	Universitas Negeri Surabaya Faculty of Engineering, Electrical Engineering Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Opto-electronics*	2020102365	Compulsory Study Program Subjects	T=0	P=0	ECTS=0	7	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	Program Objectives (PO)	
	PO - 1	Able to describe the nature of light and its uses
	PO - 2	Able to describe the working principles and applications of light modulation
	PO - 3	Able to describe the working principles and applications of Display Devices
	PO - 4	Able to describe the principles of laser generation and application
	PO - 5	Able to describe the working principles and applications of Photodetector
	PO - 6	Able to describe the principles and applications of optical fiber
	PO - 7	Able to describe the working principles and applications of integrated optics
	PO - 8	Able to carry out analysis and design of optical communication systems
	PO - 9	Able to describe OptoElectronics and Laser Technology system designs for problem solving
	PLO-PO Matrix	

P.O
PO-1
PO-2
PO-3
PO-4
PO-5
PO-6
PO-7
PO-8
PO-9

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																
PO-4																
PO-5																
PO-6																
PO-7																
PO-8																
PO-9																

Short Course Description	Optoelectronics is a branch of science that studies electronic devices related to light and is also considered a sub-field of photonics. In this context, the light studied also includes all the spectrum of light in electromagnetic waves (electromagnetic spectrum) such as gamma rays, alpha rays, X-rays, ultraviolet and infrared, which are forms of invisible radiation other than the light visible to the normal human eye (visible spectrum) as well as laser light. In this branch of science, the advantages found in combining the fields of optics and electronics are the ability to produce much better and more useful equipment, especially those related to fiber optic telecommunications technology itself.
References	**Main :** 1. Steven Ashley, 1CMaking Light of Silicon 1D dalam Scientific American August 2005 2. S.O. Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.
	Supporters: 1. Juanjun Gao, 1C Optoelectronic integrated circuit design and devais modeling, 1D East China Normal University, Shanghai, China, 2011.
Supporting lecturer	Dr. Nurhayati, S.T., M.T. Parama Diptya Widayaka, S.ST., M.T. Sayyidul Aulia Alamsyah, S.T., M.T.

Week-	**Final abilities of each learning stage (Sub-PO)**	**Evaluation**		**Help Learning, Learning methods, Student Assignments, [Estimated time]**		**Learning materials [References]**	**Assessment Weight (%)**
		Indicator	**Criteria & Form**	**Offline (*offline*)**	**Online (*online*)**		
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1	Mastering the concepts and principles of the properties of light to understand its uses	Be able to describe the nature of light polarization	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Polarization, interference, diffraction **Reader:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	2%
2	Mastering the concepts and principles of the properties of light to understand its uses	1.Able to describe the nature of interference and diffraction of light 2.Able to describe the spectrum of light and monochromator	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** light spectrum, monochromator **Reader:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	2%

3	Master the concepts and principles of light modulation to understand its use	1. Able to describe the Electro-Optic Effect 2. Able to describe the Magneto-Optic Effect	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Electro-Optic Effect, Magneto-Optic Effect, **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	2%
4	Master the concepts and principles of light modulation to understand its use	1. Able to describe the Acousto-Optic Effect 2. Able to describe the application of light modulation	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities, Tests	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Electro-Optic Effect, Magneto-Optic Effect, Acousto-Optic Effect. **References:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	2%
5	Master the concepts and principles of Display Devices to describe the superiority of the technology	1. Be able to describe the working principle of a Light Emitting Diode 2. Able to describe the working principle of a Plasma Display	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities, Tests	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Light Emitting Diode, Plasma Display, Liquid Crystal Display **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	2%
6	Master the concepts and principles of Display Devices to describe the superiority of the technology	1. Able to describe the working principle of a Liquid Crystal Display 2. Able to describe Display Device applications	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities, Tests	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Light Emitting Diode, Plasma Display, Liquid Crystal Display **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	2%
7	Master the concepts and principles of laser generation to describe its use in various application fields	1. Able to describe laser generation 2. Able to describe the working principle of Doped Insulator Laser 3. Able to describe the working principle of Q-switching 4. Able to describe Laser applications	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities, Tests	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Doped Insulator Laser, Semiconductor Laser, Gas Laser, Molecular Laser, Liquid Dye Laser, Q-switching technique **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	5%
8	UTS	Evaluation Rubric	**Criteria:** Each question item has an assessment weight adjusted to the student's ability to answer **Form of Assessment** : Participatory Activities, Tests	Midterm Exam 2 x 50		**Material:** Meeting material 1 **Bibliography:** *Steven Ashley, 1CMaking Light of Silicon 1D in Scientific American August 2005*	20%

9	Master the concepts and principles of Photodetector to describe its application‘	1.Be able to describe the working principle of the Photodetector 2.Able to describe the working principle of the CMOS Image Sensor	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Photocathode, UVTRON, Photomultiplier, Photoconductive, Photodiode, Photovoltaic, CMOS Image Sensor, Phototransistor, Charge Couple Device, color image sensor **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	4%
10	Master the concepts and principles of Photodetector to describe its application‘	1.Able to describe the working principle of the Charge Couple Device 2.Able to describe the Photodetector application	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Photocathode, UVTRON, Photomultiplier, Photoconductive, Photodiode, Photovoltaic, CMOS Image Sensor, Phototransistor, Charge Couple Device, color image sensor **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	4%
11	Master the concepts and principles of optical fiber to describe its applications	1.Able to describe Fiber Dispersions, Inter-modal dispersion, and Material Dispersion 2.Able to describe Fiber Losses	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Fiber Dispersions, Multimode stepindex fiber, Intermodal dispersion, Single-mode fiber, Graded-index fiber, Material Dispersion, Fiber Losses, Optical Time-Domain Reflector **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012 .*	5%
12	Master the concepts and principles of optical fiber to describe its applications	1.Able to describe the working principles of Multimode step-index fiber, Single-mode fiber, Graded-index fiber, Time-Domain Reflector 2.Able to describe fiber optic applications	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Fiber Dispersions, Multimode stepindex fiber, Intermodal dispersion, Single-mode fiber, Graded-index fiber, Material Dispersion, Fiber Losses, Optical Time-Domain Reflector **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012 .*	5%

13	Master the concepts and principles of integrated optics to describe their applications.	1. Able to describe Waveguide Fabrication integrated optics 2. Able to describe integrated optical components 3. Able to describe integrated optical applications	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Waveguide Fabrication, Directional Coupler, splitter, Wavelength multiplexer, Interferometric Filter, Phase Modulator, Optical switch, Optical amplifier **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	5%
14	Mastering the concepts and principles of optical communication to carry out analysis and design of optical communication systems	1. Able to carry out Free Space Communication analysis 2. Able to carry out Fiber Optical Communication System analysis 3. Able to carry out Power Budget, Bandwidth Budget analysis 4. Able to describe the design of optical communication systems	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Free Space Communication, Fiber Optical Communication System, Power Budget, Bandwidth Budget **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.*	5%
15	Master factual knowledge about Opto-Electronic technology and Laser Technology and their application in various application fields	1. Able to describe the design of Opto-Electronic technology systems and Laser Technology. 2. Able to describe the application of Opto-Electronic technology systems and Laser Technology in the industrial sector 3. Able to describe the application of Opto-Electronic technology systems and Laser Technology in the medical field 4. Able to describe the application of Opto-Electronic technology systems and Laser Technology in the military field	**Criteria:** The evaluation rubric uses the analytical method (the process of giving grades based on analysis that is adjusted to the answers provided based on the level of truth) **Form of Assessment** : Participatory Activities	Through lectures, questions and answers and 2 x 50 assignments		**Material:** Laser rangefinder, Light Detecting and Ranging, spectrophotometer, Compact Disk, Digital Versatile Disk, Bluray Disc, holography, implementation of lasers in industrial, medical, military and environmental fields **Library:** *SO Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall , 2012.*	5%
16	UAS	Evaluation Rubric	**Criteria:** Each question item has an assessment weight adjusted to the student's ability to answer	Final Exam Semester 2 x 50			30%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	54.5%
2.	Test	15.5%
		70%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.