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	80	100%
2	E-learning	-	-
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	-	-
4	Distance learning	-	-



3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	48
2.	Laboratory/Studio	32
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		80

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with course	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Define standard terminology of positioning and projection.	K1	Lectures	Direct method Exams and quizzes
1.2	Describe the routine and alternative skeletal radiographic procedures.	K3	Lectures	Indirect method (Survey)
2.0	Skills			
2.1	Choose the appropriate radiographic positioning according to the patient medical condition.	S1	Small group discussion	Direct method Discussion Indirect method (Survey)
2.2	Communicate effectively all routine and alternative skeletal radiographic examinations with patient.	S4	Case study	
2.3	Illustrate the anatomical structures on radiograph images for the upper and lower extremities, shoulders, pelvis girdle, bony thorax and the vertebrae	S3	Lectures / practical	Direct method Practical exam Indirect method (Survey)
3.0	Values, autonomy, and responsibility			
3.1	Develop professionalism in working carefully and safely with conventional X-ray machines	V1	Group work	Direct method Oral presentation Indirect method (Survey)



C. Course Content

No	List of Topics	Contact Hours
1.	Standard Terminology for Positioning and Projection Chapter 1 (page 3 -45) Textbook 1	5
2.	Standard Terminology for Positioning and Projection Chapter 1 (page 46 -70) Textbook 1	5
3.	1. Upper extremities: a. Hand. b. Fingers 2. Practical session (demonstration). Chapter 4 (page 127 -154) Textbook 1	5
4.	1. Upper extremities: a. Wrist joint b. Forearm. 2. Practical session (demonstration). Chapter 4 (page 155 -165) Textbook 1	5
5.	1. Upper extremities: a. Elbow joint. b. Humorous 2. Practical session (demonstration). Chapter 4 (page 166 -187) Textbook 1	5
6.	1. Shoulder Girdle. 2. Practical session (demonstration). Chapter 5 (page 188 -210) Textbook 1	5
7.	1. Lower extremities: a. Foot. b. phalanges. 2. Practical session (demonstration). Chapter 6 (page 212 -238) Textbook 1	5
8.	1. Lower extremities: a. Ankle joint. b. Legs. 2. Practical session (demonstration). Chapter 6 (page 239 -245) Textbook 1	5
9.	1. Lower extremities: a. Knee joint b. Patella 2. Practical session (demonstration). Chapter 6 (page 246 -261) Textbook 1	5
10.	1. Lower extremities: a. Femur. b. Hip joint 2. Practical session (demonstration). Chapter 7 (page 264 -278) Textbook 1	5
11.	1. Pelvic girdle. 2. Practical session (demonstration). Chapter 7 (page 279 -289) Textbook 1	5
12.	1. Vertebral column: Radiographic anatomy and topographic landmarks Chapter 8 (page 292 -307) Textbook 1	5
13.	1. Vertebral column: a. Cervical. b. Dorsal spine. 2. Practical session (demonstration). Chapter 8 (page 308 -322) Textbook 1	5
14.	1. Vertebral column: a. Lumber spine. b. Sacral spine. 2. Practical session (demonstration). Chapter 9 (page 323 -354) Textbook 1	5
15.	1. Bony thorax. 2. Practical session (demonstration). Chapter 10 (page 356 -373) Textbook 1	5
16.	Revision	5
Total		80



D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz	5 th	10 %
2.	Midterm Exam	8 th	30 %
3.	Activity (OSPE)	12 th	10 %
4.	Practical exam	16 th	10 %
5.	Final exam	18 th	40 %

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Bontrager`s, Textbook for Radiographic Positioning & Related Anatomy John P. Lampignano, Leslie E. Kendrick, 9th Edition Elsevier 2018 ISBN: 978-0-323-39966-1
Supportive References	2. CLARK`S Positioning in Radiography WITHLEY Taylor & Francis group 13th Edition 2016 ISBN: 9780429167133
Electronic Materials	<ol style="list-style-type: none"> http://www.radiologyinfo.org/glossary http://www.radsciresearch.org http://www.radiography.com/ http://www.jrcert.org http://www.emory.edu/X-RAYS/Sprawls
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, laboratories, demonstration rooms/labs
Technology equipment (projector, smart board, software)	Data show projectors
Other equipment (depending on the nature of the specialty)	Conventional / Digital X-ray machine



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders	Direct
Effectiveness of Students assessment	Students, Peer review	Direct, Indirect
Quality of learning resources	Student, Faculty	Indirect
The extent to which CLOs have been achieved	Faculty	Direct
Other Teaching and interaction with students	Students	Indirect

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	11TH
DATE	24TH MAY 2022





Course Specification

— (Bachelor)

Course Title: **Pathology**

Course Code: **374314-4**

Program: **Program of Bachelor in Radiological Sciences -374000-Level 6**

Department: **Department of Radiological Sciences**

College: **College of Applied Medical Sciences**

Institution: **Taif University**

Version: **3**

Last Revision Date: **4th September 2023**



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	4
D. Students Assessment Activities	6
E. Learning Resources and Facilities	7
F. Assessment of Course Quality	8
G. Specification Approval	8



A. General information about the course:

1. Course Identification

1. Credit hours: (4 hours)

2. Course type

A. University College Department Track Others
B. Required Elective

3. Level/year at which this course is offered: Level 4 / Second Year

4. Course general Description:

Pathology deals with basic theoretical knowledge about the basic pathological aspects of diseases in the form of (etiology, predisposing factors, pathogenesis. morphologic tissue changes as well as fate and prognosis) of general diseases (as inflammations, neoplasia, circulatory disturbances, and cell injuries) as well as the common system's diseases. With emphasis on tissue changes on imaging.

5. Pre-requirements for this course (if any):

Physiology (374224-4)

6. Co-requirements for this course (if any):

None

7. Course Main Objective(s):

The main purpose of this course is that the student will be able to:
Gain proper knowledge about general and systemic diseases, identify the pathological basis of diseases. Also be able to describe the structural disturbances in the form of gross & microscopic changes and interpret specific physical signs and symptoms, specific diagnostic radiological finding, common complications, and preferred treatment.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	64	100%
2	E-learning	-	-
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	-	-
4	Distance learning	-	-





3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	64
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		64

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with course	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	List etiology, pathogenesis, clinical significances, complication, and prognosis of general diseases.	K1	Lectures	Direct: - Written exams
1.2	Describe the morphologic changes of the diseases in the form of gross and microscopic images.	K1		
1.3	Explain the mechanism of diseases, and their structural and functional disturbances.	K1		
2.0	Skills			
2.1	Build an interpretation of inflammatory, neoplastic, and other general and system diseases process in terms of physical and radiological changes involved.	S2	-Lectures -Problem based learning.	Direct: - Written exams
2.2	Analyze the local and general factors that adversely affect prognosis of diseases.	S3	-Lectures -Group discussion	
3.0	Values, autonomy, and responsibility			
3.1	Improve effective communication skills with colleagues in work as a team in performing tasks.	V2	-Collaborative Learning -Self-learning	Direct method: - Presentations

C. Course Content

No	List of Topics	Contact Hours
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1.	Introduction of pathology: <ul style="list-style-type: none"> ▪ Pathology ▪ Pathogenesis ▪ Etiology ▪ Clinical significance of diseases: Signs & Symptoms ▪ Morphologic changes ▪ Fate of diseases (Complication & Prognosis) 	4
2.	Inflammation: <ul style="list-style-type: none"> ▪ Acute inflammation ▪ Chronic inflammation (granulomas) 	4
3.	Healing and Repair: <ul style="list-style-type: none"> ▪ Types of healing ▪ Mechanism of healing by fibrosis and Granulation tissue ▪ Types of wound Healing ▪ Healing of bone fracture ▪ Complication of wound healing 	4
4.	Circulatory Disturbance: <ul style="list-style-type: none"> ▪ Hyperemia, Congestion, and ischemia ▪ Thrombosis & Embolism ▪ Hemorrhage & Edema 	4
5.	Cell injury (reversible and irreversible): <ul style="list-style-type: none"> ▪ Adaptation ▪ Degeneration ▪ Necrosis and Apoptosis 	4
6.	Neoplasia (Disturbances of Growth): <ul style="list-style-type: none"> ▪ Benign tumors ▪ Malignant tumors 	4
7.	Diseases of the breast: <ul style="list-style-type: none"> ▪ Inflammatory diseases ▪ Neoplastic conditions 	4
8.	Diseases of female reproductive system: <ul style="list-style-type: none"> ▪ Inflammatory diseases ▪ Hormonal disturbances effects ▪ Neoplastic conditions 	4
9.	Diseases of urinary tract: <ul style="list-style-type: none"> ▪ Inflammatory diseases 	4



	<ul style="list-style-type: none"> ▪ Urinary stones & Urinary obstruction ▪ Neoplastic conditions 	
10.	Gastrointestinal system diseases: <ul style="list-style-type: none"> ▪ Esophageal diseases ▪ Gastric diseases ▪ Intestinal diseases 	6
11.	Liver diseases: <ul style="list-style-type: none"> ▪ Acute and chronic hepatitis ▪ Liver cirrhosis ▪ Hepatic tumors 	4
12.	Diseases of respiratory tract: <ul style="list-style-type: none"> ▪ Inflammatory ▪ Chronic Obstructive Pulmonary Diseases ▪ Neoplastic conditions 	6
13.	Bone and Joint Diseases: <ul style="list-style-type: none"> ▪ Congenital bone diseases ▪ Metabolic bone diseases ▪ Bone tumor ▪ Arthritis (types-pathogenesis- clinical presentation -diagnosis) 	4
14.	Nervous System diseases: <ul style="list-style-type: none"> ▪ Inflammatory condition ▪ CNS Neoplasms 	4
15.	Revision	4
Total		64

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid-term Examination	7 th	30%
2.	Case study Assignment Activity	12 th	10%
3.	Final Examination	18 th – 19 th	60%
...	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).



E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ul style="list-style-type: none"> Essentials of Rubin's Pathology Emanuel Rubin; Howard M. Reisner 5th Edition. 2009 Copyright: Lippincott Williams. ISBN: 978-07817-7324-9
Supportive References	<ul style="list-style-type: none"> Master Medicine: General and Systematic Pathology By: Paul Bass; Susan Burroughs; Norman Carr; Claire Way 3rd Edition 2009 Publisher: Elsevier Limited ISBN: 9780080451299 eText ISBN: 9780702048142, 0702048143
Electronic Materials	<p>Websites, Search engines (Saudi Digital Library, PubMed, Google Scholar)</p> <ul style="list-style-type: none"> E-Learning: Video tapes (audio-visual) www.WHO.com
Other Learning Materials	<p>Journals, Scientific Magazines and Articles.</p> <ul style="list-style-type: none"> Pathology Journal – Elsevier The American Journal of Pathology Pathology Journal Online Journal in Pathology – MDLinx Diagnostic Pathology Journal

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data show, Blackboard and A/V
Other equipment (depending on the nature of the specialty)	None



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Peer Reviewer	Direct
Effectiveness of Students assessment	Examination Committee	Direct
Quality of learning resources	Students and Faculty	Indirect
The extent to which CLOs have been achieved	Examination Committee	Direct
Other	NA	NA

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	11TH
DATE	24TH MAY 2022





Course Specification

— (Bachelor)

Course Title: **Radiation Biology**

Course Code: **374227-2**

Program: **Program of Bachelor in Radiological Sciences -374000-Level 6**

Department: **Department of Radiological Sciences**

College: **College of Applied Medical Sciences**

Institution: **Taif University**

Version: **3**

Last Revision Date: **4th September 2023**



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	7
E. Learning Resources and Facilities	7
F. Assessment of Course Quality	8
G. Specification Approval	8



A. General information about the course:

1. Course Identification

1. Credit hours: (2)

2. Course type

- A. University College Department Track Others
- B. Required Elective

3. Level/year at which this course is offered: (4th Level/ 2nd year)

4. Course general 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.

5. Pre-requirements for this course (if any):

- Radiation Protection and Dosimetry (374212-2)

6. Co-requirements for this course (if any):

None

7. Course Main Objective(s):

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.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	32	100%
2	E-learning	-	-
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	-	-
4	Distance learning	-	-





3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	32
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		32

B. Course Learning Outcomes(CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with course	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	List and describe the molecular composition of the human body.	K1	Lectures	Direct Assessment: •Exasms Direct Assessment: •Exasms Direct Assessment: •Exasms
1.2	Define the direct, indirect, deterministic and stochastic radiation effects.	K1	Lectures	
1.3	Describe acute radiation syndromes, factors affecting radiation response and lethality	K3	Lectures	
2.0	Skills			
2.1	Analyze the radiation dose-response relationships.	S2	Small group discussion	Direct method: Assignments. Indirect method: Survey.
2.2	Differentiate parts, functions, and processes of the human cells division.	S2	Small group discussion	
2.3	Estimates of radiation risk in diagnostic radiology.	S2	Small group discussion	
3.0	Values, autonomy, and responsibility			
-	-	-	-	-



C. Course Content

No	List of Topics	Contact Hours
1.	Human Biology: 1) Human Radiation Response 2) Composition of the Body a) Molecular Composition	2
2.	Human Biology: 3) The Human Cell a) Cell Function b) Cell Proliferation c) Mitosis d) Meiosis Tissues and Organs	2
3.	Fundamental Principles of Radiobiology: 1) Law of Bergonie and Tribondeau 2) Physical Factors That Affect Radiosensitivity a) Linear Energy Transfer b) Relative Biologic Effectiveness c) Protraction and Fractionation 3) Biologic Factors That Affect Radiosensitivity a) Oxygen Effect b) Age c) Recovery d) Chemical Agents a. Hormesis	2
4.	Fundamental Principles of Radiobiology: 4) Radiation Dose-Response Relationships a) Linear Dose-Response Relationships b) Nonlinear Dose-Response Relationships Constructing a Dose-Response Relationship	2
5.	Molecular Radiobiology: 1) Irradiation of Macromolecules a) Main-Chain Scission b) Cross-Linking c) Point Lesions d) Macromolecular Synthesis e) Radiation Effects on DNA a. Direct and Indirect Effects	2
6.	Molecular Radiobiology: 2) Irradiation of Macromolecules f) Radiolysis of Water	2



	Direct and Indirect Effects	
7.	Cellular Radiobiology: 1) Target Theory 2) Cell-Survival Kinetics a) Single-Target, Single-Hit Model b) Multitarget, Single-Hit Model a. Recovery	2
8.	Cellular Radiobiology: 3) Cell-Cycle Effects Linear Energy Transfer, Relative Biologic Effectiveness, and Oxygen Enhancement Ratio	2
9.	Deterministic Effects of Radiation: 1) Acute Radiation Lethality a) Prodromal Period b) Latent Period c) Manifest Illness d) LD50/60 Mean Survival Time	2
10.	Deterministic Effects of Radiation: 2) Local Tissue Damage a) Effects on the Skin b) Effects on the Gonads 3) Hematologic Effects a) Hemopoietic System a. Hemopoietic Cell Survival	2
11.	Deterministic Effects of Radiation: 4) Cytogenetic Effects a) Normal Karyotype b) Single-Hit Chromosome c) Aberrations d) Multi-Hit Chromosome e) Aberrations f) Kinetics of Chromosome g) Aberration a. The Human Genome	2
12.	Stochastic Effects of Radiation: 1) Local Tissue Effects a) Skin b) Chromosomes c) Cataracts 2) Life-Span Shortening	2



13.	3) Risk Estimates a) Relative Risk b) Excess Risk c) Absolute Risk	2
14.	Stochastic Effects of Radiation: 4) Radiation-Induced Malignancy a) Leukemia Cancer	2
15.	Stochastic Effects of Radiation: 5) Total Risk of Malignancy a) Nuclear Reactor Incidents BE	2
16.	6) Radiation and Pregnancy a) Effects on Fertility b) Irradiation In Utero Genetic Effects	2
Total		32

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz	5 th	10%
2.	Midterm written exam	7 th - 8 th	30%
3.	Assignment (essay)	14 th	10%
4.	Final written exam	18 ^h - 19 th	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ol style="list-style-type: none"> 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 047197590
Supportive References	Radiologic Science for Technologists: Physics, Biology, and Protection Bushong S. 8 th Edition St. Louis, Mo: Mosby 2001. ISBN 0323013376
Electronic Materials	<ol style="list-style-type: none"> http://google.com 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. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with 30 seats.
Technology equipment (projector, smart board, software)	Black board, Projector and Smart Board.
Other equipment (depending on the nature of the specialty)	None.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders	Direct
Effectiveness of Students assessment	Students, peer review	Direct, Indirect
Quality of learning resources	Student, Faculty	Indirect
The extent to which CLOs have been achieved	Faculty	Direct
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	11 TH
DATE	24 TH MAY 2022

