

## Course Syllabus of Radiobiology

Faculty: Faculty of Medicine and Health Sciences

Department: Health Sciences

Program: Bachelor in Radiologic Technology and Medical Imaging

### I. General information about the course instructor:

|                         |                     |                               |     |     |     |     |     |
|-------------------------|---------------------|-------------------------------|-----|-----|-----|-----|-----|
| Name                    | Saddam Alzofi       | Office Hours (3 Hours Weekly) |     |     |     |     |     |
| Location & phone number | UST- 775031101      | Sat                           | Sun | Mon | Tue | Wed | Thu |
| Email                   | S.alzofi @gmail.com | 1                             |     | 1   |     | 1   |     |

### II. General information about the course:

|   |  |   |                            |          |       |  |
|---|--|---|----------------------------|----------|-------|--|
| 1 | Course Title:                          | Radiobiology  |                            |          |       |  |
| 2 | Course Code and Number                 | BMI218  |                            |          |       |  |
| 3 | Credit Hours:                          | Lecture   | Seminar/Tutorial/Practical | Training | Total |  |
|   |  | 2   | -                          | -        | 2     |  |
| 4 | Study Level and Semester:              | 2 <sup>nd</sup> year/ 1 <sup>st</sup> semester        |                            |          |       |  |
| 5 | Pre-requisites:                        | BHS120  |                            |          |       |  |
| 6 | Co-requisites:                         | None  |                            |          |       |  |
| 7 | Program in which the course is offered | Bachelor in Radiologic Technology and Medical Imaging |                            |          |       |  |
| 8 | Teaching Language:                     | English   |                            |          |       |  |
| 9 | Instruction location:                  | University of Science and Technology, Sana'a, Yemen   |                            |          |       |  |

### III. Course Description:

This course is a comprehensive study of radiobiology and radiation protection measures. This course offers an introduction to different types of radiation and its sources. An explanation of radiation units and radiation detection & measurement devices including principles of operation of each device. This course also focuses in interaction of radiation with biological tissue and organs in addition to effects result from exposure to ionizing radiation. Dose limit and tissues sensitivity also will be discussed in this course. The teaching will include, lectures with seminars, collaborative learning, dialogue and discussion. The students will be evaluated through reports, quiz, assignment and written exam. Biology is a pre-requisite course.

**IV. Course objectives:** This course is aimed to:

1. Provide understanding of interaction of radiation with biological tissues and organs.
2. Explain early and late effects of radiation.
3. Identify mechanism of molecular and tissues repair and radiotherapy.
4. Mention dose limit for different tissues and organs.
5. Discuss the principles of operation for radiation detection and measuring devices.
6. Give an examples of radiation accidents.

**V. Course Intended Learning Outcomes (CILOs):**

1. Identify different type of radiation, radiation sources and radiation units.
2. Describe the issues regarding to tissues sensitivity and radiation effect.
3. Explain principles of radiation detection and measuring devices.
4. Summarize types of radiotherapy and explain mechanism of tissues repair.
5. Distinguish the alternative procedures to prevent harmful effect of ionize radiation in case of pregnancy.
6. Utilize of standard issues that contribute in reduction of patient dose and increase image quality.
7. Effectively utilize of accessories and other elements in radiology department to protect patient, improve patient care and increase image quality.

**VI. Content:**

## Topics/Units of Course Contents

## First: Theoretical Aspects

| No. | Course Topics/Units             | Sub-topics   | No. of Weeks    | Contact Hours |
|-----|---------------------------------|--|-----------------|---------------|
| 1   | <b>Introduction</b>             | Sources of radiation<br>Types of radiation<br>Radiation detection and monitoring devices | 1 <sup>st</sup> | 2             |
| 2   | <b>Radiation units</b>          | SI units<br>US units   | 2 <sup>nd</sup> | 2             |
| 3   | <b>Molecular radiobiology</b>   | Irradiation of macromolecules<br>Mechanism of DNA repair                                 | 3 <sup>rd</sup> | 2             |
| 4   | <b>Cellular Radiobiology I</b>  | Cell cycle<br>Radio-sensitivity  | 4 <sup>th</sup> | 2             |
| 5   | <b>Cellular Radiobiology II</b> | Modification of radiation injury<br>Radio-sensitizing agents<br>Radioprotective agents   | 5 <sup>th</sup> | 2             |
| 6   | <b>Mid-term exam</b>            | -  | 6 <sup>th</sup> | 2             |

|  |   |   |                                     |           |
|--|---|---|-------------------------------------|-----------|
| 7                                      | <b>Radiotherapy</b>                             | Types and developments of tumors<br>Types of radiotherapy<br>Effects of radiotherapy  | 7 <sup>th</sup>                     | 2         |
| 8                                      | <b>Tumor response to radiation</b>              | TCP<br>NTCP<br>TBI  | 8 <sup>th</sup>                     | 2         |
| 9                                      | <b>Late effects of ionizing radiation</b>       | Local tissues effects   | 9 <sup>th</sup>                     | 2         |
| 10                                     | <b>Biological effects of ionizing radiation</b> | Tissue, Organ and Systemic effects  | 10 <sup>th</sup>                    | 2         |
| 11                                     | <b>Radiation accidents I</b>                    | Types of radiation accidents<br>Scale of radiation accidents                          | 11 <sup>th</sup>                    | 2         |
| 12                                     | <b>Radiation accidents II</b>                   | Management of radiation victims<br>Nuclear waste<br>Chernobyl<br>Hiroshima & Nagasaki | 12 <sup>th</sup> , 13 <sup>th</sup> | 4         |
| 13                                     | Review  |   | 14 <sup>th</sup>                    | 2         |
| 14                                     | <b>Final exam</b>                               | -   | 15 <sup>th</sup>                    | 2         |
| <b>Total number of weeks and hours</b> |   |   | <b>15</b>                           | <b>30</b> |