In the Name of God

Hamadan University of Medical Sciences and Health Services

Educational Deputy of the University

Center for Studies and Development of Medical Sciences Education

Theory/Practical Lesson Plan Form

Dear Colleague,
As the teaching-learning process is one that cannot achieve its goals without planning, it is essential to develop a lesson plan at the beginning of the educational process (as a map and guide for instructors and students). This is considered one of the main tools for the educational activities of instructors. Therefore, we kindly ask the esteemed instructors to exercise utmost care in completing the lesson plan.

Course and Instructor Details (All fields in this section must be completed)

- **Course Title:** Medical Physics
- **Instructors' Names:** Safoura Nikzad, Vahideh Nazari
- **Course Coordinator's Name:** Vahideh Nazari
- **Department Head's Name:** Safoura Nikzad
- **Type and Credit Hours Breakdown:**
  - ✔ Theoretical: 1.86 credits
  - ✔ Practical: 0.24 credits
- **Student's Field and Degree Level:** Medicine - Professional Doctorate
- **Academic Semester:**
  - First Semester: ✔
  - Second Semester: ✔
- **Teaching Location:** Medical School Classroom

Session	Topic	Behavioral Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
1	Introduction to Ionizing Radiation and Its Sources	1. Explain the concept of ionizing radiation. 2. Name types of ionizing radiation and their sources.	Knowledge	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions

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		3. Describe types of nuclear decay.					
2	Interaction of Ionizing Radiation and Concepts	1. Compare interactions of ionizing radiation. 2. Explain radioactivity and half-life. 3. Describe differences in types of half-lives.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
3	Imaging in Nuclear Medicine and Detection Methods	1. Describe types of detection methods for ionizing radiation. 2. Name types of imaging methods in nuclear medicine. 3. Compare nuclear medicine imaging systems.	Knowledge	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
4	Basic Concepts of Radiobiology and Radiation Protection	1. Explain the concept and general goal of radiobiology. 2. Name radiation sensitizers and protectors. 3. Describe biological effects of ionizing radiation. 4. Explain the effects of ionizing radiation on embryos. 5. Describe the ALARA principle. 6. State general	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions

Session	Topic	Behavioral Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
		radiation protection laws.					
5	Fundamentals of Radiotherapy and Its Methods	1. Explain the concept of radiotherapy. 2. List types of radiation used in radiotherapy. 3. Explain the advantages and disadvantages of various radiotherapy methods.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
6	Ultrasound – Basic Principles and Physical Concepts	1. Explain the interaction of ultrasound with matter. 2. Describe the piezoelectric effect in ultrasound transducers. 3. State the biological effects of ultrasound.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
7	Types of Ultrasound Methods	1. Name types of ultrasound scanning modes. 2. Compare ultrasound scanning modes. 3. State factors affecting scan quality.	Knowledge	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
8	Types of Radiopharmaceuticals and Production Methods	1. Define radiopharmaceuticals. 2. Describe types of radiopharmaceutical production methods. 3. List advantages and	Knowledge	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions

Session	Topic	Behavioral Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
		disadvantages of various production methods. 4. Explain the application differences of radiopharmaceuticals based on physical characteristics.					
9	Introduction to Electromagnetic Radiation	1. Explain the nature of light and name types of radiation. 2. Describe the electromagnetic spectrum and features of radio waves, microwaves, and infrared light. 3. Explain the application of electromagnetic waves in physiotherapy. 4. Name the characteristics of ultraviolet light.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
10	Characteristics of Visible Light and Eye Structure	1. Explain characteristics of visible light including Snell's law, refraction law, critical angle, and total reflection. 2. Describe the concept of polarization. 3. Explain optical instruments such as mirrors, lenses, and prisms. 4. Name the structure and	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions

Session	Topic	Behavioral Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
		components of the eye.					
11	Types of Optical Aberrations of the Eye	1. Explain myopia and hyperopia and their causes. 2. Describe astigmatism and its causes. 3. Explain how to use converging, diverging, and cylindrical lenses. 4. Describe visual acuity. 5. Explain how to use the E chart.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
12	Types of Physiological Abnormalities of the Eye	1. Explain color blindness. 2. Describe geometric and optical aberrations. 3. Explain diplopia. 4. Describe the diagnosis and treatment methods for diplopia. 5. Name and explain diagnostic tools in ophthalmology.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
13	X-rays	1. Explain types of X-rays and their production. 2. Describe various parts of an X-ray tube including: cathode, anode, vacuum glass tube, transformers,	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions

Session	Topic	Behavioral Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
		half-wave and full-wave rectifiers, collimator, grid.					
14	Types of X-ray Tubes	1. Explain the structure and operation of each X-ray device: mammography, radiography, fluoroscopy, CT scan, dental radiography, radiotherapy, accelerator structure.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
15	Characteristics of X-rays and Their Interaction with Matter	1. Explain the concepts of quantity and quality of X-rays. 2. Describe the effect of kilovoltage on quality and quantity. 3. Explain the effect of milliampere-seconds on X-ray tube output. 4. Describe types of interactions of X-rays with matter including: Thomson scattering, photoelectric effect, Compton effect, pair production.	Understanding	Lecture, Q&A, Class Discussion	90 min	Slides, Film	Q&A, Short Answer Questions
16	Formation of X-ray Images	1. Explain how radiographic images are formed.	Understanding	Lecture, Q&A, Class	90 min	Slides, Film	Q&A, Short Answer

Session	Topic	Behavioral Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
		2. Describe factors affecting image quality based on types of physical interactions of X-rays and tissues. 3. Explain the effect of contrast agents in enhancing image contrast based on interaction of radiation with tissues.		Discussion			Questions

Practical Sessions

Session	Topic	Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
1	Nuclear Experiment	Demonstrate the half-life of a gas (Thoron) with a graph.	Analysis	Demonstration	4 hours	-	Q&A, Short Answer Questions
2	Glasses Experiment	Differentiate between spherical and cylindrical lenses, demonstrate how to identify convex and	Understanding, Application	Demonstration	4 hours	Tools for observation	Q&A, Short Answer Questions

Session	Topic	Objectives	Learning Domain	Teaching Method	Duration	Teaching Aids	Evaluation Method
		concave lenses, and show the function of a prism and Maddox rod in strabismus diagnosis.					

Grading Scheme

Type of Evaluation	Assessment Tool	Weight (out of 100)
Quiz	-	-
Project Presentation	-	-
Midterm Exam	-	-
Final Exam (Theory)	Multiple Choice Questions on Theoretical Topics	80
Final Exam (Practical)	Multiple Choice Questions on Practical Topics	10
Other Factors	(Professional behavior, participation in class discussions, etc.)	10
Total		**100**

Resources for Medical Physics Course

1. **Textbooks:**
    - **Medical Physics for Medical and Dental Students**
      By Dr. Mohammad Aghabian
    - **Medical Physics**
      By Dr. Abbas Takavar
2. **Educational Materials:**

- **Educational Films**
  (Related to Medical Physics)

3. **Recent Articles:**

   - Up-to-date articles on current topics in Medical Physics.