

Course Description

College/Faculty	Biomedical	Engineerin	ıg	Department -				
Curriculum	Biomedical	Engineerin	g Program					
		S	ection 1 Ge	neral Informatio	n			
РНҮ 139		Biomed	lical Engineer	ing Physics 2			3	(2-3-6)
Co-requisite Course	(s)	-						
Prerequisite Course(s)	-						
Semester		2/2024						
Section		01, 02,	03, 11, 12, 13					
Categorization of Co	ourse	Prepara	tion Course					
	Ľ	General	Education Co	ourses				
		Specific	e Requirement	t Courses				
	Ľ	Free Ele	ective Courses	5				
Responsible		Assoc.P	Prof.Preya Anı	apongongarch		Instructor		
Instructor		Assoc.F AsstPi Assoc.F	Prof. Nuntacha rof. Sani Buny Prof.Sueiit Pec	ui Thongpance yakul shprasarn		Instructor		Guest Instructor
Place						On Campus		Off Cumpas
Date of preparation		25 Dece	ember 2024					

Section 2 Course objectives and course components

1. Objective of Course

This course is designed for Biomedical Engineering students. The objectives of this course are as following:

To train student to understand the concept of Physics of electrostatics and electrodynamics; bioelectrics; physics of electromagnetism; electrical machines; physics of electrodes and transducers; physics of waves; physics of sound; electromagnetic waves and Maxwell's equations of electromagnetism; optics and biomedical optical instrumentation; physics of eye and vision; computer based optical system simulation. The student can use the knowledge to apply in related fields.

2. Course Description

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Physics of electrostatics and electrodynamics; bioelectrics; physics of electromagnetism; electrical machines; physics of electrodes and transducers; physics of waves; physics of sound; electromagnetic waves and Maxwell's equations of electromagnetism; optics and biomedical optical instrumentation; physics of eye and vision; computer based optical system simulation

3. Number of hours per week for advising and academic counseling for individual students

5hours/week	e-mail : preya.a@rsu.ac.th
	Facebook :
	Line : Ipompomanu
	อื่น ระบุ

4. Course Learning Outcomes: CLOs

1) Student understand the concept of Physics of electrostatics and electrodynamics; bioelectrics; physics of electromagnetism; electrical machines; physics of waves; physics of sound.

2) Student understand the concept of Physics of physics of electrodes and transducers; electromagnetic waves and Maxwell's equations of electromagnetism; optics and biomedical optical instrumentation; physics of eye and vision; computer based optical system simulation.

3) The student can use the knowledge to apply in related fields.

Section 3 Learning Outcomes

Development of the standard learning outcomes in the following:

1. Morals and Ethics

	Expected Outcomes	Methodology	Assessment
1.2	The students need to have self-	□ Teaching indirectly about discipline and	Observing student
	disciplinary, punctuality and	punctuality in classroom.	behavior and manner
	responsibility for ourselves and	Applying classroom policy.	in class.
	society.		Checking completed
			assignment
			submission.

2. Knowledge

	Expected Outcomes	Methodology	Assessment
2.1	The students will be able to	Lecture by using problem based learning	Evaluate quizzes
	understand basic mathematics,	Demonstrate the physics phenomena	assignment and
	basic principles of physics2.	Assign additional reading	activities in class.
		Assign interesting problems	Midterm and Final
			examination

3. Cognitive Skills

\bullet	Expected Outcomes	Methodology	Assessment
3.4	The students will be able to	Lecture with applications.	Midterm and Final
	apply the basic principles of	Discuss on basic engineering problems	examination
	physics to analyze engineering	or case studies.	Evaluating homework
	problems accurately and		and assignments
	appropriately.		

4. Transaction Skills and Responsibility

	Expected Outcomes	Methodology	Assessment
4.1	The students have self-	Analyze problems, understand and apply	Observing attendance
	responsibility towards others	knowledge, skills and use appropriate	and participation in
	and society	tools for problem solving	class.
			Evaluating the
			student's assignments.

	Expected Outcomes	Methodology	Assessment
5.3	The students will be able to have	Self-study on biomedical	Evaluating the
	analytic skills and interpretative skills	engineering problems from	student's assignments.
	of numerical data that relate with	website.	
	laboratory physics2 subject correctly.	Assign case study to the students.	

5. Numerical Analysis, Communication and Information Technology Skills

Section 4 Teaching Plan and Assessment

1. Course Planning

Week	Topics/Description	Activity and Media	Hours	Instructor
1	Introduce course and explain overall in this	Introduce course and explain overall	5	Assoc.Prof.Nuntachai
(6-10/01/25)	subject	in this subject		Thongpance,
	Chapter 1 Physics of Electrostatics	Chapter 1 Physics of Electrostatics		Asst.Prof.Sani
	1.1 Charge	1.1 Charge		Bunyakul
	1.2 Coulomb's Law and Electric Force	1.2 Coulomb's Law and Electric		
	1.3 Electric Field	Force		
	1.4 Electric Flux	1.3 Electric Field		
		1.4 Electric Flux		
2	1.6 Motion of charge in constant electric field	Lab1. Using a multimeter to measure	5	Assoc.Prof.Nuntachai
(13-17 Jan 25)	1.7 Potential energy and Electric Potential	electrical quantities		Thongpance,
	1.8 Capacitance, Capacitor			Asst.Prof.Sani
				Bunyakul
3	Chapter 2 Physics of Electric Current	Lab2. Electric potential measurement	5	Assoc.Prof.Nuntachai
(20-24 Jan 25)	2.1 Electric Current			Thongpance,
	2.2 Resistor, Resistance, Electrical Energy &			Asst.Prof.Sani
	Power Ohm's Law and DC Circuit Analysis			Bunyakul
4	2.3 Charge and discharge in RC Circuit	Lab3.Properties of DC Circuits	5	Assoc.Prof.Nuntachai
(27 Jan-31 Jan 25)	2.4 Alternating Current			Thongpance,
	2.5 R, C, L in AC circuit, rms			Asst.Prof.Sani
	2.6 RLC Circuit			Bunyakul
	2.7 Average Power			
	2.8 Resonance in RLC Circuit			
5	Chapter 3 Physics of Electromagnetics	Lab4.Direct Current RC Circuit	5	Assoc.Prof.Nuntachai
(3-7 Feb 25)	3.1 Magnetic Field			Thongpance,
	3.2 Magnetic force happens by moving charge in			Asst.Prof.Sani

Week	Topics/Description	Activity and Media	Hours	Instructor
	magnetic field.			Bunyakul
	3.3 Magnetic force happens by flowing current in			
	wire.			
	3.4 Magnetic force happens by flowing current in			
	two parallel wires.			
6	3.5 Induced EMF	Lab5. Construction of A-V- Ω -Meter	5	Assoc.Prof.Nuntachai
(10-14 Feb 25)	3.6 Faraday's Law and Lenz's Law			Thongpance,
	3.7 Self - Inductance			Asst.Prof.Sani
	3.8 Electrical Machine			Bunyakul
	Dynamo and Motor			
7	Chapter 4 Alternating Current	Lab6. Using Oscilloscope	5	Assoc.Prof.Nuntachai
(17-21 Feb 25)	4.1 R, C, L in AC circuit, rms			Thongpance,
	4.2 RLC Circuit			Asst.Prof.Sani
	Series			Bunyakul
	Parallel RLC Circuit			
	4.3 Average Power			
	4.4 Resonance in RLC Circuit			
8		Midterm (Term Break)		
(2-28Feb 25)		[[
9	Chapter 7 Physics of Electrode Transducer and	Lab7.Properties of AC Circuits	5	Assoc.Prof.Nuntachai
(3-7 Mar 25)	Bioelectricity			Thongpance,
	7.1 Electrode			Asst.Prof.Sani
	7.2 Electrical Potentials of Nerves			Bunyakul
	7.3 Electro Cardiogram (ECG), Electromyogram			
	(EMG), Electroencephalogram (EEG),			
	Electoretinogram (ERG), Electrooclogram (EOG)			
10	7.4 Transducer	Lab8. Testing the properties of diodes	5	Assoc.Prof.Nuntachai
(10-14 Mar 25)	7.5 Types of Transducer	and rectifier circuits.		Thongpance,
				Asst.Prof.Sani
				Bunyakul
11	Chapter 5 Wave Sound	Lab9. Electrical safety testing of	5	Assoc.Prof.Nuntachai
(17-21 Mar 25)	5.1 Speed of wave	medical equipment		Thongpance,
	5.2 Properties of Waves	Project: PBL		Asst.Prof.Sani
	5.3 Wave Function			Bunyakul

Week	Topics/Description	Activity and Media	Hours	Instructor
12	5.4 Superposition and Standing Wave	5.4 Superposition and Standing Wave	5	Assoc.Prof.Nuntachai
(24-28 Mar 25)				Thongpance,
				Asst.Prof.Sani
				Bunyakul
13	Chapter 6 Sound	Chapter 6 Sound	5	Assoc.Prof.Nuntachai
(31Mar -4Apr 25)	6.1 Speed of sound	6.1 Speed of sound		Thongpance,
	6.2 Intensity and Intensity Level	6.2 Intensity and Intensity Level		Asst.Prof.Sani
	6.3 Doppler Effect	6.3 Doppler Effect		Bunyakul
	6.4 Application in Biomedical Engineering	6.4 Application in Biomedical		
		Engineering		
14	Chapter 8 Electromagnetic waves and Optics	Chapter 8 Electromagnetic waves	5	Assoc.Prof.Nuntachai
(8-10,17Apr 25)	8.1 Electromagnetic waves	and Optics		Thongpance,
	and Maxwell's Equation	8.1 Electromagnetic waves		Asst.Prof.Sani
		and Maxwell's Equation		Bunyakul
15	8.2 Properties of light	8.2 Properties of light	5	Assoc.Prof.Nuntachai
(17,25 Apr 25)	8.2.1 Law of Reflection	8.2.1 Law of Reflection		Thongpance,
	8.2.2 Law of Refraction	8.2.2 Law of Refraction		Asst.Prof.Sani
	8.2.3 Interference	8.2.3 Interference		Bunyakul
	8.2.4 Diffraction	8.2.4 Diffraction		
	8.2.5 Polarization	8.2.5 Polarization		
16	Chapter 9 Physics of eyes and Vision	Chapter 9 Physics of eyes and Vision	5	Assoc.Prof.Nuntachai
(17,25 Apr 25)	Physics principles of visual equipment/old	Physics principles of visual		Thongpance,
	age/new age/	equipment/old age/new age/		Asst.Prof.Sani
	visual system simulation	visual system simulation		Bunyakul
17	FINAL Examination			
(27 April 25)				
	Total		75	

2. Assessment Planning

Learning Outcomes	Evaluation Method	Week of Assessment	Portion of Assessment
2124	Midterm Exam	9	30%
2.1, 3.4	Final Exam	17	20%
1.2, 4.1, 5.3	Class Attendance and Quiz + Homework	Whole Semester	20%
1.2, 2.1, 3.4,	1. Experimental Report	Whole semester	10 %
4.1, 5.3	2.Assigment Project	Whole semester	10%
	3. Exam	17	10%

Section 5 Learning and Teaching Resources

- 1. Required Textbook
 - Preya Anupongongarch, Physics 2 & General Physics 2, Department of Physics , Faculty of Science , Rangsit University
 - Nuntachai Thongpance. Teaching materials for Physics 2 for Biomedical Engineering, Biomedical Engineering College, rangsit University. 2025
 - □ Raymond A. Serway, John W. Jewett, Jr., Physics for scientists and engineers with modern physics ,10th edition, Thomson/Brooks/Cole, 2018.
 - John D. Cutnell, Kenneth W. Johnson, Physics, 11th edition, Wiley, 2018.

- 1. Supplementary Text
 - \Box Youtube relate with topics in physics 2.

Section 6 Assessment and Improvement of Course Operation

1. Course assessment strategies by students

The effective assessment of this course is designed by students as following:

- 1.1 Groups discussion between teacher and students
- 1.2 Observation student behavior
- 1.3 Class evaluation/peer evaluation

2. 2. Teaching assessment strategies

In collecting data for teaching assessment have the process as following:

- 2.1 To collect from midterm and final examination and analyze data to plan for improvement teaching
- 2.2 To verify the result of learning assessment.

3. Teaching Development

Changes made in accordance with the previous evaluation are the teaching development by brainstorming activities to find the teaching solution as following:

3.1 Teaching and learning seminars.

4. Verification of the Achievement of Students

Discuss with students
Investigate from student behaviors
Grading and evaluation of learning outcome
Comprehensive knowledge examination
Learning outcome report
Class evaluation / peer evaluation

5. Review and Planning for Improvement Subject Course

From the assessment and the verification of achievement of subject course, the teaching process and course description are improved in every semester for higher quality or follow by suggestion and verification results of the achievement by an internal quality assurance committee in topics 4.