TEACHING INSTRUCTIONAL DESIGN (BRP)

COURSE

ADVANCED BIOPHYSICS

by

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PREFACE

The Teaching Instructional Design (BRP) of the Advanced Biophysics course was prepared to be used as a guideline for Advanced Biophysics course in the Physics Undergraduate Study Program of the Faculty of Mathematics and Natural Sciences Universitas Indonesia, which was attended by 7th semester medical physics and biophysics elective physics students that had taken the Introduction to Biophysics course. In this course, students will be taught about the application of physics concepts of electricity, magnetism, and optics on biological system and human body for development of medical instrument device and biosensor. It is hoped that this guideline can become helpful in the learning process for both lecturers and student so that the material is conveyed properly and perfectly.

Depok, 25 November 2016

Dra. Nurlely, Ph.D.

I. General Information

1.	Name of Program / Study Level	:	Physics / Undergraduate
2.	Course Name	:	Advanced Biophysics
3.	Course Code	:	SCFI604918
4.	Semester	:	7
5.	Credit(s)	:	2 Credits
6.	Teaching Methods(s)	:	Interactive learning, self-directed study, individual assignment, and exams
7.	Prerequisite Course(s)	:	Introduction to Biophysics
8.	Requisite Course(s)	:	None
9.	Integration Between Other Courses	:	None
10.	Lecturer(s)	:	Dra. Nurlely, Ph.D.
11.	Course Description	:	After completing this course, 7th semester medical physics and biophysics elective physics student will be able to apply physics concepts of electricity, magnetism, and optics on biological system and human body for development of medical instrument device and biosensor. This course will be taught in Indonesian.

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

A. CLO

Students are able to apply physics concepts of electricity, magnetism, and optics on biological system and human body for development of medical instrument device and biosensor (ELO(s) 3, 5, 6, 8).

B. Sub-CLOs

1. Able to apply electricity and magnetism concepts as well as biophysics in the physiology of human body.
2. Able to apply principles of electric and magnetic interaction in human tissue.
3. Able to explain the basic principle of optics on biomedical device and biosensor
4. Able to apply principles of biomedical optics and biosensor for biology imaging.

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	**Introduction to course**							
2	1	• Propagation of electric and magnetic field in tissue	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the basic concepts of electricity and magnetism in biological system	[1]
3	1	• Physiology and biophysics phenomena	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to describe physiology and biophysics phenomena	[1]
4	1	• Biophysics of neuron and brain cell	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to describe biophysics phenomena in brain	[1]
5	2	• Principle of bioelectromagnetic	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the basic principle of bioelectromagnetic	[2]
6	3	• Application of medical imaging	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the application of bioelectromagnetic imaging	[2]
7	2	• Application of biophysical stimulation therapy	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the application of bioelectromagnetic for stimulation therapy	[2]
8	**Mid-Term Exam**							

9	4	• Basic principle of biomedical optics	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the basic principle of biomedical optics	[3]
10	4	• Continuation of biomedical optics principle	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the basic principle of biomedical optics	[3]
11	3	• Biosensor principle	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the basic principle of biosensor	[3]
12	4	• Application of biosensor	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to apply the basic principle of biosensor	[3]
13	1-4	• Biophotonic	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the methods and principle of biophotonic	[4]
14	1-4	• Principle of Optical Coherence Tomography (OCT)	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the principle of OCT	[4]
15	1-4	• Application of Optical Coherence Tomography (OCT)	Interactive learning, self-directed study	100 minutes	20% O, 60% E, 20% F	7.69	Able to explain the methods and basic principle of OCT for biosensor	[5]
16	**Final Exam**							

*) O : Orientation
E : Exercise
F : Feedback

References:

1. Robert O. Becker. The Body Electric: Elektromagnetism and the foundation of life. Wiliam Morrow, 1995
2. Jaakko malmivuo. Bioelctromagnetism: Principle and Applications of Bioelectric and Biomagnetic Fields.Oxford University Press, 1995
3. Wang, LV and Wu HI, Biomedical Optics, Principles and Imaging, (Wiley-VCH), 2007
4. Prasad, P.N., “Introduction to Biophotonics”, (Wiley-VCH), 2003
5. Popp,Tuchin, Chiou, Heinemann (Editors)Handbook of Biophotonics, 3 Volume Set, (Wiley-VCH), 2012
6. Leahy, M.J. editor, Microcirculation Imaging, (Wiley-VCH), 2012.

IV. Assignment Design

Week	Assignment Name	Sub-CLOs	Assignment	Scope	Working Procedure	Deadline	Outcome
2-7, 9-15	Individual Assignment 1-13	1-4	Homework	• All study materials	At home	1 week	Answer sheet
8	Mid-Term Exam	1-2	Problem sets	• Propagation of electric and magnetic field in tissue • Physiology and Biophysics phenomena • Biophysics of neuron and brain cell • Principle of bioelectromagnetic • Application of medical imaging • Application of biophysical stimulation therapy	Exam	100 minutes	Answer sheet
16	Final Exam	3-4	Problem sets	• Basic principle of biomedical optics • Continuation of biomedical optics principle • Biosensor principle • Application of biosensor • Biophotonic • Principle of Optical Coherence Tomography (OCT) • Application of Optical Coherence Tomography (OCT)	Exam	100 minutes	Answer sheet

V. Assessment Criteria (Learning Outcome Evaluation)

Evaluation Type	Sub-CLOs	Assessment Type	Frequency	Evaluation Weight (%)
Individual Assignment	1-4	Answer sheet	1 each week	40
Mid-Term Exam	1-2	Answer sheet	1	30
Final Exam	2-4	Answer sheet	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 Mid-Term Exam and Final Exam

1) Able to write down their ideas and use it to solve a problem (25%);

2) Able to use the correct concept in solving the problem (35%);

3) Able to formulate the final result correctly (30%);

4) Able to use the appropriate dimension, units, and significant figures (10%);