Akashi College				Year	2022		Co	urse itle	Optoelectronics Devices		
Course	Informat	tion	•				•	•			
Course Co	4035				Course Catego	ry S	Specialized / Elective				
Class Format Lecture						Credits	ŀ	Academic	ademic Credit: 2		
Departme	Department Mechanica Engineerir		cal and ring	al and Electronic System		Student Grade	Þ	Adv. 2nd			
Term	Term First Seme			ester		Classes per We	eek 2	2			
Textbook Teaching	and/or Materials										
Instructor	·	SUYAMA	Taikei								
Course	Objectiv	es									
<ol> <li>Can explain the basics of quantum mechanics and semiconductors, and the interaction between optical waves and electrons as the basis for optical devices.</li> <li>Understand the operating principles and characteristics of various light emitting devices, photosensitive devices, and solid-state display devices and can explain the important properties systematically.</li> <li>Can construct an experimental system for the given lab assignment, using knowledge and technology from one's field of specialty.</li> </ol>											
Rubric	Rubric										
			Idea	Ideal Level		Standard Level			Unacceptable Level		
Achievement 1			Unde basic quan semi	erstand and c character ntum mech iconductor	d can apply the istics of light, ianics, and s.	Understand the characteristics mechanics, and semiconductors	Jnderstand the basic characteristics of light, quantum nechanics, and semiconductors.		Do not understand the basic characteristics of light, quantum mechanics, and semiconductors.		
Achievement 2			Unde betw elect prob	erstand the leen light v rons and c lems.	e interaction waves and can solve	Understand the between light velocities of the second seco	Jnderstand the interaction between light waves and electrons.		Do not understand the interaction between light waves and electrons.		
Achievement 3			Unde and devic wave	erstand the application ces such as eguides, LE	e basic principles is of optical s optical EDs, and lasers.	Understand the of optical devic optical wavegu lasers.	lerstand the basic principles ptical devices such as ical waveguides, LEDs, and ers.		Do not understand the basic principles of optical devices such as optical waveguides, LEDs, and lasers.		
			Unde detai displ optic meas appli appli	erstand an il photoser ay devices cal commu surement ications, op ications, et	d can explain in sitive and , optical fibers, nication, optical and medical otical power cc.	Understand photosensitive and display devices, optical fibers, optical communication, optical measurement and medical applications, optical power applications, etc.		tive and fibers, optical lical wer	Do not understand photosensitive and display devices, optical fibers, optical communication, optical measurement and medical applications, optical power applications, etc.		
Assigne	Assigned Department Objectives										
Teachin	g Metho	d									
Outline Outlin					fusion of optical te l diversify and imp Optical devices ma this course, the fi rious optical devic chnology using the	echnology, quant prove the perform ake up the core of rst half will focus ces used for opti- e latest informati	tum elec mance o devices v s on the cal infor ion.	tronics en f electroni within this basics an mation tra	gineering, and electronics c engineering functions and has , and this technology has d theory of optical devices. The ansmission, optical recording,		
Style Students who miss 1/3 or more of classes will not be eligible for a passing grade The overall evaluation will be based 80% on periodic exams and 20% on report assignments. The minimum score for a pass will be 60%. The periodic exam will assess students' level of understanding of the class content. There will be only one exercise and it will assess whether Course Objective 2) has been achieved.											
Notice This course's content will amount to 90 hours of study in total. These hours include the learning time guaranteed in classes and the standard self-study time required for pre-study / review, and completing assignment reports. It is recommended that students have mastered subjects related to electronic properties. Students who miss 1/3 or more of classes will not be eligible for a passing grade.											
Charact	eristics o	of Class /	Divisi	ion in Le	arning	1					
Active Learning			□ A	□ Aided by ICT		□ Applicable to Remote Class		te Class	<ul> <li>Instructor Professionally</li> <li>Experienced</li> </ul>		
Course Plan											
			Theme			Goals					
1st Semeste r	1st Quarter	1st	Optical Optical charact Telecor enginee describ up the	electronica electronica ceristic has municatio ering, and e the form core of thi	s and optical devices s is a technology of three sides: ons engineering, i light energy. Base of optical devices s field.	ces whose maging ed on this, s, which make	Optical electronics and optical devices Understand the form of optical electronic make		s and optical devices orm of optical electronics.		
		2nd	Fundan Review reflectio etc.) th	nental prop the basic on, interfen nat have be	perties of light properties of light rence, diffraction, een learned so far	it light (refraction, tion, polarization, o far in physics, etc.					

		3rd	Basics of quantum Describe the backg development, the waves of matter, t Schrödinger equat make up the theor mechanics required between optical wa	mechanics ground of quantu dual nature of pa he wave equation ion, and wave fu etical backgroum d to understand f aves and electron	m mechanics articles and n of the nctions, which d of quantum the interaction	Understand the b	asics of quantum	mechanics.	
		4th	Optical properties Materials absorb a to interactions bet Think phenomenol and emission in se	of semiconductor nd emit light. Thi ween electrons ir ogically about lig miconductors.	rs is is mainly due n substances. ht absorption	<sup>1</sup> Understand light absorption and emission in semiconductors.			
		5th	Electrical propertie Describe the electr semiconductors, w devices.	s of semiconduct ical properties of hich form the ba	tors f isis of optical	Understand the electrical properties of semiconductors.			
		6th	Quantum theory of waves and electron Think about a met representation of t and electrons. Der material (the real µ accumulation of er that represents ab emission) by the s approximation usir	f the interaction hs hod of quantum he interaction be ive the polarizati part that indicate hergy and the im sorption and stim econd-order syst ng a density mati	between light mechanical etween light on factor of a es the aginary part nulated rem rix.	Understand the quantum theory of the interaction between light waves and electrons.			
		7th	Quantum theory o waves and electror stimulated emissio Derive the rate eq percentage of tem electron density ba wave amplification week. Think about level system, base	f the interaction ns (electron trans n) uation representi poral changes in ased on the analy process from th the polarization d on this.	between light sition and ng the photon and /sis of the light e previous of the multi-	Understand electronic transitions and stimulated emission.			
		8th	Exercise			Exercise			
		9th	Photoelectric wave Using mainly light of photoelectric wa as an optical wave reflection, wavegu index, containmen light propagation, power matching of loss, power matchin propagation, mode bluster angle and l	eguides approximation for aveguide, describ guide's basic pro ide mode, equiva t coefficient, pow light gathering an f light propagatio ing conditions for a matching condit conding loss.	or the analysis be topics such operties (total alent refractive ver matching of nd emission), n and bending r light tions, and	Photoelectric waveguides Using mainly light approximation for the analysis of photoelectric waveguide, understand topics such as an optical waveguide's basic properties (total reflection, waveguide mode, equivalent refractive index, containment coefficient, power matching of light propagation, light gathering and emission), power matching of light propagation and bending loss, power matching conditions for light propagation, mode matching conditions, and bluster angle and bending loss.			
		10th	Periodic structures projection Explain periodic str Understand light co	and light concer ructures and pho oncentration and	ntration and tonic crystals. projection.	Understand periodic structures, light concentration and projection, periodic structures and photonic crystals, and light concentration and projection.			
		11th	Light emitting diod Describe the struct materials of light e the important light light emitting chara think about its curr	les ture, production mitting diodes (L emitting devices acteristics and fe rent problems.	methods, and EDs), one of s. Explain its atures and	Understand the principles of light emitting diodes.			
	Quarte	12th	Semiconductor las Explain the proper a light sources and threshold, optical of amplification gain, structure, type, en semiconductor lase	ers ties of semicondu l determine an os output, oscillatior and so on. Desc nission character ers (LD).	uctor lasers as scillation n wavelength, ribe the istics, etc. of	Understand the principles of semiconductor lasers.			
		13th	Photosensitive and Describe the struct photosensitive dev photodiodes, solar devices with a focu	l display devices ture, properties, ices such as pho cells, etc. Descri us on LCDs.	and features of todetectors, ibe display	Understand the structure, properties, and features of photodetectors, photodiodes, solar cells, etc.			
		14th	Optical fiber lines a Describe optical fib circuit elements, o	and optical component optical component optical behavior optical polarizers,	onents onding, optical etc.	Understand optical fiber and device bonding, optical circuit elements, optical polarizers, etc.			
		15th	Applications of opt Describe topics wit communications, c medical application etc.	ical devices th a focus on opti optical measurem ns, optical power	ical nent and generation,	Understand the applications of optical devices.			
	16th F		Final exam			Final exam			
Evaluation Method and Weight (%)									
	E	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Exercise	Total	
Subtotal	8	30	0	0	0	0	20	100	
Basic Proficiency		30	0	0	0	0	20	100	

Specialized Proficiency	0	0	0	0	0	0	0
Cross Area Proficiency	0	0	0	0	0	0	0