TEACHING INSTRUCTIONAL DESIGN (BRP)

COURSE

INTERNSHIP IN MEDICAL PHYSICS AND BIOPHYSICS

by

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PREFACE

The Teaching Instructional Design (BRP)

This Teaching Instructional Design (BRP) was prepared as a guide for activities of Internship in Medical Physics and Biophysics intended for 7th semester medical physics and biophysics elective physics students who have received the Introduction to Radiology Physics and Radiobiology course. On the next semester, students are expected to start researching for their undergraduate thesis.

The internship's objective is to provide work experience for students to learn about actual radiotherapy and radiology activities at hospitals. The internship is normally held on some hospitals in Jakarta such as Dharmais Cancer Hospital, Persahabatan Central General Hospital, Pasar Mingu Regional General Hospital, Husada Hospital, MRCCC Siloam Hospital, and Cipto Mangunkusumo Central General Hospital. The learning method is designed such that students are not only able to work independently but can also work in groups to understand the material comprehensively and integrally.

It is hoped that this book can provide guideline in the learning process so that all the targets expected by lecturers and students can be achieved.

Depok, August 2016

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I. General Information

1.	Name of Program / Study Level	:	Physics / Undergraduate
2.	Course Name	:	Internship in Medical Physics and Biophysics
3.	Course Code	:	SCFI604941
4.	Semester	:	7
5.	Credit(s)	:	2 Credits
6.	Teaching Methods(s)	:	Collaborative learning
7.	Prerequisite Course(s)	:	Introduction to Radiology Physics, Radiobiology
8.	Requisite Course(s)	:	None
9.	Integration Between Other Courses	:	Undergraduate Thesis
10.	Lecturer(s)	:	Dr. rer. nat. Musaddiq Musbach
11.	Course Description	:	Clinical orientation, introduction to radiology equipment, introduction to radiotherapy equipment, introduction to radiology and radiotherapy dosimetry, quality assurance of diagnostic radiology and radiotherapy equipment, radiotherapy treatment planning

II. Course Learning Outcome (CLO) and Sub-CLOs

A. CLO

Students get to know some important facilities in hospitals such as radiotherapy, radiology diagnostic, and nuclear medicine facilities.

B. Sub-CLOs

1. Learn about patient immobilization equipment.
2. Make patient immobilization equipment for conventional radiotherapy treatment.
3. Learn about the components of simulator machine and its auxiliary equipment.
4. Learn about how simulator machine works.
5. Learn how to use simulator machine on patient.
6. Perform quality control on a simulator machine.
7. Evaluate simulator machine shielding requirement.
8. Learn about the components and database of a treatment planning system.
9. Learn about how treatment planning system works.
10. Learn about examples of treatment planning for various patient cases.
11. Make a treatment planning for a specific case.
12. Learn about treatment planning evaluation.
13. Learn about different types of LINAC machine.
14. Learn about the components of a LINAC machine.
15. Learn about how LINAC machine works.
16. Learn about the application of LINAC machine for various patient cases.
17. Perform dosimetry calculation for LINAC machine.
18. Perform quality control on a LINAC machine.
19. Learn about radiation protection for LINAC machine.
20. Evaluate LINAC machine shielding requirement.
21. Learn about the components of teletherapy machine.
22. Learn about how teletherapy machine works.
23. Learn about the application of teletherapy machine for various patient cases.
24. Perform dosimetry calculation for teletherapy machine.
25. Perform quality control for teletherapy machine.
26. Learn about radiation protection for teletherapy machine.
27. Evaluate teletherapy machine shielding protection requirement.

28. Learn about components of brachytherapy machine and its auxiliary equipment.
29. Learn about how brachytherapy machine works.
30. Learn about the application of brachytherapy machine on various patient cases.
31. Perform dosimetry calculation for brachytherapy machine.
32. Perform quality control of brachytherapy machine.
33. Learn about radiation protection for brachytherapy.
34. Evaluate brachytherapy machine shielding requirement.
35. Learn about different types of radiography machine.
36. Learn about components of radiography machine.
37. Learn about how radiography machine works.
38. Learn about the application of radiography machine on various patient cases.
39. Perform dosimetry calculation for radiography machine.
40. Learn about dose and image quality optimization for radiography machine.
41. Perform quality control on radiography machine.
42. Learn about radiation protection for radiography machine.
43. Evaluate radiography machine shielding requirement.
44. Learn about different types of fluoroscopy machine.
45. Learn about components of fluoroscopy machine.
46. Learn about how fluoroscopy machine works.
47. Learn about the application of fluoroscopy machine on various patient cases.
48. Perform dosimetry calculation for fluoroscopy machine.
49. Learn about dose and image quality optimization for fluoroscopy machine.
50. Perform quality control on fluoroscopy machine.
51. Learn about radiation protection for fluoroscopy machine.
52. Evaluate fluoroscopy machine shielding requirement.
53. Learn about components of mammography machine.
54. Learn about how mammography machine works.
55. Learn about the application of mammography machine on various patient cases.
56. Perform dosimetry calculation for mammography machine.
57. Learn about dose and image quality optimization for fluoroscopy machine.
58. Perform quality control on mammography machine.
59. Learn about radiation protection for mammography machine.
60. Evaluate mammography machine shielding requirement.
61. Learn about various types of dental radiography machine.

62. Learn about the components of dental radiography machine.
63. Learn about how the dental radiography machine.
64. Learn about the application of dental radiography in various patient examination.
65. Perform dosimetry calculations for dental radiography machine.
66. Learn about dose and image quality optimization for dental radiography examination.
67. Performing quality control on dental radiography machine.
68. Learn about radiation protection for dental radiography.
69. Evaluate dental radiography machine shielding requirement.
70. Learn about the different types of CT machine.
71. Learn about components of CT machine.
72. Learn about how CT machine works.
73. Learn about the application of CT machine in various patient examinations.
74. Perform dosimetry calculations on the CT.
75. Learn about dose and image quality optimization for CT examination.
76. Performing quality control for CT machine.
77. Learn about radiation protection for CT machine.
78. Evaluate CT radiation shielding requirement.
79. Learn about components of MRI machine and its auxiliary equipment.
80. Learn how the MRI machine works
81. Learn about the application of MRI machine on various patient examinations.
82. Learn about image quality optimization on MRI examination.
83. Perform quality control machine MRI.
84. Learn about MRI room design.
85. Learn about the components of the ultrasound machine (types of transducers, imaging modes, image and display acquisition systems, and their supporting equipment)
86. Learn how the USG machine works
87. Learn about the application of ultrasound machine in various patient examinations
88. Learn about image quality optimization on ultrasound machine
89. Perform quality control on the USG machine.
90. Learn about the types and methods of production of radiopharmaceuticals used in nuclear medicine applications.
91. Learn about the preparation of nuclear medicine examinations in patients
92. Learn about gamma camera machine components (collimator types, detector systems, image and display acquisition systems, and their supporting equipment)

93. Learn how the gamma camera machine works
94. Learn about the gamma camera application in various patient examinations and their handling after the examination
95. Perform dosimetry calculations on the gamma camera application
96. Learn about image quality optimization on gamma camera inspection
97. Perform quality control on gamma camera machine.
98. Learn about radiation protection in the gamma camera application
99. Evaluating the adequacy of the gamma camera chamber shielding
100. Learn about SPECT machine components (collimator types, detector systems, image and display acquisition systems, and their supporting equipment).
101. Learn how the SPECT machine works
102. Learn about the SPECT application in various patient examinations and their handling after the examination.
103. Perform dosimetry calculations on the SPECT application
104. Learn about image quality optimization on the SPECT examination
105. Perform quality control on SPECT machine.
106. Learn about radiation protection in SPECT applications
107. Evaluating the adequacy of SPECT room shielding
108. Learn about PET machine components (collimator types, detector systems, image acquisition and display systems, and their supporting equipment)
109. Learn how PET machine work
110. Learn about the application of PET in various patient examinations and their handling after examination
111. Perform dosimetry calculations on PET applications
112. Learn about image quality optimization on PET inspection
113. Perform quality control on PET machine
114. Learn about radiation protection in PET applications
115. Evaluate the adequacy of PET chamber shielding
116. Learn how the hybrid system works
117. Perform quality control for machine using the hybrid system.

III. Teaching Plan

Week	Sub-CLO	Study Materials	Teaching Method	Time Required	Learning Experiences (*O-E-F)	Sub-CLO Weight on Course (%)	Sub-CLO Achievement Indicator	References
1	1-34	• Radiotherapy	Internship	• 6 x 6 hours	20% O, 60% E, 20% F	4	Able to explain mold room, simulator, TPS, LINAC, Co-60, Brachytherapy, x-ray film	[1]
2	35-90	• Radiology Diagnostic	Internship	• 6 x 6 hours	10% O, 70% E, 20% F	4	Able to explain fluoroscopy, mammography, dental x-ray, CT, MRI, and USG	[2]
3	91-117	• Nuclear Medicine	Internship	• 6 x 6 hours	10% O, 70% E, 20% F	4	Able to explain radiopharmacy lab and patient preparation, gamma camera, SPECT, PET, and Hybrid	[3]

*) O : Orientation
E : Exercise
F : Feedback

References:

1. IAEA Training Course Series No 37, Clinical Training of Medical Physicist Specializing in Radiation Oncology, Vienna, 2009
2. IAEA Training Course Series No 47, Clinical Training of Medical Physicist specializing in Diagnostic Radiology, Vienna, 2009
3. IAEA Training Course Series No 50, Clinical Training of Medical Physicist specializing in Nuclear Medicine, Vienna, 2009

IV. Assignment Design

Week	Assignment Name	Sub-CLOs	Assignment	Scope	Working Procedure	Deadline	Outcome
1-5	Individual Assignment 1	1-34	Problem sets	• Radiotherapy	Homework	5 x 100 menit	Written report
1-5	Group Assignment 1	1-34	Problem sets	• Radiotherapy	Group Assignment	5 x 100 minutes	Written report
6-10	Individual Assignment 2	35-90	Problem sets	• Radiology Diagnostic	Homework	5 x 100 minutes	Written report
6-10	Group Assignment 2	35-90	Problem sets	• Radiology Diagnostic	Group Assignment	5 x 100 minutes	Written report
11-14	Individual Assignment 3	91-117	Problem sets	• Nuclear Medicine	Homework	4 x 100 minutes	Written report
11-14	Group Assignment 3	91-117	Problem sets	• Nuclear Medicine	Group Assignment	4 x 100 minutes	Written report

V. Assessment Criteria (Learning Outcome Evaluation)

Evaluation Type	Sub-CLOs	Assessment Type	Frequency	Evaluation Weight (%)
Pretest & Quiz	1-117	Answer sheet	14	20
Performance	1-117	Attendance list and activities report	14	20
Laboratory Report	1-117	Module and Lab Report	14	30
Presentation	1-117	Presentation	1	30
Total				**100**

VI. Rubric(s)

A. Criteria of Individual Assignment

Score	Answer Quality
>90	Student able to answer 90% of the problem sets correctly
70-89	Student able to answer 70-89% of the problem sets correctly
60-69	Student able to answer 60-69% of the problem sets correctly
55-59	Student able to answer 55-59% of the problem sets correctly
50-54	Student able to answer 50-54% of the problem sets correctly
<50	Students able to answer <50% of the problem sets correctly

B. Criteria of Group Assignment

Score	Answer Quality
90-100	Students are able to apply basic concepts in explaining natural phenomena and technology with an accuracy of 80-90%, have a clear order, and appropriate wording.
70-89	Students are able to apply basic concepts in explaining natural phenomena and technology with an accuracy of 60-79% accuracy with appropriate wording.
60-69	Students are able to apply basic concepts in explaining natural phenomena and technology with an accuracy of 59% or less with appropriate wording.

C. Criteria of Presentation

Score	Answer Quality
90-100	Students are able to present their topic with correct language structure, easy to understand explanation, understand their topic well, and have good body language.
70-89	Students are able to present their topic with easy to understand explanation, understand their topic well, and have good body language.
60-69	Students are able to present their topic with easy to understand explanation and have good body language