# Course Syllabus

**Faculty: Faculty of Medicine and Health Sciences**
**Department: Health Sciences**
**Program: Radiologic Technology & Medical Imaging**

## I. General information about the course instructor :

| Name | Dr. Abdullah Taher | Office Hours(3 Hours Weekly ) | | | | | |
|---|---|---|---|---|---|---|---|
| Location & phone number | UST- 715989708 | Sat | Sun | Mon | Tue | Wed | Thu |
| Email | Ataher8383@yahoo.com | | | | | | |

## II. General information about the course:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | Course Title : | Radiation Protection | | | | |
| 2. | Course Code and Number : | BMI222 | | | | |
| 3. | Credit Hours : | Credit Hours | | | | Total |
| | | Theoretical | Seminar/Tutorial | Practical | Training | |
| | | 2 | 1 | | | 3 |
| 4. | Study Level and Semester: | 2nd level, 1st semester | | | | |
| 5. | Pre-requisites (if any): | Radiation Physics (2) course. | | | | |
| 6. | Co-requisites (if any): | - | | | | |
| 7. | Program in which the course is offered: | Radiologic Technology & Medical Imaging | | | | |
| 8. | Teaching Language: | English | | | | |
| 9. | Instruction location: | UST- Sana'a | | | | |

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## I. Course Description

This course provides instruction on the nature of radiation and radioactivity, the ionization hazard and risk its presents, the necessary control measures, the radiation protection application and method of compliance with relevant radiation safety legislation.

عميد الكلية:
د. عبدالله المخلافي

رئيس القسم:
د. عبدالحبيب ردمان

المراجع :
ا.د. إسماعيل الشرعبي

الموصف :
د. عبدالله طاهر

The course topics will focus on: Principles of radiation protection, Sources and types of radiation, Hazard and risk from radiation, Measuring the risk, Assessment of external and internal exposures, evaluation of doses to whole body, control of the radiation risk, medical exposures in radiology and safety, Protection against occupational exposure, Safety of radioactive waste management, Shielding and X Ray room design, Responsibilities and organization of radiation protection.

The course carried out using: lectures, self-learning, seminar, applied research, discussion, Brainstorming session, Miniature education, simulation methods, solve problems techniques, and other activities to teach this course. Evaluation via periodic oral, written presentations, reports, and final written exam.

The prerequisite of this course are radiation physics (1, 2) courses.

## II. Course Aims:

1. Provide the necessary knowledge in radiation protection and the safety of radiation sources.
2. Learn to apply various Quality control concepts related to radiation protection problems in radiology.
3. Investigate the effect of physical parameters on radiation safety.
4. Expand both theoretical and practical knowledge for student in the multidisciplinary scientific and technical bases of international recommendations and standards on radiation protection and their implementation in radiologic systems.

## III. Course Intended Learning Outcomes (CILOs) :

1. Develop understanding of the basic knowledge in radiation protection aspects used in radiology procedures.
2. Develop an awareness of the causes and consequences of situations of chronic exposure, for radiological and nuclear accidents and approaches to mitigate their consequences.
3. Interpret the relations between radiologic parameters and radiation safety using physical laws.
4. Analyze the relevant data collected during radiographic procedures to calculate X ray room Shielding.
5. Apply the radiation protection principles to medical exposures.
6. Preparation of an organizational chart and highlights of a radiation protection programme in a hospital (radiotherapy, diagnostic radiology, and nuclear medicine).
7. Prepare the literature review for reports using library and internet.
8. Manage of self time and tasks regarding doing assignments about the course materials in a team.

| عميد الكلية: | رئيس القسم: | المراجع : | الموصف : |
|---|---|---|---|
| د. عبدالله المخلافي | د. عبدالحبيب ردمان | ا.د. إسماعيل الشرعبي | د. عبدالله طاهر |

## IV. Course Contents

**Theoretical Aspect:**

| No. | Course Units | Sub-topics | No. of Weeks | Contact Hours |
|---|---|---|---|---|
| 1 | **Ch. 1 Scientific background and units in radiation protection** | - Structure of atom and nucleus.<br>- Nuclear stability.<br>- Interaction of radiation with matter.<br>- Principles of protection.<br>- Charged particle radiation.<br>- Uncharged radiation.<br>- Sources of radiation. | 2 | 4 |
| 2 | **Ch. 2 Hazard and risk from radiation** | - External and internal radiation hazards.<br>- Penetrating powers of radiation.<br>- Routes of entry into the body.<br>- Surface and air contamination.<br>- General control of the radiation risk. | 3 | 6 |
| 3 | **Ch. 3 Principles of radiation detection and measurement** | - Gas filled detectors.<br>- Ionization chambers.<br>- Scintillation detectors.<br>- Semiconductor detectors.<br>- Thermoluminescent detectors.<br>- Nuclear track detectors.<br>- Measurement techniques:<br>- Efficiency (geometric and intrinsic), background, discriminators<br>- computer analysis of spectra.<br>- Measuring the risk<br>- Choice and use of monitoring instruments.<br>- Personal monitoring<br>- Monitoring the internal risk | 3 | 6 |
| 4 | **Ch. 4 Assessment of external and internal exposures** | - Dosimetric quantities:<br>- The radiation weighting factor wR in terms of unrestricted linear energy transfer in water; equivalent dose; tissue weighting factor wT; effective dose; personal dose equivalent.<br>- Interpretation of measurements:<br>- Recording levels; evaluation of doses to whole body, extremities and skin; calculation of the effective | 2 | 4 |

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|---|---|---|---|---|
| | | dose caused by external exposure. | | |
| 5 | **Ch. 5 Medical exposures in radiology and safety** | - Diagnostic and treatment purposes.<br>- Justification of medical exposures.<br>- Optimization of protection for medical exposures<br>- Determination of a dose to the patient.<br>- Radiation protection in diagnostic and interventional radiology<br>- Protection against occupational exposure<br>- cardinal principles of radiation protection<br>- Safety of radioactive waste management.<br>- Shielding and X Ray room design<br>- Responsibilities and organization | 4 | 8 |
| **Total number of weeks and hours** | | | 14 | 28 |

| **Second: Practical/Tutorial/Clinical Aspects :** | | | |
|---|---|---|---|
| **Write up practical/tutorial/clinical topics** | | | |
| **No.** | **Practical/Tutorial/Clinical topics** | **Week due** | **Contact Hours** |
| 1 | Presentation of different types of radiation sources and explanation of their application. | 2 | 2 |
| 2 | Application of ALARA principle (as low as reasonably achievable) for occupational exposure. | 4 | 2 |
| 3 | Measurement element half-life | 6 | 2 |
| 4 | Interpretation of measurements recorded by personal dosimeter. | 8 | 2 |
| 5 | Technical Visit to nuclear medicine a department at specialized hospital. | 10 | 2 |
| 6 | Optimization of doses to patients in diagnostic radiology | 12 | 2 |
| 7 | Limitations and use of radiation protection instrumentation | 14 | 2 |
| **Total number of weeks and hours** | | **7** | **14** |

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