MAGISTER

Kurikulum 2018

Departemen Teknik Elektro
Fakultas Teknologi Elektro
Institut Teknologi Sepuluh Nopember

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I Learning Outcomes (LOs)

Learning Outcomes		
Attitude	S01	Believing in the oneness of God and able to demonstrate religious attitude
	S02	Upholding the value of humanity in undertaking the task based on religion, morality and ethics
	S03	Contributing in improving the quality of community life, nation and state and the advance of civilization based on Pancasila
	S04	Playing a role as a proud citizen who loves his/her homeland , having a nationalism and responsibility to the country and nation
	S05	Appreciating the diversity of cultures, point of view, religion and belief as well as opinion or the original findings of others
	S06	Working together, having social sensitivity and caring for community and environment
	S07	Law abiding and disciplined in community and state life
	S08	Internalizing values, norms and academic ethics
	S09	Demonstrating attitude of responsibility on work in his/her field of expertise independently
	S10	Internalizing spirit of independence, struggle and entrepreneurship
	S11	Trying his/her best to achieve perfect results
	S12	Working together to be able to make the most of his/her potential

General Skill	KU01	Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals
	KU02	Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise
	KU03	Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community
	KU04	Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach
	KU05	Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data
	KU06	Capable of managing, developing and maintaining networking with colleagues, peers within the broader institutes and research community

General Skill	KU07	Being able to improve the capacity of learning independently
	KU08	Capable of documenting, storing, securing, and rediscovering research data in order to ensure validity and prevent plagiarism
	KU09	Being able to develop themselves and compete in national and international level
	KU10	Being able to implement the principle of sustainability in developing knowledge
	KU11	Being able to implement information and communication technology in the context of execution of his/her work
Knowledge	P01	Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career
	P02	Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.
	P03	Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill	KK01	Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.
	KK02	Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.
	KK03	Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.
	KK04	Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment

II LOs vs. Courses Matrix

1. Power System Engineering

	COURSES																										
LOs	Statistical Methods and Optimization	Introduction to Research	Optimal Operation of Power System	High Voltage Insulation	Scientific Writing	Power Electronic Converters	Smart Grid	Renewable Energy System & Design	Electric Motor Drives	Dynamic of Electric Machines	Intelligent Comp. for Power System	Smart Power System Protection	Electric Energy Storage Devices	Transient Stability of Power System	Small Signal Stability in Power Systems	Generator Control System Automation	Power System Apparatus Diagnosis	Partial Discharge	Transformer Technology	Power Quality Conditioning	Special Topics in Power System Eng.	Power System Analysis	Electric Mechines	High Voltage Engineering	Power Electronics	Thesis	RATING
S01																											0
S02																											0
S03																											0
S04								1																			1
S05																											0
S06						1			1	1													1		1		5
S07																											0
S08																										1	1
S09	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		23
S10																											0
S11																										1	1
S12		1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		22
KU01											1			1												1	3
KU02			1																							1	2
KU03					1																					1	2
KU04							1	1					1													1	4
KU05																								1		1	2
KU06																										1	1
KU07							1		1				1								1					1	5
KU08																											0
KU09																										1	1
KU10						1																	1		1		3
KU11	1	1		1			1			1		1	1		1	1	1	1	1	1	1	1			1	1	17
P01	1			1		1	1						1			1	1	1	1		1	1	1		1	1	14
P02		1	1		1		1	1	1	1	1	1	1	1	1					1				1		1	15
P03																					1					1	2
KK01	1	1	1	1	1	1	1		1	1	1		1	1	1	1	1	1	1			1	1		1	1	21
KK02							1	1				1	1							1	1			1		1	8
KK03							1						1													1	3
KK04																										1	1
	4	5	5	5	4	6	10	4	6	6	5	5	10	5	5	5	5	5	5	5	6	5	6	5	7	18	

2. Control System Engineering

LOs	Statistical Methods and Optimization	Introduction to Research	Linear Systems Theory	Analysis & Design of Digital Control Systems	Scientific Writing	Analysis & Design of Instrumentation Systems	Identification and Filtering	Robot Dynamics and Control	Optimal and Robust Control Systems	Nonlinear Control Systems	Intelligent System and Control	Formation & Collaboration Control Systems	Networked Control Systems	Human-Robot Interaction	Intelligent Control of Energy Distribution	Control of Electrical Machines	Event Discrete Control Systems	Special Topics in Control Systems	Analysis and Design of Control Systems	Optmization Techniques	System Automation	Thesis	**RATING**
	COURSES																						
S01																							0
S02																							0
S03																							0
S04																							0
S05																							0
S06																							0
S07																							0
S08																						1	1
S09	1	1	1	1	1			1	1	1	1				1	1			1	1	1		14
S10																							0
S11						1	1					1	1	1			1	1				1	8
S12		1	1					1	1	1	1			1	1						1		9
KU01																						1	1
KU02																						1	1
KU03					1																	1	2
KU04																						1	1
KU05																						1	1
KU06																						1	1
KU07			1	1		1		1	1	1	1							1		1		1	10
KU08																							0
KU09																						1	1
KU10																							0
KU11	1	1	1	1		1	1					1	1	1	1	1	1	1	1		1	1	16
P01	1		1	1			1	1				1				1		1	1	1	1	1	12
P02		1			1		1		1	1	1		1	1	1		1					1	11
P03			1			1			1	1	1							1				1	7
KK01	1	1	1	1	1		1	1	1	1	1	1				1			1	1	1	1	16
KK02							1					1	1	1	1		1	1				1	8
KK03						1			1	1	1											1	5
KK04																						1	1
	4	**5**	**7**	**5**	**4**	**5**	**6**	**5**	**7**	**7**	**7**	**5**	**4**	**5**	**5**	**4**	**4**	**6**	**4**	**4**	**5**	**18**	

3. Multimedia Telecommunications

	COURSES																											
LOs	Statistical Methods and Optimization	Introduction to Research	Random Process and Signal Processing	Propagation and Radiation	Scientific Writing	Digital Communication Systems	Network Engineering	Multimedia Signal Processing	Wireless and Mobile Comm. Systems	Broadcast Engineering	Radar Signal Processing	Multi Antenna Communication Systems	Internet Engineering	Multicarrier Communication Systems	Information Security and Cryptography	Software Defined Radio	Advanced Electromagnetics	Information Theory and Coding	Wireless Sensor Networks	Microwave Circuits	Optical Networks and Comm. Systems	Satellite Communication Systems	Comm. System and Network Protocol Eng.	Special Topics in Telecommunications	Signals and System Analysis	Electromagnetics	Thesis	**RATING**
S01																												0
S02																												0
S03																												0
S04																												0
S05																												0
S06																												0
S07																												0
S08																	1										1	2
S09	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		26
S10																												0
S11																											1	1
S12		1				1	1		1	1			1	1				1	1				1		1			11
KU01																											1	1
KU02																											1	1
KU03					1																						1	2
KU04																											1	1
KU05				1							1	1															1	4
KU06																											1	1
KU07																	1				1	1		1			1	5
KU08																												0
KU09																					1	1		1			1	4
KU10																												0
KU11	1	1	1			1	1	1	1	1			1	1	1	1		1	1	1			1		1	1	1	19
P01	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25
P02		1			1																						1	3
P03																											1	1
KK01	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	26
KK02						1			1	1				1			1						1				1	7
KK03																											1	1
KK04																											1	1
	4	**5**	**4**	**4**	**4**	**6**	**5**	**4**	**6**	**6**	**4**	**4**	**5**	**6**	**4**	**4**	**5**	**5**	**5**	**4**	**5**	**5**	**6**	**5**	**5**	**4**	**18**	

4. Electronic Engineering

	COURSES																					
LOs	Statistical Methods and Optimization	Introduction to Research	Transducers	Microelectronic Systems	Scientific Writing	Electronic Circuit Systems	Multidimensional Signal Processing	Intelligent Electronic Systems	Electronic Control System Design	Robotics and Automation	Computer-based Visual Perception	Optoelectronics and Laser Technology	Anatomy and Physiology	Biomedical Measurement and Instrumentation	Biomedical Engineering	Biomedical Signal Analysis	Special Topics in Electronics	Electronic Circuit Analysis and Design	Circuit Analysis Techniques	Numerical Analysis and Dynamic Programming	Thesis	**RATING**
S01																						0
S02																						0
S03																						0
S04																						0
S05																						0
S06																						0
S07																						0
S08																					1	1
S09	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		20
S10				1							1											2
S11				1							1										1	3
S12		1		1							1		1	1	1	1				1		8
KU01																					1	1
KU02						1															1	2
KU03					1																1	2
KU04														1	1						1	3
KU05																			1		1	2
KU06																					1	1
KU07			1				1	1	1	1		1	1				1	1			1	10
KU08																						0
KU09											1										1	2
KU10											1											1
KU11	1	1		1							1					1				1	1	7
P01	1						1						1						1	1	1	6
P02		1	1	1	1	1		1	1	1	1	1		1	1			1			1	14
P03				1							1					1	1				1	5
KK01	1	1			1		1						1						1	1	1	8
KK02			1	1				1	1	1		1						1			1	8
KK03				1							1						1				1	4
KK04						1					1			1	1	1					1	6
	4	**5**	**4**	**9**	**4**	**4**	**4**	**4**	**4**	**4**	**11**	**4**	**5**	**5**	**5**	**5**	**4**	**4**	**4**	**5**	**18**	

5. Multimedia Intelligent Network

LOs	Statistical Methods and Optimization	Introduction to Research	Mobile Computing	Soft Computing	Scientific Writing	Cloud Computing	Multimedia Signal Processing	Modern Computing Network	Distributed Database Manag. System	e-Health	Business Intelligence	Biometric System	Intelligent Pattern Recognition	Grid Computing	Human-Computer Interaction	Computer Vision	Special Topics in Mutimedia Intelligent Net.	Multimedia in Network	Game Engine	3D Modelling Design	Scenario Manag. for Imm. Environments	Network Game Programming	Artificial Intelligent for Game	Thesis	RATING
	COURSES																								
S01																									0
S02																									0
S03																									0
S04																									0
S05																									0
S06																									0
S07																									0
S08																								1	1
S09	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1		1			20
S10																									0
S11																							1	1	2
S12		1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1			19
KU01																								1	1
KU02																								1	1
KU03					1																			1	2
KU04																								1	1
KU05																								1	1
KU06																								1	1
KU07																					1		1	1	3
KU08																									0
KU09																								1	1
KU10																									0
KU11	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23
P01	1		1	1		1															1	1		1	7
P02		1			1		1	1	1	1	1	1	1		1	1		1	1	1			1	1	16
P03								1		1				1			1				1		1	1	7
KK01	1	1	1	1	1	1				1					1		1					1		1	11
KK02							1		1		1	1	1	1		1		1	1	1			1	1	12
KK03								1																1	2
KK04										1														1	2
	4	5	5	5	4	5	5	4	5	7	5	5	5	5	5	5	5	5	5	5	5	5	6	18	

6. Telematics

	COURSES																						
LOs	Statistical Methods and Optimization	Introduction to Research	ICT System and Network	Network Management	Scientific Writing	Governance, Assesment and ICT Regulation	e-Gov. & Smart City	Information System and Networks Security	Big Data & Cloud Comp.	Strategic Management	Internet Engineering	Business Intelligence	Biometrics System	Performance Management	Multimedia Signal Processing	Analysis and System Reliability	Random Processes in Telematics	Special Topics in Telematics	Intelligence System	e-Commerce	e-Health	Thesis	**RATING**
S01																							0
S02																							0
S03																							0
S04																							0
S05																							0
S06																							0
S07																							0
S08																						1	1
S09	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		20
S10																							0
S11								1														1	2
S12		1	1	1		1	1		1	1	1	1	1	1		1	1	1	1	1	1		17
KU01																						1	1
KU02																						1	1
KU03					1																	1	2
KU04																						1	1
KU05																						1	1
KU06																						1	1
KU07																						1	1
KU08																							0
KU09																						1	1
KU10																							0
KU11	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
P01	1										1		1		1		1	1	1			1	8
P02		1	1	1	1	1	1	1	1	1		1		1		1				1	1	1	15
P03																			1	1		1	3
KK01	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1		1	1	19
KK02							1	1												1		1	4
KK03																						1	1
KK04																		1		1		1	3
	4	**5**	**5**	**5**	**4**	**5**	**5**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**4**	**5**	**5**	**6**	**6**	**7**	**5**	**18**	

III Curriculum Structure

1. Power System Engineering

No.	Code	Course Name	Credit
SEMESTER I			
1	EE185101	Statistical Methods and Optimization	2
2	EE185102	Introduction to Research	2
3	EE185111	Optimal Operation of Power System	3
4	EE185112	High Voltage Insulation	3
		Total of credits	**10**
SEMESTER II			
1	EE185201	Scientific Writing	2
2	EE185211	Power Electronic Converters	3
3	EE185212	Smart Grid	3
4		ELECTIVE COURSE	2
		Total of credits	**10**
SEMESTER III			
		ELECTIVE COURSES	8
		Total of credits	**8**
SEMESTER IV			
1	EE185401	Thesis	8
		Total of credits	**8**

ELECTIVE COURSES

No.	Code	Course Name	Credit
1	EE185510	Renewable Energy System and Design	2
2	EE185511	Electric Motor Drives	2
3	EE185512	Dynamic of Electric Machines	3
4	EE185513	Intelligent Computation for Power System	2
5	EE185514	Smart Power System Protection	2
6	EE185515	Electric Energy Storage Devices	3
7	EE185516	Transient Stability of Power System	2
8	EE185517	Small Signal Stability in Power Systems	2

9	EE185518	Generator Control System Automation	3
10	EE185519	Power System Apparatus Diagnosis	3
11	EE185610	Partial Discharge	2
12	EE185611	Transformer Technology	2
13	EE185612	Power Quality Conditioning	2
14	EE185613	Special Topics in Power System Engineering	2

Prerequisite Courses

No.	Code	Course Name	Credit
1	EE185710	Power System Analysis	2
2	EE185711	Electric Mechines	2
3	EE185712	High Voltage Engineering	2
4	EE185713	Power Electronics	2

2. Control System Engineering

No.	Code	Course Name	Credit
SEMESTER I			
1	EE185101	Statistical Methods and Optimization	2
2	EE185102	Introduction to Research	2
3	EE185121	Linear Systems Theory	3
4	EE185122	Analysis and Design of Digital Control Systems	3
		Total of credits	**10**
SEMESTER II			
1	EE185201	Scientific Writing	2
2	EE185221	Analysis and Design of Instrumentation Systems	3
3	EE185222	Identification and Filtering	3
4		ELECTIVE COURSES	2
		Total of credits	**10**
SEMESTER III			
1	EE185321	Robot Dynamics and Control	2
		ELECTIVE COURSES	6
		Total of credits	**8**
SEMESTER IV			
1	EE185401	Thesis	8
		Total of credits	**8**

ELECTIVE COURSES

No.	Code	Course Name	Credit
1	EE185520	Optimal and Robust Control Systems	2
2	EE185521	Nonlinear Control Systems	2
3	EE185522	Intelligent System and Control	2
4	EE185523	Formation and Collaboration Control Systems	2
5	EE185524	Networked Control Systems	2
6	EE185525	Human-Robot Interaction	2
7	EE185526	Intelligent Control of Energy Distribution	2
8	EE185527	Control of Electrical Machines	2
9	EE185528	Event Discrete Control Systems	2
10	EE185529	Special Topics in Control Systems	2

Prerequisite Courses

No.	Code	Course Name	Credit
1	EE185720	Analysis and Design of Control Systems	2
2	EE185721	Optmization Techniques	2
3	EE185722	System Automation	2

3. Multimedia Telecommunications

No.	Code	Course Name	Credit
SEMESTER I			
1	EE185101	Statistical Methods and Optimization	2
2	EE185102	Introduction to Research	2
3	EE185131	Random Process and Signal Processing	3
4	EE185132	Propagation and Radiation	3
		Total of credits	**10**
SEMESTER II			
1	EE185201	Scientific Writing	2
2	EE185231	Digital Communication Systems	3
3	EE185232	Network Engineering	3
4		ELECTIVE COURSES	2
		Total of credits	**10**
SEMESTER III			
1	EE185331	Multimedia Signal Processing	2
		ELECTIVE COURSES	6
		Total of credits	**8**
SEMESTER IV			
1	EE185401	Thesis	8
		Total of credits	**8**

ELECTIVE COURSES

No.	Code	Course Name	Credit
1	EE185530	Wireless and Mobile Communication Systems	2
2	EE185531	Broadcast Engineering	2
3	EE185532	Radar Signal Processing	2
4	EE185533	Multi Antenna Communication Systems	2
5	EE185534	Internet Engineering	2
6	EE185535	Multicarrier Communication Systems	2
7	EE185536	Information Security and Cryptography	2
8	EE185537	Software Defined Radio	2
9	EE185538	Advanced Electromagnetics	2
10	EE185539	Information Theory and Coding	2

11	EE185630	Wireless Sensor Networks	2
12	EE185631	Microwave Circuits	2
13	EE185632	Optical Networks and Communication Systems	2
14	EE185633	Satellite Communication Systems	2
15	EE185634	Communication System and Network Protocol Engineering	2
16	EE185635	Special Topics in Telecommunications	2

Prerequisite Courses

No.	Code	Course Name	Credit
1	EE185730	Signals and System Analysis	2
2	EE185731	Electromagnetics	2

4. Electronic Engineering

No.	Code	Course Name	Credit
SEMESTER I			
1	EE185101	Statistical Methods and Optimization	2
2	EE185102	Introduction to Research	2
3	EE185141	Transducers	3
4	EE185142	Microelectronic Systems	3
		Total of credits	**10**
SEMESTER II			
1	EE185201	Scientific Writing	2
2	EE185241	Electronic Circuit Systems	3
3	EE185242	Multidimensional Signal Processing	3
4		ELECTIVE COURSES	2
		Total of credits	**10**
SEMESTER III			
1	EE185341	Intelligent Electronic Systems	2
		ELECTIVE COURSES	6
		Total of credits	**8**
SEMESTER IV			
1	EE185401	Thesis	8
		Total of credits	**8**

ELECTIVE COURSES

No.	Code	Course Name	Credit
1	EE185540	Electronic Control System Design	2
2	EE185541	Robotics and Automation	2
3	EE185542	Computer-based Visual Perception	2
4	EE185543	Optoelectronics and Laser Technology	2
5	EE185544	Anatomy and Physiology	2
6	EE185545	Biomedical Measurement and Instrumentation	2
7	EE185546	Biomedical Engineering	2
8	EE185547	Biomedical Signal Analysis	2
9	EE185548	Special Topics in Electronics	2

Prerequisite Courses

No.	Code	Course Name	Credit
1	EE185740	Electronic Circuit Analysis and Design	2
2	EE185741	Circuit Analysis Techniques	2
3	EE185742	Numerical Analysis and Dynamic Programming	2

5. Multimedia Intelligent Network

No.	Code	Course Name	Credit
SEMESTER I			
1	EE185101	Statistical Methods and Optimization	2
2	EE185102	Introduction to Research	2
3	EE185151	Mobile Computing	3
4	EE185152	Soft Computing	3
		Total of credits	**10**
SEMESTER II			
1	EE185201	Scientific Writing	2
2	EE185251	Cloud Computing	3
3	EE185252	Multimedia Signal Processing	3
4		ELECTIVE COURSES	2
		Total of credits	**10**
SEMESTER III			
1	EE185351	Modern Computing Network	2
		ELECTIVE COURSES	6
		Total of credits	**8**
SEMESTER IV			
1	EE185401	Thesis	8
		Total of credits	**8**

ELECTIVE COURSES

No.	Code	Course Name	Credit
1	EE185550	Distributed Database Management System	2
2	EE185551	e-Health	2
3	EE185552	Business Intelligence	2
4	EE185553	Biometric System	2
5	EE185554	Intelligent Pattern Recognition	2
6	EE185555	Grid Computing	2
7	EE185556	Human-Computer Interaction	2
8	EE185557	Computer Vision	2
9	EE185558	Special Topics in Mutimedia Intelligent Network	2
10	EE185559	Multimedia in Network	2

11	EE185650	Game Engine	2
12	EE185651	3D Modelling Design	2
13	EE185652	Scenario Management for Immersive Environments	2
14	EE185653	Network Game Programming	2
15	EE185654	Artificial Intelligent for Game	2

6. Telematics

No.	Code	Course Name	Credit
SEMESTER I			
1	EE185101	Statistical Methods and Optimization	2
2	EE185102	Introduction to Research	2
3	EE185161	ICT System and Network	3
4	EE185162	Network Management	3
		Total of credits	**10**
SEMESTER II			
1	EE185201	Scientific Writing	2
2	EE185261	Governance, Assesment and ICT Regulation	3
3	EE185262	e-Government and Smart City	3
		ELECTIVE COURSES	2
		Total of credits	**10**
SEMESTER III			
1	EE185361	Information System and Networks Security	2
		ELECTIVE COURSES	6
		Total of credits	**8**
SEMESTER IV			
1	EE185401	Thesis	8
		Total of credits	**8**

TELEMATIKA ELECTIVE COURSES

No.	Code	Course Name	Credit
1	EE185560	Big Data and Cloud Computing	2
2	EE185561	Strategic Management	2
3	EE185562	Internet Engineering	2
4	EE185563	Business Intelligence	2
5	EE185564	Biometrics System	2
6	EE185565	Performance Management	2
7	EE185566	Multimedia Signal Processing	2
8	EE185567	Analysis and System Reliability	2
9	EE185568	Random Processes in Telematics	2
10	EE185569	Special Topics in Telematics	2
11	EE185660	Intelligence System	2

12	EE185661	e-Commerce	2
13	EE185662	e-Health	2

IV Course Syllabus

1. Power System Engineering

COURSE	Name	:	Statistical Methods and Optimization
	Code	:	EE185101
	Credit(s)	:	2
	Semester	:	I

Description of Course
In this course, students learn the two main topics, namely: (1) statistical methods needed to design research as well as to analyze and interpret the measurements and simulations; (2) the basics and methods of optimization needed to find solutions to various technical problems encountered in research, for example: linear programming, convex optimization, iterative methods, optimization inspired by nature: genetic algorithms, etc.

Learning Outcomes
Knowledge (P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career. **Specific Skill** (KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and methods of statistical analysis of measurement data and mastering the optimization method for a problem in engineering in the field of electrical engineering

Specific Skill

Able to design experiments and calculate statistical analysis on measurement data and be able to define optimization problems and find optimal solutions

General Skill

Able to use software and tools for statistical analysis and optimization, e.g. Matlab and R.

Attitude

show the attitude of being responsible for the work in his area of expertise independently

Main Subjects

1. Introduction
2. Descriptive statistics
3. Experimental design
4. Univariate, multivariate and variance analysis
5. Application of statistical methods
6. Optimization problems
7. Mathematical optimization
8. Completion of analytical optimization
9. Completion of numerical optimization

10. Dynamic programming
11. Introduction to meta-heuristics and evolutionary algorithms

Reference(s)

[1] William M. Mendenhall & Terry L. Sincich, “Statistics for Engineering and the Sciences,” 6th ed., CRC Press, 2016.
[2] Jay Devore, “Probability and Statistics for Engineering and the Sciences,” 9th ed., CENGAGE Learning, 2016.
[3] William Navidi, “Statistics for Engineers and Scientists,” 3rd ed., McGraw-Hill, 2011.
[4] Jorge Nocedal & Stephen J. Wright, “Numerical Optimization,” 2nd ed., Springer, 2006.
[5] Edwin K.P. Chong & Stanislaw H. Zak, “An Introduction to Optimization,” 4th ed., John Wiley & Sons, 2013
[6] Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, “Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization,” John Wiley & Sons, 2017.

Prerequisite(s)

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COURSE			
	Name	:	Introduction to Research
	Code	:	EE185102
	Credit(s)	:	2
	Semester	:	I

Description of Course

This course is preparing student to formulate research ideas, planning research activities and writing the thesis proposals. In this course students will be given materials on basic knowledge of research before formulating the topics to be studied in their thesis. The materials include: defining problem in research, the difference between research project and practical/work project, understanding the hypothesis, novelty, plagiarism (including in method and methodology), types of research (qualitative and quantitative), types of collecting data method and techniques (survey, questionnaire, interview, measurement, data mining) and fishbone diagram.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrate a responsible attitude towards the work in the field of his/her expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Students understand the hypothesis, novelty, plagiarism and the types of research and various techniques of data retrieval in research so that the thesis proposal then can be prepared better.

Specific Skill

Students are able to develop a research problem that has the potential to be his/her research idea in their thesis, and contains elements of novelty and avoid plagiarism.

General Skill

Able to develop research plans that contain novelty starting from building a hypothesis, defining problem formulation and developing research methodology plan.

Attitude

Shows an honest attitude in developing the research topic, open to suggestions and inputs and responsible to avoid plagiarism activities.

Main Subjects

1. The procedure for a scientific article search
2. Introduction to Research
3. Hypothesis in research
4. An understanding of Novelty in research

5. Plagiarism
6. Data collection techniques in research
7. Types of research
8. Citation and use of Reference (s)
9. The 1st Lab-Research theme
10. The 2nd Lab-Research theme
11. The 3rd Lab-Research theme
12. The 4th Lab-Research theme
13. Preparation of Fishbone Diagram

Reference(s)

[1] Research Methodology., A Step by step guide for beginners., Ranjit Kumar., 3rd Edition., 2011
[2] Research Methodology: Methods and Techniques., 2nd Revised Edition., C.R. Kothari., New Age International Publisher., 2004
[3] Research and Methodology: Tools and Techniques., Prabhat Pandey, Meenu Mishra Pandey, 2015

Prerequisite(s)

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COURSE			
	Name	:	Optimal Operation of Power System
	Code	:	EE185111
	Credit(s)	:	3
	Semester	:	I

Description of Course

The course of optimal operation of the power system discusses the topic of scheduling and economic optimal of power plant loading. Optimal plant loading is carried out by considering the limitations of primary energy supply and network constraints such as voltage and channel capacity. In addition, this course also discusses the coordination between thermal power plants (thermal) and hydropower (Hydro) in supplying loads. Some conventional methods and intelligent methods are introduced to solve problems.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of scheduling the generator plant and operation of the electric power system optimally by considering the limitations of primary energy supply and the limitations of the transmission network.

Mastering the concept of coordinating thermal and hydro plants.

Specific Skill

Being able to formulate mathematically the problem of operating an electric power system which includes optimal scheduling of the power plant and operation of the power system by considering the limitations of primary energy supply and limitation of the transmission network as well as coordinating thermal and hydro power plants.

General Skill

Being able to use Matlab / Powergen / Powerworld software to solve the problem of scheduling the generation and operation of the electric power system optimally by considering the limitations of primary energy supply and the limitation of the transmission network as well as coordinating thermal and hydro power plants.

Attitude

Demonstrate an attitude of being responsible for work in his area of expertise independently.

Able to work together in teams and be responsible for team achievements.

Main Subjects

1. Economic Dispatch
2. Commitment Unit
3. Take or Pay contract scheme
4. Composite generation cost function
5. Scheduling primary fuel
6. Coordination of Hydro-thermal plants
7. Optimal power flow
8. Security constrained optimal power flow

Reference(s)

[1] Power Generation Operation and Control (Allen J. Wood & Bruce F. Wollenberg), 2014
[2] Power System Analysis (Hadi Saadat)

Prerequisite(s)

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COURSE			
	Name	:	High Voltage Insulation Engineering
	Code	:	EE185112
	Credit(s)	:	3
	Semester	:	I

Description of Course

This course studies high voltage isolation technology consist of gas insulation, vacuum, liquid and solid. More details, the characteristics of each isolation will be discussed. These characteristics include, pre-breakdown, breakdown, electric field, electric arc, and classification. Ageing phenomena including causes, identification and improvement will also be discussed. In addition, maintenance and detection of damage is also discussed.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering and understanding the characteristic and phenomenon of failure on air dielectric, vacuum, liquid and solid dielectric.

Mastering the principle of lightning mechanism and its protection.

Mastering the basic principle of high voltage insulation equipment design.

Specific Skill

Able to explain the failure process on air dielectric, SF6 gas, vacuum, liquid and solid dielectric.

Able to explain the principle of lightning mechanism and its protection design.

Able to explain the important factors in the basic design of high voltage equipment isolation system.

General Skill

Able to understand the flow of scientific journal writing and able to do a review journal.

Attitude

Show a responsible attitude towards the work in the field of expertise independently.

Work together to be able to take full advantage of the potential possessed.

Main Subjects

1. The process of failure (breakdown) there is air dielectric material
2. The process of failure in Vacuum

3. The process of failure of the liquid dielectric material
4. Failure process on solid dielectric material
5. Mechanism of lightning and its protection
6. Basic design of high voltage insulation equipment

Reference(s)

[1] Ravindra Arora, Wolfgang Mosch, “High Voltage and Electrical Insulation Engineering”, IEEE Press, John Wiley and Sons, 2011
[2] Dieter Kind, Herman Kärner, “ High-Voltage Insulation TEchnology

Prerequisite(s)

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COURSE			
	Name	:	Scientific Writing
	Code	:	EE185201
	Credit(s)	:	2
	Semester	:	II

Description of Course

Scientific Writing course discusses the method of writing scientific documents, especially for thesis proposals at the master level. Lecture materials include various, characteristics and functions of scientific documents and parts of scientific documents. Indonesian language citation, plagiarism and grammar will also be discussed. Through this lecture students will develop the skills to write academic documents that are useful for their future success.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Being able to recognize and describe an academic document.

Specific Skill

Being able to describe procedures for making academic documents.

General Skill

Being able to make an academic document.

Attitude

Demonstrating an attitude of being responsible for work in his area of expertise independently.

Main Subjects

1. Introduction: types, functions and characteristics of scientific documents.
2. Parts of scientific documents: opening (front matter).
3. Parts of scientific documents: contents or torso (body).
4. Parts of scientific documents: cover (end matter).
5. Illustration on scientific documents.
6. Citation: source, writing, and plagiarism.
7. Indonesian language spelling and grammar: spelling, words, sentences, and paragraph.

Reference(s)

[1] Program Pasca Sajana ITS, Pedoman Penyusunan Tesis Tahun 2014.
[2] Tim Pengembang Pedoman Bahasa Indonesia, PEDOMAN UMUM EJAAN BAHASA INDONESIA, Edisi 4, Badan Pengembangan dan Pembinaan Bahasa Kementerian Pendidikan dan Kebudayaan, 2016.

[3] Adjat Sakri, Bangun Paragraf Bahasa Indonesia, Penerbit ITB, 1993
[4] Adjat Sakri, Bangun Kalimat Bahasa Indonesia, Penerbit ITB, 1994
[5] L.C. Perelman, J. Paradis, and E. Barrett. The Mayfield Handbook of Technical and Scientific Writing. New York, NY: McGraw-Hill, 1997. ISBN: 9781559346474.

Prerequisite(s)

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COURSE		
	Name	: Power Electronic Converters
	Code	: EE185211
	Credit(s)	: 3
	Semester	: II

Description of Course

This course leads students to analyze, model, simulate and design Power Electronics converter with closed loop control. The discussion begins with a review of 4 types of open-loop converters ac-dc, dc-dc, dc-ac, ac-ac. The next discussion about closed loop system and error compensator. Modeling and simulation of closed loop converter using method of Large Signal and Small Signal. Introduction is also given for characteristic observation, analysis and design of converters for power supply applications and control of electric motors.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU10) Being able to implement the principle of sustainability in developing knowledge.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S06) Working together, having social sensitivity and caring for community and environment.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

- Know the technological trends and applications of power electronics converters in electrical systems
- Mastering the power electronics converter system and its main components with closed loop control
- Mastering the characteristics of the power electronics converter that is applied as a conditioner of electric power, power supply, electric motor controller

Specific Skill

- Able to design a closed loop electronics power converter system
- Able to make technical analysis of closed loop power electronics converter device

Main Subjects

1. Trend of technological development of power electronics converter in power system
2. Closed loop system, compensator error: Proportional, Integral, Differential
3. Design of electronic converter power control closed loop
4. Modeling and simulation Power factor correction, active filter
5. Modeling and simulation Uninterruptible Power Supply, Inverter grid connected system

6. Modeling and simulating variable speed drive

Reference(s)

[1] Mochamad Ashari, “Desain Konverter Elektronika Daya”, Penerbit Informatika, Bandung, 2017
[2] Muhammad H. Rashid, “Power Electronics Handbook Devices, Circuits, and Applications”, Third Edition, 2011
[3] Ned Mohan, “Power Electronics”, John Willey and Sons, 2012

Prerequisite(s)

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COURSE			
	Name	:	Smart Grid
	Code	:	EE185212
	Credit(s)	:	3
	Semester	:	II

Description of Course

This course discusses smart grid include communication system and measurement technology on smart grid, smart grid design, smart storage, and smart system, as well as data security and safety on standardized Smart Grid Network.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

General Skill

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept, scientific principles and smart grid engineering comprehensively.

Specific Skill

Being able to formulate problems related to smart grid and make a solution by generating system design.

General Skill

Being able to identify and positioning itself in research map related to smart grid.

Attitude

Being able to demonstrate an attitude of responsibility on work in his/her field of expertise independently.

Being able to work together to be able to make the most of his/her potential.

Main Subjects

1. Overview on smart grid
2. Communication system and measurement technology of smart grid system
3. Performance analysis devices for smart grid design
4. Stability analysis device for smart grid
5. Computational devices for smart grid design
6. Smart grid design flowchart
7. Smart storage
8. Smart energy consumption
9. Standarization of safety and data security of smart grid network
10. Research, education, and training related to smart grid
11. Study cases and test bed of smart grid

Reference(s)

[1] T. Sato, et. al, Smart Grid Standards: Specifications, Requirements, and Technologies. John Wiley & Sons Singapore Pte. Ltd., 2015
[2] J. Momoh, Smart Grid: Fundamentals of Design and Analysis. John Wiley & Sons, Inc., 2012

Prerequisite(s)

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COURSE		
	Name	: Thesis
	Code	: EE185401
	Credit(s)	: 8
	Semester	: IV

Description of Course

The Thesis course is a capstone project for the master program as one of the requirements to complete the master program study. Thesis research is the culmination of all knowledge gained by students during the study and scientific validation and expertise that has been obtained. Students must write the results of their research in the Thesis book and take the Thesis examination, and publish the results of their thesis research in scientific journals as one of the graduation requirements.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

(KU06) Capable of managing, developing and maintaining networking with colleagues, peers within the broader institutes and research community.

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S08) Internalizing values, norms and academic ethics

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of scientific and engineering comprehensively, and factual knowledge about information and communication technology and the latest technology to develop procedures and strategies needed for the analysis and design of systems in the field of Electrical Engineering and its applications which are the topic of discussion.

Specific Skill

Being able to formulate and compile engineering problem solving, produce system designs and implement alternative engineering problem solving by expanding knowledge that adapts changes in science or technology in the field of Electrical Engineering which is the topic of discussion.

General Skill

Being able to produce a feasible thesis to be published in scientific journals by utilizing both software / hardware technology in conducting experiments related to system analysis and design which is the topic of discussion.

Attitude

Striving maximally in solving problems in the field of Electrical Engineering which is the topic of discussion to achieve perfect results.

Main Subjects

1. Introduction (Background, Problem Formulation, Objectives, Contributions)
2. Research Studies and Basic Theory
3. Research Methodology
4. Research Results and Discussion
5. Conclusions and Suggestions

Reference(s)

[1] Supporting textbooks
[2] Papers from supporting journals or conferences
[3] Pedoman Penyusunan Thesis, Program Pascasarjana ITS, 2014.
[4] Pedoman Penyusunan Tesis, Departemen Teknik Elektro, http://teras.ee.its.ac.id/

Prerequisite(s)

Scientific Writing

COURSE	Name	: Renewable Energy System and Design
	Code	: EE185510
	Credit(s)	: 2
	Semester	:

Description of Course

Renewable Energy Engineering course discusses the application and implementation of power plant systems with renewable energy sources related to optimal sizing capacity and system design by considering the quality of electrical power and energy efficiency.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes
Knowledge Mastering the concept of a renewable energy generating system that includes theories related to the types of renewable energy generator and energy conversion systems and the problems that exist in renewable energy systems. **Specific Skill** Being able to determine optimal capacity sizing and electrical energy storage systems. Being able to design renewable energy generation systems by considering system power quality and economic factors. **General Skill** Able to demonstrate independent, quality, and measurable performance in analyzing existing problems in renewable energy generation systems. **Attitude** Able to be responsible for the work, both individually and in groups.
Main Subjects
1. Renewable Energy Potential 2. Solar radiation energy generator system (PV) 3. Wind energy generator system (WT) 4. Microhydro (MH) energy generator system 5. Ocean current energy generator systems 6. Fuel cell energy generator system
Reference(s)
[1] R.K. Behl, R.N. Chhibar, S. Jain, V.P. Bahl, N.El Bassam, "Renewable energy source and their application", IFEED [2] V V N Kishore, Renewable Energy Engineering and Technology [3] Ben Sorensen, Renewable Energy 3th edition, 2017 [4] J. Aabakken, Power Technology Energy Databook 3th Edition, 2005

Prerequisite(s)
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COURSE	Name	: Electric Motor Drives
	Code	: EE185511
	Credit(s)	: 2
	Semester	:

Description of Course

The electric drives course discuss the basic concepts of electrical driving, electrical driving analysis which includes the electric motor along with its characteristics, how it controls, and understands the power converter as power supply for electric motor.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S06) Working together, having social sensitivity and caring for community and environment.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept, principles and analyze electric drives for motor aplication and design in the field of power system engineering.

Specific Skill

- Knowing the basic concepts of electric drives.
- Knowing how to analyze electric drives which includes electric motors and their characteristics, how to control, and understand the power converter as an electric motor power supply.

General Skill

- Able to design control techniques in electric drives.
- Able to calculate and analyze the electric motor supplied from the power converter and how to control it.

Attitude

- Working together, having social sensitivity and caring for community and environment.
- Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Main Subjects

1. Electric motor drives concept
2. Characteristics of electric motor: braking (electric motor braking), Starting electric motor.
3. Dynamics electric motors as driving in controlling electric motors:
4. Converter as power supply for electric motor.
5. Motor control
6. Modeling electric motors
7. Rating and heating electric motor
8. Control techniques in controlling electric motors

Reference(s)
[1]. G. K. Dubey, “Power Semiconductor Control Drives”, Prentice Hall Int. & Co., London, Sidney, Toronto, Mexico, New Delhi, Tokyo, Singapore, Rio Publising Co.de Jenairo, New Jersey, 1989. [2]. V. Subrahmayam, ”Electric Drives”, Tata Mc Graw Hill Publishing Co. & Ltd., New Delhi, 1994.

Prerequisite(s)
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COURSE	Name	: Electric Machine Dynamic
	Code	: EE185512
	Credit(s)	: 3
	Semester	:

Description of Course

This course provides basic principles of electrical machine analysis that begins with the principle of electromechanical energy conversion. Based on this principle electromagnetic torque can be expressed in mechanical electric current and mechanical movement. To be able to make an analysis on an electric machine will be given a decrease in equivalent circuit of a magnetically coupled circuit, sinusoidally distributed winding, the concept of magnetomotive force in the air gap, and the decrease of winding inductance. The basic principle of the analysis is used to construct dynamic models of non-rotating and rotating electric machines such as transformers, dc machines and ac machines. The reference frame theorem is used to overcome the value of the inductance that changes with time due to the change of rotor position so that the order of the differential equations on the machine becomes simpler.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S06) Working together, having social sensitivity and caring for community and environment.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

- Understand the concept of a magnetically connected circuit
- Understand the principle of conversion of electromechanical energy
- Understanding the construction of engine windings and magnetomotive force on the air gap
- Understand the dynamic modeling principle of dc engine
- Understand the reference-frame theory for the transformation of voltage and current values in the stationary circuit
- Understand the dynamic modeling principle of induction machine and synchronous machine

Specific Skill

- Able to derive a voltage equation in a circuit that is magnetically connected to transformer modeling
- Ability to calculate the energy balance in magnetic connected circuits for simple electromechanical systems
- Ability to arrange equations of voltage on the engine as function of inductance winding
- Capable of constructing dynamic equations of dynamic models of dc machines and compiling simulations using application software

- Able to use reference-frame theory for transformation of voltage and current values in stationary circuits
- Able to develop dynamic model of induction machine and synchronous machine using application software

Main Subjects

1. The connected circuit is magnetic
2. Conversion of electromechanical energy
3. Crystalline disbursed sinusoidal and air-gap mmf
4. Inductance winding and induced voltage
5. The voltage and torque equation of dc engine
6. Transformation of stationary variable variables into arbitrary reference-frames
7. The equations of voltage and torque on the machine variables
8. The transformation equation of rotor and stator circuit
9. The angle of the rotor and the angle between the rotor
10. Simulation of induction machine and synchronous machine

Reference(s)

[1] P. C. Krause, O. Wasynczuk, and S. D. Sudhoff, “Analysis of electric machinery and drive systems”, 2nd ed., New York: Wiley-IEEE, 2002
[2] Chee-Mun Ong, "Dynamic simulation of electric machinery using Matlab/Simulink”, Prentice Hall, 1998

Prerequisite(s)

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COURSE			
	Name	:	Intelligent Computation for Power System
	Code	:	EE185513
	Credit(s)	:	2
	Semester	:	

Description of Course

Expert system: concept, architecture, application in electric power system. Artificial Neural Network: concept, architecture, application in power system. Fuzzy system: concept, fuzzy logic, fuzzy model, application in power system. Decision tree: concept, type, application in power system. Genetic algorithms: concepts, applications in electrical power systems. Multi-agent system: concept, multi-agent technology, application in power system. Heuristic optimization techniques: concepts, types, applications in power systems. Unstructured learning and hybrid methods: concepts, types, applications in power systems.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering intelligent computing techniques to solve power system problems.

Specific Skill

Able to modelled the power systems component with intelligent computing techniques and solve power systems problem.

General Skill

Able to use Matlab / Simulink software to perform visualization and experimentation of problems in power system using intelligent computing techniques.

Attitude

Shows a responsible attitude towards the work in the field expertise independently.

Work together to be able to make the most of it potential possessed.

Main Subjects

1. Expert system: concept, architecture, application in power system.
2. Artificial Neural Network: concept, architecture, application in power system.
3. Fuzzy system: concept, fuzzy logic, fuzzy model, application in power system.
4. Decision tree: concept, type, application in power system.
5. Genetic algorithms: concepts, applications in electrical power systems.
6. Multi-agent system: concept, multi-agent technology, application in power system.
7. Heuristic optimization techniques: concepts, types, applications in power systems.
8. Unstructured learning and hybrid methods: concepts, types, applications in power systems.

Reference(s)

[1] Mircea Eremia, Chen Ching Liu, Abdel Aty Edris, "Advanced Solutions in Power Systems HVDC, FACTS, and Artificial intelligence", IEEE Press-John Wiley & Son, 2016.
[2] Kwang Y. Lee & Mohamed A. El-Sharkawi, "Modern Heuristic Optimization Techniques-Theory and Application to Power Systems", IEEE Press-John Wiley & Son, 2008.
[3] Weerakorm Ongsakul & Dieu Ngoc Vo, "Artificial Intelligence in Power System Optimization", CRC Press, 2013
[4] James A. Momoh & Mohamed E. El-Hawary, "Electric Systems Dynamics and Stability with Artificial Intelligence Applications", Marcel Dekker, 2000
[5] Abhisek Ukil, "Intelligent Systems and Signal Processing in Power Engineering", Springer, 2007.

Prerequisite(s)

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COURSE	Name	:	Pengaman Sistem Tenaga Listrik Cerdas
	Code	:	EE185514
	Credit(s)	:	2
	Semester	:	

Description of Course

Learning Outcomes

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE	Name	: Transient Stability in Power Systems
	Code	: EE185516
	Credit(s)	: 2
	Semester	:

Description of Course

Definition and classification of stability in power systems, generator modeling, transient stability for single machine using the equal area criteria method, transient stability for multi machines using the development of the equal area criteria method, transient stability for multi machines using time domain simulation method, transient stability for multi machines by direct calculation of critical disconnection, transient stability for multi machines using boundary controlling unstable (BCU) equilibrium point method, transient stability for the multi machine using BCU shadowing method, transient stability for a single machine using critical trajectory, transient stability for the multi machine using critical trajectory based loss of synchronization method, transient stability for multi machine using critical trajectory based critical generators method. Calculate Critical Clearing Time and apply in Power system.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the modeling of power system device into mathematical equations and transient stability analysis using direct and indirect methods.

Specific Skill

Able to analyze transient stability and calculate critical clearance time (CCT) and its application to power system.

General Skill

Able to use Matlab / Simulink and / or ETAP software to visualize and workout the concept of CCT calculation and its application to power system.

Attitude

Shows a responsible attitude towards the work in the field expertise independently.

Work together to be able to make the most of it potential possessed.

Main Subjects

1. Definition and classification of power system stability
2. Generator modelling, exciter and governor
3. The same area method and development for multi machine
4. Time Domain Simulation Method
5. Energy Function Method
6. Critical Trajectory Method

Reference(s)

[1] Hsiao-Dong Chiang, “Direct Methods for Stability Analysis of Electric Power Systems: Theoretical Foundation, BCU Methodologies, and Applications”, John Wiley and Son Inc., 2010
[2] P.M. Anderson and A.A. Fouad, ”Power System Control and Stability”, IEEE Press Series on Power Engineering Second Edition, 2003
[3] Prabha Kundur, “Power System Stability and Control”, McGraw-Hill Inc. 2004
[4] Ardyono Priyadi, Naoto Yorino and Mauridhi Hery Purnomo, “Critical Trajectory for Transient Stability”, JTE-ITS Press 2012
[5] Mania Pavella, Damien Ernst, and Daniel Ruiz-Vega, “Transient Stability of Power Systems A Unified Approach to Assessment and Control”, Kluwer 2000

Prerequisite(s)

Power System Analysis

COURSE	Name	: Small Signal Stability in Power Systems
	Code	: EE185517
	Credit(s)	: 2
	Semester	:

Description of Course

This course studies the stability of small disturbances in electrical power systems and how to control them. Designing controllers to improve stability due to small interference in the power system will be discussed. Controller design with several methods namely phase compensation, robust control and artificial intelligence. The steady state instability through analysis of the generator's maximum load through power tracing and the concept of losses will also be discussed. In addition, the steady state rotor generator instability due to leading operation, and prevent leading operations by observing the generator capability curve are also discussed.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently

(S12) Working together to be able to make the most of his/her potential

Course Learning Outcomes

Knowledge

Mastering the concept of small disturbance stability and small stability simulation procedures in the power system and mastering the design concept of small disturbance stability control with several methods such as phase compensation, robust, artificial intelligence, series compensation and capability generator capability control.

Specific Skill

Able to design the controller with phase compensation method, robust and artificial intelligence with matlab simulink software and able to simulate steady state stability with matlab and ETAP.

General Skill

Able to use software such as matlab simulink and ETAP for simulation of small disturbance stability.

Attitude

Demonstrate a responsible attitude towards the work in the field of expertise Simulation and Analysis of the stability of small electrical power system interference independently.

Working together to be able to take full advantage of their potential.

Main Subjects

1. Basic concept of dynamic stability of electric power system.
2. Laplace transform model for generator and device, transmission and load.

3. Assemble the model in Simulink
4. Dynamic Stability Simulation in Simulink
5. Design of Controller with phase compensation method, robust and AI.
6. Basic concept of stable steady state electric power system.
7. Steady state models for generators and devices, transmissions and loads.
8. Find the maximum load with power tracing
9. Steady state stability simulation in Matlab / Etap
10. Capacitor series compensation
11. Leading generator operation and its limits
12. Prevent Leading operations

Reference(s)

[1] Adi Soeprijanto, “ Analisis Kestabilan Multi generator dengan pendekatan SMIB”, Dee Press, 2017
[2] Paul M Anderson, A.A. Fouad, “Power System Control and Stability, 2nd edition”, Wiley-IEEE Press, 2002
[3] Hadi Saadat, “Power System Analysis”, McGraw-Hill Inc, 1999
[4] Prabha Kundur, “Power System Stability and Control”, McGraw-Hill, 1994

Prerequisite(s)

Power System Analysis

COURSE	Name	: Generator Control System Automation
	Code	: EE185518
	Credit(s)	: 3
	Semester	:

Description of Course
This course discusses about working principle of control and monitoring instrument in generator. The material details includes: voltage control instrument, frequency control instrument, Governor working principle, AGC working principle, Auxiliary control instrument and monitoring instrument in generator.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of generator automation and monitoring as well as the working principle of generator automation control and instrument.

Specific Skill

Able to evaluate the safety conditions of plant operation and able to improve the generator security condition through the performance improvement of its automatic control instrument.

General Skill

Able to use software such as matlab simulink and ETAP for simulation of performance evaluation of generator instrument.

Attitude

Demonstrate a responsible attitude towards the work in the field of Simulation and Analysis of generator security in the power system independently.

Main Subjects

1. The basic concept of Voltage Control Instrument in generator: The working principle of AVR, AVR circuit, AVR Working Mode. AVR auxiliary instrument.

2. Simulation of Voltage Control with AVR: AVR Modeling. AVR Parameters. Setting AVR parameters. Simulation and evaluation of AVR performance. Improving AVR performance
3. The basic concept of Frequency Control Instrument in Generator: The working principle of Governor and AGC, Governor and AGC circuit, Working Modes of Governor and AGC, Auxiliary instrument of Governor and AGC
4. Frequency Control Simulation with Governor and AGC: Modeling of Governor and AGC, Parameters Governor and AGC, Setting governor and AGC parameters, Simulation and evaluation of governor and AGC performance, improving the performance of Governors and AGCs.
5. Basic Concept of Control and Auxiliary Monitoring Instrument on Generators: Working Principles of Control and Auxiliary Instrument. Auxiliary Control and Monitoring Instrument Circuit. Working Mode of Control and Auxiliary Instrument Monitoring, Control and Monitoring of Auxiliary Instrument
6. Control and Monitoring Simulation of Monitoring and Control Auxiliary Instrument: Modeling Control and Monitoring Instrument. Parameter of Modeling Control and Monitoring Instrument. Setting the parameters of Modeling Control and Monitoring Instrument. Simulation and performance evaluation of Modeling Control and Monitoring Instrument. Improve the performance of Modeling Control and Monitoring Instrument.
7. The basic concept of Parallel generator: The working principle of Parallel Equipment. Parallel Equipment Circuit. Parallel Simulation

Reference(s)

[1] Philip Kiameh, “Power Plant Equipment, Operation and Maintenance Guide”, McGraw-Hill, 2011
[2] Adi Soeprijanto, “ Analisis Kestabilan Multi generator dengan pendekatan SMIB”, Dee Press, 2017
[3] Paul M Anderson, A.A. Fouad, “Power System Control and Stability, 2nd edition”, Wiley-IEEE Press, 2002
[4] Hadi Saadat, “Power System Analysis”, McGraw-Hill Inc, 1999

[5] Prabha Kundur, “Power System Stability and Control”, McGraw-Hill, 1994

Prerequisite(s)
Power System Analysis

COURSE	Name	: Power System Apparatus Diagnosis
	Code	: EE185519
	Credit(s)	: 3
	Semester	:

Description of Course

This course discusses the diagnostics of equipment and power systems especially high voltage transmission. To optimize the balance between cost efficiency and quality improvement of power systems, it is necessary to diagnose the condition of the equipment now and to estimate its performance in the future. The subjects discussed are diagnostic strategies of electric power systems, diagnostic tools of major age-sensitive equipment including Generators, Circuit breakers, transformers, GIS and transmission line.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently

Attitude

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering and understanding the concept of monitoring system conditions and diagnostics of power systems.

Knowing the management asset of Power System.

Know the diagnostic techniques Generator, Circuit breaker, transformer, GIS and channel.

Specific Skill

Able to explain the concept of system monitoring and diagnostic condition of electric power system, Power Management System asset, and diagnostic technique Generator, Circuit breaker, transformer, GIS and channel.

General Skill

Able to understand the flow of scientific journal writing and able to do a review journal.

Attitude

Demonstrate a responsible attitude towards the work in the field of expertise independently.

Working together to be able to take full advantage of their potential.

Main Subjects

1. Introduction: equipment failure rate, reliability of power system, intelligent grid management system, system monitoring and diagnostic of electric power system
2. Principles Asset management of electric power system
3. Principle of diagnosis of generator system
4. Principle of diagnostic Transformer

5. The principle of GIS diagnosis
6. The principle of transmission line diagnosis
7. Journal review

Reference(s)

[1] M. Hanai, H. Kojima, N. Hayakawa, K. Shinoda and H. Okubo, "Integration of asset management and smart grid with intelligent grid management system," in IEEE Transactions on Dielectrics and Electrical Insulation, vol. 20, no. 6, pp. 2195-2202, December 2013.
[2] M. Shahidehpour and R. Ferrero, "Time management for assets: chronological strategies for power system asset management," in IEEE Power and Energy Magazine, vol. 3, no. 3, pp. 32-38, May-June 2005
[3] "Handbook of Large Turbo-Generator Operation and Maintenance", Geoff Klempner and IsidorKerszenbaum, John Wiley, 2008
[4] Visa Musa Ibrahim, Zulkurnain Abdul-Malek, Nor AsiahMuhamad, Status Review on Gas Insulated Switchgear Partial Discharge Diagnostic Technique for Preventive Maintenance, Indonesian Journal of Electrical Engineering and Computer Science, Vol. 7, No. 1, July 2017, pp. 9 ~ 17, DOI: 10.11591/ijeecs.v7.i1.pp9-17
[5] https://dimrus.com/dilin_e.html
[6] Beberapa jurnal tentang peluahan sebagian dari international Journal

Prerequisite(s)

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COURSE	Name	: Partial Discharge
	Code	: EE185610
	Credit(s)	: 2
	Semester	:

Description of Course

This subject describes all partial discharge phenomena occurring on dielectric materials such as Gaseous, liquid, and solid. The development of Partial discharge starting from stable corona until breakdown of dielectric material is explained in detail. Detection and measurement system of partial discharge include electric, physic, chemical by product methods as well as its electromagnetic characteristics are explained in general. Intepretation of partial discharge in a dielectric system is discussed based on current data base available. Mitigation systems are also discussed briefly.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Understanding and mastering of the phenomenon of partial discharge on the gas, liquid, solid, dielectric material with various terminology of partial discharge according to its electrical and physical characteristics.

Mastering methods of measurement and detection of partial discharge

Specific Skill

Being able to explain the electrical and physical characteristics of partial discharges on gas, liquid, solid and dielectric materials and able to classify partial discharges based on these characteristics and compare it with various terminology from various researcher.

Being able to explain and perform measurements of electrical and non-electric PDs.

Being able to interpret material degradation based on partial discharge measurement results.

General Skill

Being able to understand the flow of scientific journal and able to do a journal review.

Attitude

Being able to demonstrate attitude of responsibility on work in his/her field of expertise independently.

Being able to work together and to make the most of his/her potential.

Main Subjects

1. Introduction: Terminology of Partial Discharge from the various point of view
2. Partial discharge mechanism on gas dielectric and modes of positive and negative corona of air in non-uniform field.
3. Partial discharge on SF6 gas
4. The development of a streamer on a liquid dielectric for non-uniform field
5. Partial discharge on solid dielectric
6. Detection of partial discharge electrically non-electrically method
7. Journal review

Reference(s)

[1] Ravindra Arora, Wolfgang Mosch, “High Voltage and Electrical Insulation Engineering”, IEEE Press, John Wiley and Sons, 2011
[2] F.H. Krueger, “Partial Discharge Detection in High Voltage Equipment”, Butterworths, 1989
[3] Farouk A. M. Rizk, Giao N. Trinh, “High Voltage Engineering”, CRC Press, 2014
[4] Beberapa jurnal tentang peluahan sebagian dari international Journal

Prerequisite(s)

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COURSE	Name	: Transformer Technology
	Code	: EE185611
	Credit(s)	: 2
	Semester	:

Description of Course
This course deals with design techniques, diagnosis, and maintenance of transformer. In electric power systems, the role of power transformers is very important to increase and decrease the voltage on the transmission and distribution lines. Whereas instrumentation transformer is used as main equipment in electric power measurement system. In current technological developments, the use of high frequency transformers greatly supports the performance and investment needs of converter equipment or power electronics power. Based on these considerations, the transformer types discussed are power transformers, instrumentation or measurement transformers and high frequency transformers.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering and understanding the design concept of power transformer, design, diagnosis, and maintenance of transformer. The types of transformers discussed in this course include power transformers, instrumentation transformers or measurements and high-frequency transformers

Specific Skill

Capable of explaining the design principles of power transformers, instrumentation transformers (CT and PT), and high frequency transformers.
Able to explain diagnostic techniques and maintenance of power transformers, instrumentation transformers (CT and PT), and high frequency transformers.

General Skill

Able to understand the flow of scientific journal writing and able to do a review journal.

Attitude

Demonstrate a responsible attitude towards the work in his own field of expertise independently.

Work together to be able to take full advantage of the potential possessed.

Main Subjects

1. Introduction: Type of transformer, the use of transformer, transformer specifications and the development of transformer technology
2. Design principle of Power Transformer
3. Design principle of Instrument Transformer
4. Design principle of High Frequency Transformer
5. Maintenance and diagnosis of Power Transformer
6. Maintenance and diagnosis of Instrument Transformer
7. Maintenance and diagnosis of High Frequency Transformer
8. Journal Review

Reference(s)

[1] Xose M. López-Fernández, H. BülentErtan, JanuszTurowski, “Transformers: Analysis, Design, and Measurement”, CRC Press; 1 edition (June 27, 2012), ISBN-10: 1466508248
[2] S. D. Myers, J. J. Kelly, R. H. Parrish, E. L. Raab, A Guide to Transformer Maintenance, S D Myers Inc (June 1, 1981) ISBN-10: 0939320002.
[3] John J. Winders, Jr, Power Transformers Principles and Applications, Marcel Dekker, Inc. 2002
[4] Beberapa jurnal tentang peluahan sebagian dari international Journal

Prerequisite(s)

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COURSE	Name	: Power Quality Conditioning
	Code	: EE185612
	Credit(s)	: 2
	Semester	:

Description of Course

This course discusses about PHENOMENA and MITIGATION, as well as the simulation of the quality of electric power in electric power distribution system, by discussing: Definition of Power Quality, Standards, Capacitor Bank for Power Factor Correction, Reactive Power Flow and power system losses, Voltage Quality, Voltage Unbalance, Power System Harmonics and Mitigation.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of PHENOMENA and MITIGATION electric power quality in power distribution system ac 3 phase in state of steady state / transient and symmetry / not symmetry.

Specific Skill

Able to simulate PHENOMENA and MITIGATION electric power quality in 3 phase ac power distribution system in steady state / transient and symmetry / no symmetry using simulation software.

General Skill

Able to use simulation software to simulate PHENOMENA and MITIGATION power quality in power distribution system.

Attitude

Demonstrate a responsible attitude towards the work in the field of electrical power expertise independently.

Working together to be able to take full advantage of their potential.

Main Subjects

1. Understanding PHENOMENA and MITIGATION electric power quality, problems due to decreased power quality
2. POWER QUALITY & STANDARD QUALITY DEFINITION: Transients, Short Duration Variations, Long Duration Variations, Voltage Imbalance, Waveform Distortions, Voltage Fluctuations, Power Frequency Variations
3. CAPACITOR BANK FOR CORRECTION OF POWER FACTOR: Definition of Power Factor, Reactive Energy Source, Technical and Economic Benefit, Capacitor Power Capacity of Bank, Example of Benefit of Power Factor Improvement

4. REACTIVE POWER REQUIREMENTS AND POWER RESPONSES: Reactive Power Flow, Reactive Power Absorbent Equipment / Costs, Reactive Power Rejection Rewards, Reactive Power Compensation, Capacitor Location, Reactive Power Compensation Side Effects.
5. VOLTAGE QUALITY: Understanding Voltage Disturbances, Transients, Short Duration Variations, Long Duration Variations, Voltage Fluctuation (Flicker).
6. IMPLICATIONS: Definition of Imbalance, Cause of Imbalance, Components of Symmetry, Indicators of Imbalance, Impact of Inequalities on Electrical Equipment, Practical Recommendations for Restricting Equilibrium, Improving Supply Chain Equilibrium.
7. Harmonics: Harmonic Causes, Harmonic Problems, How to Reduce Harmonics, How to Detect Harmonics, Voltage Harmonics and Current on Supply System, Harmonic Distortion Factors of Voltage and Current, Harmonic Flow Source, Characteristic Response System, Effects of Harmonics, Capacitors and Harmonics, Reduction of Flow Harmonics, Standard Harmonics.

Reference(s)

[1] W. Mielcczarski, G.J. Anders, M.F. Conlon, W.B. Lawrence, H. Khalsa, G. Michalik, ”Quality of Electricity Supply & Management of Network Losses”, Puma Press, 1997
[2] Roger C. Dugan, Mark F.McGranagan, H. Wayne Beaty, ”Electrical Power Systems Quality”, McGraw Hill, 1996
[3] Wilson E. Kazibwe, Musoke H. Sendaula, ”Electric Power Quality Control Techniques”, Van Nostrand Reinhold, 1993

Prerequisite(s)

Power System Analysis

COURSE			
	Name	:	Special Topics in Power System Engineering
	Code	:	EE185612
	Credit(s)	:	2
	Semester	:	

Description of Course

Nowadays, the development of knowledge on field of electrical power system engineering is very fast therefore the major of power system engineering on the graduate school of electrical engineering provides a subjects namely Special Topic for Power Systems Engineering. This subject discusses the latest developments in the field of power system engineering. This course discusses specific topic to solve current issues regarding to power system engineering such as: Defense scheme on power system, Super grid system, Renewable energy impact, Smart protection system, Bulk storage system, etc.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S08) Internalizing values, norms and academic ethics.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering on scientific concepts and principles thoroughly in the field of power system engineering related to current issues and developing strategies to analyze and solve current problems related to the electric power system.

Specific Skill

Able to develop and analyze an engineering problems and solve the problems related to scheme defense on power systems, super grid systems, renewable energy impacts, smart protection systems, bulk storage systems, and alternative storage systems

General Skill

Able to use and utilize simulation software such as MatLab, ETAP, Digsilent, and other software in power system analysis

Attitude

Internalize academic values, norms and ethics

Have an attitude of being responsible for the work in his area of expertise independently.

Main Subjects
1. Adapted to the topics offered in the semester
Reference(s)
[1] Handbook related to topics offered [2] IEEE transactions related
Prerequisite(s)
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COURSE			
	Name	:	Power System Analysis
	Code	:	EE185710
	Credit(s)	:	2
	Semester	:	

Description of Course

The power system analysis course discusses the calculation and simulation of power flow in electric power systems using several methods such as Gauss Seidel, Newton Raphson and Fast Decoupled methods. In addition, this course discusses short circuit analysis both symmetry and non-symmetry. Then, a transient stability analysis using the same broad criteria method will be discussed.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential

Course Learning Outcomes

Knowledge

Mastering the concept of simulating a 3 phase ac power system based on a 1 phase circuit calculation in a steady state / transient and symmetry / no symmetry state.

Specific Skill

Able to analyze 3-phase ac power system in a steady state / transient and symmetric / unymmetric state using MATLAB software.

General Skill

Able to use MATLAB software to simulate and analyze electric power systems

Attitude

Demonstrating the attitude of being responsible for work in the field of expertise in the Simulation and Analysis of electric power systems independently.

Working together to be able to make the most of his/her potential.

Main Subjects

1. The basic concept of power system analysis
2. Modeling: main component models, inline diagrams, impedance / admitance diagrams, units per unit, circuit models (Ybus, Zbus), mathematical models (power flow equations)
3. Power Flow Simulation and Analysis: Gauss-Seidel method, Newton Raphson method, Fast Decoupled method
4. Basic concept of short circuit on electric power systems
5. The Z-bus method is applied to the simulation and short circuit analysis of 3 symmetry phases

6. Symmetry Component Theory
7. Short circuit simulation and analysis using symmetry component theory.
8. Basic concept of stability in electric power systems
9. Stability Simulation and Analysis.

Reference(s)

[1] John J. Grainger, William D. Stevenson, Jr., "Power System Analysis", McGraw-Hill Inc, 1994.
[2] Hadi Saadat, “Power System Analysis”, McGraw-Hill Inc, 1999
[3] M.E. El-Hawary, "Electric Power Systems : Design and Analysis", Reston Publiishing Company, 1983.
[4] C.A. Gross, " Power System Analysis", 2nd Edition, John Wiley & Sons,1983.
[5] Turan Gonen, "Modern Power System Analysis", John Wiley & Sons, 1988.

Prerequisite(s)

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COURSE		
	Name	: Electric Machines
	Code	: EE185711
	Credit(s)	: 2
	Semester	:

Description of Course

Electric Machines course generally discusses the principle of electrical energy conversion machines. In detail, the course describes the principles of electromagnetics, construction and operation of transformers, design and calculation of stresses generated in rotating electrical machines. Features and characteristics of synchronous machines, construction and analysis of induction motors, construction and analysis of dc engines.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU10) Being able to implement the principle of sustainability in developing knowledge.

Attitude

(S06) Working together, having social sensitivity and caring for community and environment.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic concepts of electrical machines and the characteristics of electric machines.

Specific Skill

Able to analyze parameters in an electric machine and be able to calculate the calculation of the needs of an electric machine in a power system.

General Skill

Being able to implement the principle of sustainability in developing knowledge in electric machines

Attitude

Working together, having social sensitivity and caring for community and environment.

Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Working together to be able to make the most of his/her potential.

Main Subjects

1. The concept of electromechanics, the basis of electrical machinery, understanding the role of magnets in electrical machinery, the basics of analysis, signs of machine variables.
2. Basic concepts, construction and various transformers in electric power systems and their operations in electric power systems.

3. The concept of a magnetic field rotates in an electric machine, the construction of the windings and the process of generating voltage in a rotating electrical system.
4. Construction and synchronous engine features and operations.
5. Determination of equivalent sequences, parameters and how to analyze synchronous machines.
6. Construction and operation of induction machines
7. Analysis of induction motor performance.
8. Construction of dc engines and their operations.
9. Characteristics of dc machines.

Reference(s)

[1] J. Chapman, “Electric Machinery Fundamentals”, McGraw-Hill, Inc., New York,St. Louis, San Fransisco, Auckland, Bogotá, Caracas, Hamburg, Lisbon, London, Madrid, Mexico, Milan, Montreal, New Delhi, Paris, San Juan, Săo Paolo, Singapore, Sydney, Tokyo, Toronto, 1991.
[2] S.K. Sen, "Electrical Machinery” Khanna Publishers, New Delhi,1993..
[3] B.S. Guru & H.R. Hizirỏglu, " Electric Machinery and Transformers” Harcourt Brace Javanovich, Publishers, Technology Publications, San Diego, New York, Chicago, Austin, Washington DC, London, Tokyo, Toronto, 1988.

Prerequisite(s)

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COURSE			
	Name	:	High Voltage Engineering
	Code	:	EE185712
	Credit(s)	:	2
	Semester	:	

Description of Course

The High Voltage Engineering Course is a subject that studies and discusses the generation of high voltage testing, characteristics and process of failure of dielectric materials, lightning phenomena and their safety.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of High Voltage Generation (DC, AC, or impulse), isolation failure (gas, solid, liquid), the occurrence of lightning.

Specific Skill

Able to describe and describe high voltage generation modules both DC, AC, and impulses.

General Skill

Able to make decisions on the selection of high voltage generation module components and lightning protection coordination.

Attitude

Able to be responsible for his/her work, both individually and in groups.

Main Subjects

1. Development of High Voltage
2. DC High Voltage Generation
3. Generating Impulse High Voltage
4. High Voltage AC generation
5. Gas and Vacuum Insulation Failure
6. Liquid and Solid Isolation Failure
7. Lightning Safety

Reference(s)

[1] I Made Yulistya Negara, Teknik Tegangan Tinggi : Teori dan Aplikasi Praktis, Graha Ilmu, 2013.

[2] Kuffel E., Zaengl W.S., Kuffel J., “High Voltage Engineering: Fundamental”, 2nd Edition, Newnes, MA, 2005

[3] Naidu M.S., Kamaraju V., “High Voltage Engineering”, 3rd Edition, Mc Graw Hill international Edition, 2004

Prerequisite(s)

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COURSE		
	Name	: Power Electronics
	Code	: EE185713
	Credit(s)	: 2
	Semester	:

Description of Course

This course provides an overview of the role of electronic (power electronics) based energy conversion in the electricity system.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU10) Being able to implement the principle of sustainability in developing knowledge.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S06) Working together, having social sensitivity and caring for community and environment.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

- Knowing the applications and needs of an electronic energy-based conversion system in the scope of the electricity system and society in general.
- Knowing energy conversion devices and their main components.

Specific Skill

- Able to design energy conversion systems.
- Able to make technical analysis of energy conversion devices.

Main Subjects

1. Scope of the electricity system, needs and use of energy conversion devices
2. Semiconductor switch: diode, thyristor, transistor
3. Combination circuit R, L, C with a dc and ac voltage switch and source
4. Converters from:
   - AC to DC, wave ripple, leveling filter
   - dc to dc, wave ripple
   - DC to AC, harmonics, passive filters
   - AC to AC, topology
5. Uninterruptible power supply system, variable speed drive, harmonic filter

Reference(s)

[1] Mochamad Ashari, “Desain Konverter Elektronika Daya”, Penerbit Informatika, Bandung, 2017

[2] Muhammad H. Rashid, “Power Electronics Handbook Devices, Circuits, and Applications”, Third Edition, 2011

[3] Ned Mohan, “Power Electronics”, John Willey and Sons, 2012

Prerequisite(s)

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2. Control System Engineering

COURSE		
	Name	: Statistical Methods and Optimization
	Code	: EE185101
	Credit(s)	: 2
	Semester	: I

Description of Course

In this course, students learn the two main topics, namely: (1) statistical methods needed to design research as well as to analyze and interpret the measurements and simulations; (2) the basics and methods of optimization needed to find solutions to various technical problems encountered in research, for example: linear programming, convex optimization, iterative methods, optimization inspired by nature: genetic algorithms, etc.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and methods of statistical analysis of measurement data and mastering the optimization method for a problem in engineering in the field of electrical engineering

Specific Skill

Able to design experiments and calculate statistical analysis on measurement data and be able to define optimization problems and find optimal solutions

General Skill

Able to use software and tools for statistical analysis and optimization, e.g. Matlab and R.

Attitude

show the attitude of being responsible for the work in his area of expertise independently

Main Subjects

1. Introduction
2. Descriptive statistics
3. Experimental design
4. Univariate, multivariate and variance analysis
5. Application of statistical methods
6. Optimization problems
7. Mathematical optimization
8. Completion of analytical optimization
9. Completion of numerical optimization

10. Dynamic programming
11. Introduction to meta-heuristics and evolutionary algorithms

Reference(s)

[1] William M. Mendenhall & Terry L. Sincich, “Statistics for Engineering and the Sciences,” 6th ed., CRC Press, 2016.
[2] Jay Devore, “Probability and Statistics for Engineering and the Sciences,” 9th ed., CENGAGE Learning, 2016.
[3] William Navidi, “Statistics for Engineers and Scientists,” 3rd ed., McGraw-Hill, 2011.
[4] Jorge Nocedal & Stephen J. Wright, “Numerical Optimization,” 2nd ed., Springer, 2006.
[5] Edwin K.P. Chong & Stanislaw H. Zak, “An Introduction to Optimization,” 4th ed., John Wiley & Sons, 2013
[6] Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, “Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization,” John Wiley & Sons, 2017.

Prerequisite(s)

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COURSE			
	Name	:	Introduction to Research
	Code	:	EE185102
	Credit(s)	:	2
	Semester	:	I

Description of Course

The Introduction to Research course is a course that delivers or prepares students to be able to develop research ideas and plan research activities and plan writing a thesis proposal. In this course, students will be given material on basic knowledge and basic preparation before formulating the problems to be examined in their thesis proposal. The material to be taught includes: Searching for scientific articles, index measuring scientific articles and researchers, Introduction to research fields in the Laboratory of each area of expertise, definition of problems in research, differences in research projects and work projects, understanding of hypotheses, Novelty, Plagiarism, methods and methodology , types of research, types of data collection methods and data collection techniques (surveys, questionnaires, interviews, measurements, data mining) and fishbone diagrams.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the procedures for scientific article search and flow in ran. Understanding hypotheses, novelty, plagiarism, types of research in the laboratory and procedures for writing fishbone research diagrams, as well as various data collection techniques in research so that the thesis proposal plan can be prepared better.

Specific Skill

Being able to browse scientific articles of interest, is able to develop a formulation of research problems that have the potential to be used as research themes in his thesis proposal, and contain elements of novelty and avoid plagiarism.

General Skill

Able to develop research plans that contain novelty ranging from building hypothesis, formulating problems and planning research methods

Attitude

Demonstrate honesty in developing research themes, open to suggestions and input and responsible for avoiding plagiarism.

Main Subjects

1. The procedure for a scientific article search

2. Introduction to Research
3. Hypothesis in research
4. An understanding of Novelty in research
5. Plagiarism
6. Data collection techniques in research
7. Types of research
8. Citation and use of Reference (s)
9. The 1st Lab-Research theme
10. The 2nd Lab-Research theme
11. The 3rd Lab-Research theme
12. The 4th Lab-Research theme
13. Preparation of Fishbone Diagram

Reference(s)

[1] Research Methodology., A Step by step guide for beginners., Ranjit Kumar., 3rd Edition., 2011
[2] Research Methodology: Methods and Techniques., 2nd Revised Edition., C.R. Kothari., New Age International Publisher., 2004
[3] Research and Methodology: Tools and Techniques., Prabhat Pandey, Meenu Mishra Pandey, 2015

Prerequisite(s)

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COURSE	Name	:	Linear Systems Theory
	Code	:	EE185121
	Credit(s)	:	3
	Semester	:	I

Description of Course

This course discusses the structure and properties of linear systems with an emphasis on the case of single-input single output (SISO) with topics covered include matrix theory, linear vector space, eigenvalue and eigenvector, transition matrix solutions and linear differential equation solutions, state variables equations, properties of controllability and observability and their application, state-feedback-based controller and state observers.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of linear system theory to develop design procedures needed for linear system analysis and design.

Specific Skill

Able to formulate linear system control in the best control for the linear system.

General Skill

Able to increase learning capacity independently through the design of a linear control system using Matlab/Simulink software.

Attitude

Demonstrating attitude of responsibility on his/her tasks independently and working together on a team to obtain better results.

Main Subjects

1. Mathematical Descriptions of Systems
2. Matrix Algebra
3. State-Space Solutions
4. Stability
5. Controllability and Observability
6. State Feedback Controllers and State Observers

Reference(s)

[1] Chi-Tsong Chen, Linear System Theory and Design, 4th Edition, Oxford University Press, Oxford, UK, 2013

[2] Thomas Kailath, Linear Systems, Prentice-Hall, 1980
[3] Panos J. Antsaklis and Anthony N. Mitchel, Linear Systems, Birkhäuser, 2005

Prerequisite(s)

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COURSE	Name	:	Analysis and Design of Digital Control Systems
	Code	:	EE185122
	Credit(s)	:	3
	Semester	:	I

Description of Course

Analysis and Design of Digital Control Systems course discusses about stability analysis and discrete system design. The system model is represented by different equations obtained from the transformation of differential equations using z transformations. Controllability and observability are used as discrete time system analysis expressed in state equations. The design of the regulatory system using state feedback and observer and its implementation in control system using computer is also discussed in this course.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of the digital regulatory system to develop design procedures needed for system analysis and design with the help of Matlab / Simulink.

Specific Skill

Able to formulate digital regulation system problems with new ideas for technology development in the field of Management System Engineering expertise.

General Skill

Able to increase learning capacity independently through designing nonlinear control systems and able to use Matlab / Simulink software to design digital control systems.

Attitude

Shows the attitude of being responsible for the assignments given in the lecture independently.

Main Subjects

1. Review of z-transform
2. State space analysis
3. Controllability and observability
4. Design of discrete time control systems
5. State feedback controllers and observers

Reference(s)

[1] Katsuhiko Ogata, Discrete-Time Control systems, 2nd Edition, Pearson Education/PHI, 1995.

[2]	Benjamin C. Kuo, Digital Control Systems, 2nd Edition, Oxford University Press, 2003.

Prerequisite(s)
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COURSE			
	Name	:	Scientific Writing
	Code	:	EE185201
	Credit(s)	:	2
	Semester	:	II

Description of Course

Scientific Writing course discusses the method of writing scientific documents, especially for thesis proposals at the master level. Lecture materials include various, characteristics and functions of scientific documents and parts of scientific documents. Indonesian language citation, plagiarism and grammar will also be discussed. Through this lecture students will develop the skills to write academic documents that are useful for their future success.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Being able to recognize and describe an academic document.

Specific Skill

Being able to describe procedures for making academic documents.

General Skill

Being able to make an academic document.

Attitude

Demonstrating an attitude of being responsible for work in his area of expertise independently.

Main Subjects

1. Introduction: types, functions and characteristics of scientific documents.
2. Parts of scientific documents: opening (front matter).
3. Parts of scientific documents: contents or torso (body).
4. Parts of scientific documents: cover (end matter).
5. Illustration on scientific documents.
6. Citation: source, writing, and plagiarism.
7. Indonesian language spelling and grammar: spelling, words, sentences, and paragraph.

Reference(s)

[1] Program Pasca Sajana ITS, Pedoman Penyusunan Tesis Tahun 2014.
[2] Tim Pengembang Pedoman Bahasa Indonesia, PEDOMAN UMUM EJAAN BAHASA INDONESIA, Edisi 4, Badan Pengembangan dan Pembinaan Bahasa Kementerian Pendidikan dan Kebudayaan, 2016.

[3] Adjat Sakri, Bangun Paragraf Bahasa Indonesia, Penerbit ITB, 1993
[4] Adjat Sakri, Bangun Kalimat Bahasa Indonesia, Penerbit ITB, 1994
[5] L.C. Perelman, J. Paradis, and E. Barrett. The Mayfield Handbook of Technical and Scientific Writing. New York, NY: McGraw-Hill, 1997. ISBN: 9781559346474.

Prerequisite(s)
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COURSE			
	Name	:	Analysis and Design of Instrumentation Systems
	Code	:	EE185221
	Credit(s)	:	3
	Semester	:	II

Description of Course

The course of Analysis and Design of Instrumentation Systems discusses the use of instrumentation or components needed in controlling a system of plant. Instrumentation system analysis is carried out in order the use of these components meets the criteria and specifications required in the control system design.

Learning Outcomes

Knowledge

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S011) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering design instrumentation techniques and factual knowledge related to the latest technology in the field of Control System Engineering expertise.

Specific Skill

Able to produce instrumentation system designs in the design of control systems by considering technical standards, aspects of performance, reliability, ease of application, and sustainability guarantees.

General Skill

Able to improve the ability to learn and solve problems independently and able to implement ICTs in the execution of assigned tasks.

Attitude

Make every effort to get an instrumentation system design for controlling a real system.

Main Subjects

1. Introduction to instrumentation in control systems
2. Signal conditioning
3. Sensors
4. Final control operation
5. Control loop
6. Computer system

Reference(s)

[1] Curtis D. Jonhson., “Process control instrumentation technology,” 7th edition, PHI, New Jersey, 1989
[2] Wolfgang Altmann, “Practical Process Control for Engineers and Technicians,” John Elsevier, 2005

[3] W.L. Luyben, “Process Modeling, Simulation and Control for Chemical Engineers,” McGraw Hill, 2nd edition, 1990
[4] Karl J. Astrom, and Bjorn Wittenmark, “Computer-controlled systems: theory and design,” 3rd edition, PHI, New Jersey, 1997.

Prerequisite(s)

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COURSE			
	Name	:	Identification and Filtering
	Code	:	EE185222
	Credit(s)	:	3
	Semester	:	II

Description of Course

This course discusses the method of signal processing for disturbed signal to obtain a model, or identification, of the system that generates the signal. The model used is a discrete time model and is applied to estimate and predict the system state based on the identified model. The system models include ARMA, ARMAX, and ARIMA models used for state estimation and prediction using Wiener filters and Kalman filters.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concept, analysis, and application of linear system modeling from input and output measurement data

Mastering estimation concept and state estimation design for linear and nonlinear systems

Specific Skill

Able to model the measurement data of the input system output and analyze the model obtained

Able to perform analysis and design of state estimators for linear and nonlinear systems

General Skill

Able to make implementation of system identification and state estimation in the form of computer programs

Main Subjects

1. System Identification
2. Wiener Digital Filter
3. Kalman Filter

4. Wiener filter and Kalman filter Applications

Reference(s)

[1] Alkaff, A. Diktat Kuliah Teknik Penyaringan Optimal
[2] Candi, J.A., Model Based Signal Processing, Wiley-IEEE, 2006
[3] Brown, R.G. dan Y.C. Hwang, Introduction to Random Signals and Applied Kalman Filtering, 4th ed, Wiley, 2012
[4] Shanmugan, K.S. dan A. M. Breiphol, Random Signals: Estimation, Detection, and Data Analysis, Wiley, 1988

Prerequisite(s)

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COURSE	Name	: Robot Dynamics and Control
	Code	: EE185321
	Credit(s)	: 2
	Semester	: III

Description of Course

The course of Dynamics and Robot Settings discusses the kinematics and the dynamics model of robots and their control. Details of the material studied include coordinate transformation, robot kinematics, differential motion, robot dynamics, robot controls and visual feedback.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of dynamics and control of robots in the analysis and design of robot control using the dynamics model and robot kinematics.

Specific Skill

Able to formulate robot controls by considering the latest technology in robot design and control.

General Skill

Able to increase the capacity of learning independently through the design of robot control by considering the latest technology for particular applications.

Attitude

Shows the attitude of being responsible for the assignments given in lectures independently and able to work together in teams to get good design results.

Main Subjects

1. Coordinate transformation
2. Robot kinematics
3. Differential motion
4. Robot dynamics
5. Robotics Control
6. Visual feedback

Reference(s)

[1] Mark W Spong, M Vibyasagar : Robot Dynamics and Control, John Wiley & Sons, 1989.
[2] H Asada, JJE Slotine : Robot Analysis and Control, John Wiley & Sons, 1986.

[3] Fu.K.S. Gon Zalez RoC., Lee CoS.G., Robotics, Control Sensing Vision and Intelligence, McGraw Hill, into Ed., 1987

Prerequisite(s)

Linear Systems Theory

COURSE	Name	:	Thesis
	Code	:	EE185401
	Credit(s)	:	8
	Semester	:	IV

Description of Course

The Thesis course is a capstone project for the master program as one of the requirements to complete the master program study. Thesis research is the culmination of all knowledge gained by students during the study and scientific validation and expertise that has been obtained. Students must write the results of their research in the Thesis book and take the Thesis examination, and publish the results of their thesis research in scientific journals as one of the graduation requirements.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

(KU06) Capable of managing, developing and maintaining networking with colleagues, peers within the broader institutes and research community.

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S08) Internalizing values, norms and academic ethics

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of scientific and engineering comprehensively, and factual knowledge about information and communication technology and the latest technology to develop procedures and strategies needed for the analysis and design of systems in the field of Electrical Engineering and its applications which are the topic of discussion.

Specific Skill

Being able to formulate and compile engineering problem solving, produce system designs and implement alternative engineering problem solving by expanding knowledge that adapts changes in science or technology in the field of Electrical Engineering which is the topic of discussion.

General Skill

Being able to produce a feasible thesis to be published in scientific journals by utilizing both software / hardware technology in conducting experiments related to system analysis and design which is the topic of discussion.

Attitude

Striving maximally in solving problems in the field of Electrical Engineering which is the topic of discussion to achieve perfect results.

Main Subjects

1. Introduction (Background, Problem Formulation, Objectives, Contributions)
2. Research Studies and Basic Theory
3. Research Methodology
4. Research Results and Discussion
5. Conclusions and Suggestions

Reference(s)

[1] Supporting textbooks
[2] Papers from supporting journals or conferences
[3] Pedoman Penyusunan Thesis, Program Pascasarjana ITS, 2014.
[4] Pedoman Penyusunan Tesis, Departemen Teknik Elektro, http://teras.ee.its.ac.id/

Prerequisite(s)

Scientific Writing

COURSE	Name	: Optimal and Robust Control Systems
	Code	: EE185520
	Credit(s)	: 2
	Semester	:

Description of Course

The course of Optimal and Robust Control Systems discusses the design of an integrated multivariable control system for systems that have uncertainties model from systems that will be controlled or there are external disturbances that affect system behavior. The material discussed included: Norms of signals and systems, Nominal stability and performance, H2 and optimal H-infinity control, Uncertainty modeling for robust control, Robust closed-loop stability and performance; Robust H-infinity control, Robust controller design via mu-synthesis.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of robust control to develop design procedures needed in linear system analysis and design using Matlab / Simulink.

Specific Skill

Able to analyze the stability of a linear system and design a robust control system by considering the robustness aspects of the design result of the system and the ease of its application.

General Skill

Able to increase learning capacity independently through the design of a robust control system and able to use Matlab / Simulink software to design robust control systems for linear systems.

Attitude

Shows the attitude of being responsible for the assignments given in lectures independently and can work together in teams to obtain good system design results.

Main Subjects

1. Norms of signals and systems
2. Nominal stability and performance
3. H2 and H-infinity optimal control
4. Uncertainty modelling, Robust closed-loop stability and performance
5. Robust H-infinity control
6. Robust controller design via mu-synthesis

Reference(s)

[1] Kemin Zhou, with John Doyle, Essentials of Robust Control, Prentice-Hall, 1998
[2] G. E. Dullerud and F. Paganini, A Course in Robust Control Theory: A Convex Approach, Springer Verlag, 2000
[3] Frank L. Lewis, Vassilis L. Syrmos, “Optimal Control,” John Wiley & Sons Inc., New York, 1995

Prerequisite(s)

Linear Systems Theory

COURSE	Name	: Nonlinear Control Systems
	Code	: EE185521
	Credit(s)	: 2
	Semester	:

Description of Course

The Nonlinear Control course discusses the modeling, analysis, and design methods of nonlinear systems and its applications in control systems. The first part of the course focuses on the analysis of the phenomena of nonlinear systems equipped with examples in real systems. The second section focuses on system stability via Lyapunov techniques, and the last focuses on the control design of nonlinear systems using feedback linearization techniques, sliding mode control and gain scheduling.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

P(03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and engineering principles of nonlinear control to develop procedures and strategies needed for the analysis and design of nonlinear control using Matlab/Simulink.

Specific Skill

Able to analyze the stability of nonlinear systems and design nonlinear control systems taking into account the performance aspects and ease of application.

General Skill

Able to improve the learning capacity independently through the design of nonlinear control and able to use Matlab/Simulink in designing of nonlinear control system.

Attitude

Demonstrating attitude of responsibility on his/her tasks independently and working together on a team to obtain better results.

Main Subjects

1. Nonlinear Model and Nonlinear Phenomena
2. Phase Plane Analysis of Second Order Systems
3. Lyapunov Stability
4. Nonlinear Control Design
5. Feedback Linearization
6. Sliding Mode Control and Gain Scheduling

Reference(s)

[1] J.E. Slotine, W. Li (1991), "Applied Nonlinear Control," PHI, New Jersey
[2] H.K. Khalil (2002), "Nonlinear System," PHI
[3] S.S. Sastry (1999), "Nonlinear Systems, Analysis, Stability and Control," Springer Verlag
[4] H.K. Khalil (1995), "Nonlinear Systems, in M.K. Masten (Ed.), Modern Controls Systems," IEEE Inc., New Jersey
[5] International papers related to the nonlinear control problems

Prerequisite(s)

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COURSE	Name	: Intelligent System and Control
	Code	: EE185522
	Credit(s)	: 2
	Semester	:

Description of Course

The course of Intelligent Systems and Control studies system design methods and controls using fuzzy control methods and neural networks and genetic algorithms. Fuzzy systems and controls based on the Takagi-Sugeno model are used to represent the dynamics of a nonlinear system with a rule basis for controllers using the concept of Parallel Distributed Compensation. Fuzzy system design validation is applied to the real system. Neural network methods are also discussed and used for the purposes of designing a system and its controls, while genetic algorithms are used to solve optimization problems in the control system.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of intelligent systems and control for real system analysis and design with the help of Matlab / Simulink.

Specific Skill

Able to design smart systems and controls for real systems with the help of Matlab / Simulink.

General Skill

Able to increase self-capacity in overcoming system design problems and self-regulation through system design and intelligent control using Matlab / Simulink to perform system design simulation.

Attitude

Demonstrate an attitude of being responsible for the tasks given independently and able to work together in teams to obtain good system design and control.

Main Subjects

1. Introduction to Intelligent System and Control
2. Fuzzy Systems
3. The aplication of fuzzy control to pendulum-cart system
4. Neural Network and its aplication in control systems
5. Optimization using Genetic Algorithm

Reference(s)

[1] Kevin M. Passino and Stephen Yurkovich, “Fuzzy Control,” Addison-Wesley Longman Inc., 1998.
[2] Kazuo Tanaka, Hua O. Wang, “Fuzzy Control Systems Design and Analysis: A Linear Matrix Inequality Approach,” John Wiley & Sons, 2001
[3] Stuart J. Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach,” 3rd Edition., Pearson Education, Inc., 2010
[4] Melanie Mitchell., An Introduction to Genetic Algorithms., the MIT press, 1996
[5] Stephen I. Gallant, “Neural Network Learning and Expert Systems,” the MIT press, London,1993

Prerequisite(s)

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COURSE	Name	:	Formation and Collaboration Control Systems
	Code	:	EE185523
	Credit(s)	:	2
	Semester	:	

Description of Course

The Formation and Coordination Control System discusses multi-agent analysis and control techniques to form a formation by coordinating to perform certain tasks by meeting specified performance criteria. To coordinate, agents can work together, or compete, exchange certain information according to the predefined network communications topology.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

The concept of agreement protocol and its application on multi-agent system.

Concepts and principles of formation and coordination arrangements, methods of analysis and design of formation and coordination controllers.

Specific Skill

Able to design formation and coordination systems for multi-agent systems.

Able to perform analysis on system behavior without and with controller.

General Skill

Able to implement formation and coordination controllers using computer programs.

Main Subjects

1. Multi-Agent control system concept and its application
2. Consensus protocol
3. Formation and coordination control
4. Multi-agent coordination for distributed estimation
5. Optimal coordination for multi-agent
6. Noncooperative agents
7. Multi agent Markovian decision processes

Reference(s)

[1] Wei Ren and Randal W. Beard, Distributed Consensus in Multi-vehicle Cooperative Control: Theory and Application, Springer-Verlag, 2008
[2] Zhongkui Li and Zhisheng Duan, Cooperative Control of Multi-Agent Systems: A Consensus Region Approach, CRC Press, 2014
[3] Frank L. Lewis, Hongwei Zhang, Kristian Hengster-Movric, Abhijit Das, Cooperative Control of Multi-Agent Systems: Optimal and Adaptive Design Approaches, Springer-Verlag, 2015

Prerequisite(s)

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COURSE		
	Name	: Networked Control Systems
	Code	: EE185524
	Credit(s)	: 2
	Semester	:

Description of Course

The course of networked control systems equips students with the concepts and applications of the control system in which the sensors and/or actuators are connected through a computer network. We will examine the problems that arise with the configuration of this control system, how to model and to conduct a system behavior analysis will be discussed. With the results of the analysis, the controller synthesis will be performed to get the system with the desired performance.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concepts and application of networked control systems system

Specific Skill

Being able to perform analysis and design of system control that are connected in the network

General Skill

Being able to use CAD to perform analysis and design of networked constrol systems

Attitude

Trying his/her best to achieve perfect results.

Main Subjects

1. Concept and networked architecture in control system
2. Types of networked control system
3. Components in networked control system
4. Problems in the networked control system
5. Estimating on the network with data loss
6. Analyzing the network arrangement system
7. Designing a network arrangement system
8. Application on the networked control system

Reference(s)

[1] Bemporad, Alberto, Heemels, Maurice, Vejdemo-Johansson, Mikael, Networked Control Systems, Springer, 2010
[2] Jagannathan Sarangapani, Hao Xu, Optimal Networked Control Systems with MATLAB, CRC Press, 2016

Prerequisite(s)
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COURSE	Name	: Human-Robot Interaction
	Code	: EE185525
	Credit(s)	: 2
	Semester	:

Description of Course

In this course, students are introduced to the technology of interaction between humans and robots with aspects related to the modeling, analysis and design of the regulatory system. Broadly, human-robot interaction is divided into two major parts, namely computer-based interaction and physical-based interaction. The final section of the lecture also discusses the security aspects of human robot interaction.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S11) Trying his/her best to achieve perfect results.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and applications of human and robot interaction systems in terms of their controls.

Specific Skill

Able to do analysis and design of human-robot interaction based on computer and physical control.

General Skill

Able to use assistive system control software to conduct analysis and design for human-robot interaction controls.

Attitude

Try his/her best to achieve best results

Working together to be able to make the most of his/her potential.

Main Subjects

1. Concept of human - robot interaction (HRI)
2. Types and levels of HRI
3. Problems with computer based HRI (CHRI) and physical HRI (PHRI)
4. CHRI analysis and design
5. Modeling and arrangement of the PHRI Arm
6. Modeling and control on virtual end effector PHRI
7. Modeling and control on the whole body PHRI
8. Modeling and control on reactive movement (avoiding collisions)
9. Modeling and control on repulsive and active movements
10. Safety aspects of HRI

Reference(s)

[1] Takayuki Kanda, Hiroshi Ishiguro, Human-Robot Interaction in Social Robotics, 2017, CRC Press
[2] Arkin, R.C., Behavior-Based Robotics. 1998, The MIT Press

Prerequisite(s)
Robotika

COURSE	Name	: Intelligent Control of Energy Distribution
	Code	: EE185526
	Credit(s)	: 2
	Semester	:

Description of Course

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE			
	Name	:	Control of Electrical Machines
	Code	:	EE185527
	Credit(s)	:	2
	Semester	:	

Description of Course

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE			
	Name	:	Event Discrete Control Systems
	Code	:	EE185528
	Credit(s)	:	2
	Semester	:	

Description of Course

The course of Event Discrete Control Systems refers to the topic of the system that is modeled as event transitions. The concept and modeling of discrete event systems is presented in the first part. There are several modeling approaches used, including the petri net. Furthermore, the method of analysis and design of the system based on representation of the model used is also conveyed. Modeling for a supervisory and decentralized system is also part of this course. Discrete event systems are widely applied to the queue with many real-world applications.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concept and theory of discrete event management systems,

Specific Skill

Able to analyze and design discrete event management systems.

General Skill

Able to use appropriate software to analyze and design discrete event management systems,

Attitude

Trying his/her best to achieve perfect results

Main Subjects

1. Discrete event system modeling with language and automata models, Petri Net models, and dioid algebra and logic models
2. Discrete system event analysis: stability, reachability, deadlocks
3. Discrete system event supervisory arrangements: controllers and supervisors
4. Regulating supervisory system of discrete events: controllability, observability, stability
5. Decentralized system

Reference(s)

[1] C. G. Cassandras and S. Lafortune, “Introduction to Discrete Event Systems”, 2nd Edition, Springer, 2008

[2] Kumar Ratnesh, Vijay K. Garg, "Modelling and Control of Logical Discrete Event Systems “, Kluwer Academic Publishers, 1995.

Prerequisite(s)
Analysis and Design of Digital Control Systems

COURSE	Name	: Special Topics in Control Systems
	Code	: E185529
	Credit(s)	: 2
	Semester	:

Description of Course

The course of Special Topics in Control Systems is a course that provide opportunities for students to learn fundamentally and in detail about the development of science and / or technology in the field of Control System Engineering which are considered important to be known by Masters level students. The material covered includes background, basic theories and concepts, the development of method or algorithm variants, performance evaluation, and application concepts.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering scientific concepts and principles in a comprehensive manner to develop procedures and strategies needed for the analysis and design of the system and mastery of the latest technology in the Control System Engineering and its applications that become the topic of discussion.

Specific Skill

Able to compile engineering problem solving by expanding knowledge that adapts changes in science and/or technology in the field of Control System Engineering which is related to the topic of discussion.

General Skill

Being able to use and utilize the simulator software and MatLab / Simulink in conducting experiments related to the analysis and design of the Control System Engineering related the topic of discussion.

Attitude

Trying maximally in solving problems in the field of Control System Engineering related to the topic of discussion to achieve best results.

Main Subjects

1. Background or supporting concepts and theories
2. Basic concepts and theories
3. Development of variants of methods or algorithms

4. Performance evaluation
5. The concept of implementation

Reference(s)

[1] Supporting textbooks.
[2] Papers from supporting journals or conferences.

Prerequisite(s)

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COURSE		
	Name	: Analysis and Design of Control Systems
	Code	: EE185720
	Credit(s)	: 2
	Semester	:

Description of Course

This course is a continuation of the Basic Course of Control Systems. After students understand the response characteristics in the time domain, the important thing to learn is response analysis in the frequency domain and modern control techniques that use the system's mathematical model in state space. Therefore, the scope studied in this course is the technique of analyzing and designing system settings in the frequency domain (using root locus and bode diagrams) as well as in state space.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the techniques of analysis and design of control systems in time and frequency domains and in the representation of state equations.

Specific Skill

Able to analyze and design of the control system using root locus, bode diagrams, nyiquist diagrams and state space.

General Skill

Able to simulate the results of the control system design using simulation software.

Attitude

Having the spirit to improve knowledge in the field of control systems to improve the quality of the student in mastering technology.

Main Subjects

1. System stability analysis using the Root Locus method
2. Analysis of frequency domain stability using Bode diagram method and Nyquist diagram
3. Designing a Root Locus-based compensator
4. Designing a Bode Diagram based compensator
5. System representation in the form of state equations
6. The canonical form of the equation of state and its transformation
7. Intrinsic properties of state equations (controllability & observability)
8. Analysis of system stability in the form of state equations
9. Design controller state feedback
10. The decoupling process of the MIMO system using algebraic block diagrams and state feedback

11. Cascade system design
12. Design error-based controller model: Sliding Mode, inverse error model

Reference(s)

[1] Ogata, Katsuhiko. “Modern Control Engineering”, 5 edition, Pearson, 2009.
[2] Kuo, C. Benjamin. “Automatic Control System”, Wiley, 2002.
[3] Franklin, F. Gene, Powell, J. David, Naeini, Abbas Emami. “Feedback Control of Dynamic System 6th edition”
[4] Nise, Norman S., “Control System Engineering”. Wiley. 2015

Prerequisite(s)

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COURSE	Name	:	Optmization Techniques
	Code	:	EE185721
	Credit(s)	:	2
	Semester	:	

Description of Course

The Operational Techniques Course discusses the concept of optimization, the basics of mathematical optimization, analytical solutions to optimization problems, numerical solutions to optimization problems without constraints, linear programming and variations, dynamic programming both deterministic and stochastic, and metaheuristic methods.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes
Knowledge Mastering the concept of optimization and various forms of optimization problems along with the method of completion. **Specific Skill** Able to get mathematical model of optimization problems and solve various optimization problems by using analytical approaches, numerical approaches, and matrix and metaheuristic methods. **General Skill** Able to use Matlab, Delphi and Visual C software to solve optimization problems. **Attitude** Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Main Subjects
1. Optimization concept 2. Basic Mathematics of Optimization 3. Analytical completion of Optimization Issues 4. Numerical completion of Optimization Issues 5. Linear Programming 6. Linear Programming Variations 7. Deterministic Dynamic Programming 8. Stochastic Dynamic Programming 9. Case Study 10. Metaheuristic method

Reference(s)
[1] Alkaff, A. dan Gamayanti, N. Diktat Kuliah Penyelidikan Operasi [2] Analisa Hillier and Lieberman., “Introduction to Operation Research”, 8th Edition, Mc Graw Hill international Edition, 2004 [3] Hamdy A taha., “Operation Research : an Introduction”, 8th Edition, Prentice Hall, 2006

[4] WAGNER, H.M., "Principles of Operations Research", 2nd edition", Prentice-Hall, New Jersey 1980.

Prerequisite(s)

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COURSE			
	Name	:	System Automation
	Code	:	EE185722
	Credit(s)	:	2 Credit
	Semester	:	

Description of Course

This course provides an understanding to students about the forms of industrial automation system applications, various automation systems, control principles and various methods of designing ladders in the field of automation, and instrumentation technology and process control.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of automation systems in industry.

Specific Skill

Able to analyze and design automation systems in the industry

Able to provide consultation on the design and development of automation systems in the industry.

General Skill

Able to apply various ladder diagram design methods to the Programmable Logix Controller (PLC) equipment.

Able to apply system technology products and other settings.

Attitude

Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Main Subjects

1. System automation concept
2. System automation equipment
3. Designing a ladder diagram based on sequence charts
4. Designing a ladder diagram based on the cascade method
5. Designing a ladder diagram based on Grafchet
6. Designing ladder diagrams based on state diagrams
7. Designing a ladder diagram based on the huffman method
8. Designing a ladder diagram based on Petri-Net

Reference(s)

[1] D. Pessen, Industrial Automation, Wiley, 1989
[2] S. Baranov, Logic Synthesis for Control Automata, Kluwer Academic Publisher, 1994

[3] Applying Structured Analysis To Automation Systems (Paper 1)
[4] The Principles of State Logic Control (Paper 2)
[5] Tadao Murata, Petri Nets: Properties, Analysis and Applications, Proceedings of the IEEE, vol.77, no 4, April 1989 (paper 3)

Prerequisite(s)

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3. Multimedia Telecommunications

COURSE	Name	: Statistical Methods and Optimization
	Code	: EE185101
	Credit(s)	: 2
	Semester	: I

Description of Course
In this course, students learn the two main topics, namely: (1) statistical methods needed to design research as well as to analyze and interpret the measurements and simulations; (2) the basics and methods of optimization needed to find solutions to various technical problems encountered in research, for example: linear programming, convex optimization, iterative methods, optimization inspired by nature: genetic algorithms, etc.
Learning Outcomes
Knowledge (P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career. **Specific Skill** (KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and methods of statistical analysis of measurement data and mastering the optimization method for a problem in engineering in the field of electrical engineering

Specific Skill

Able to design experiments and calculate statistical analysis on measurement data and be able to define optimization problems and find optimal solutions

General Skill

Able to use software and tools for statistical analysis and optimization, e.g. Matlab and R.

Attitude

show the attitude of being responsible for the work in his area of expertise independently

Main Subjects

1. Introduction
2. Descriptive statistics
3. Experimental design
4. Univariate, multivariate and variance analysis
5. Application of statistical methods
6. Optimization problems
7. Mathematical optimization
8. Completion of analytical optimization
9. Completion of numerical optimization

10. Dynamic programming
11. Introduction to meta-heuristics and evolutionary algorithms

Reference(s)

[1] William M. Mendenhall & Terry L. Sincich, “Statistics for Engineering and the Sciences,” 6th ed., CRC Press, 2016.
[2] Jay Devore, “Probability and Statistics for Engineering and the Sciences,” 9th ed., CENGAGE Learning, 2016.
[3] William Navidi, “Statistics for Engineers and Scientists,” 3rd ed., McGraw-Hill, 2011.
[4] Jorge Nocedal & Stephen J. Wright, “Numerical Optimization,” 2nd ed., Springer, 2006.
[5] Edwin K.P. Chong & Stanislaw H. Zak, “An Introduction to Optimization,” 4th ed., John Wiley & Sons, 2013
[6] Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, “Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization,” John Wiley & Sons, 2017.

Prerequisite(s)

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COURSE	Name	: Introduction to Research
	Code	: EE185102
	Credit(s)	: 2
	Semester	: I

Description of Course

This course is preparing student to formulate research ideas, planning research activities and writing the thesis proposals. In this course students will be given materials on basic knowledge of research before formulating the topics to be studied in their thesis. The materials include: defining problem in research, the difference between research project and practical/work project, understanding the hypothesis, novelty, plagiarism (including in method and methodology), types of research (qualitative and quantitative), types of collecting data method and techniques (survey, questionnaire, interview, measurement, data mining) and fishbone diagram.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrate a responsible attitude towards the work in the field of his/her expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Students understand the hypothesis, novelty, plagiarism and the types of research and various techniques of data retrieval in research so that the thesis proposal then can be prepared better.

Specific Skill

Students are able to develop a research problem that has the potential to be his/her research idea in their thesis, and contains elements of novelty and avoid plagiarism.

General Skill

Able to develop research plans that contain novelty starting from building a hypothesis, defining problem formulation and developing research methodology plan.

Attitude

Shows an honest attitude in developing the research topic, open to suggestions and inputs and responsible to avoid plagiarism activities.

Main Subjects

1. The procedure for a scientific article search
2. Introduction to Research
3. Hypothesis in research
4. An understanding of Novelty in research

5. Plagiarism
6. Data collection techniques in research
7. Types of research
8. Citation and use of Reference (s)
9. The 1st Lab-Research theme
10. The 2nd Lab-Research theme
11. The 3rd Lab-Research theme
12. The 4th Lab-Research theme
13. Preparation of Fishbone Diagram

Reference(s)

[1] Research Methodology., A Step by step guide for beginners., Ranjit Kumar., 3rd Edition., 2011

[2] Research Methodology: Methods and Techniques., 2nd Revised Edition., C.R. Kothari., New Age International Publisher., 2004

[3] Research and Methodology: Tools and Techniques., Prabhat Pandey, Meenu Mishra Pandey, 2015

Prerequisite(s)

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COURSE	Name	: Random Process and Signal Processing
	Code	: EE185131
	Credit(s)	: 3
	Semester	: I

Description of Course

Various signals and phenomena in communication systems and networks can be modeled as a random process, which can then be used to analyze the performance of a system or to design a particular technique. In this course, students will study probabilities, random variables, random vectors, random processes, and calculation methods. In addition, the main statistical signal processing techniques for telecommunications will be studied, namely: parameter estimation and detection and several application examples, such as channel estimation, equalization, and adaptive filters.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts of probability and random processes, as well as the calculation methods to be applied to various problems in the telecommunications field.

Specific Skill

Able to model various kinds of random signals, transform them in systems and phenomena that exist in communication systems and networks, and be able to calculate probabilities and other statistical quantities.

General Skill

Able to use software and tools to implement statistical signal processing on various problems in telecommunications, for example Matlab.

Attitude

Demonstrating the attitude of being responsible for the work in his area of expertise independently

Main Subjects

1. Probability theory
2. Random variables
3. Functions of random variables
4. Random vector, random sequence and matrix computation
5. Moments of random variables
6. Random processes
7. Systems, noises and power spectral
8. Parameter estimation

9. Hypothesis test and detection
10. Statistical signal analysis applications

Reference(s)

[1] Henry Starks & Hohn W. Woods, “Probability, Statistics and Random Processes for Engineers,” 4th ed., Pearson, 2012.
[2] John J. Shynk, “Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications,” Jong Wiley & Sons, 2013.
[3] Umberto Spagnolini, “Statistical Signal Processing in Engineering,” John Wiley & Sons, 2018.

Prerequisite(s)

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COURSE		
	Name	: Propagation and Radiation
	Code	: EE185132
	Credit(s)	: 2
	Semester	: I

Description of Course

The course of Propagation and Radiation discusses the radiation of electromagnetic waves from an antenna and its propagation.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concept of radio wave propagation and electromagnetic field radiation.

Specific Skill

Be able to analyze radio wave propagation and be able to analyze electromagnetic field radiation from an antenna.

General Skill

Able to apply the concept of wave propagation and radiation to solve problems in the communication system or to design a communication system.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Integral radiation
2. Antenna Arrays
3. Antenna Synthesis
4. Pathloss and shadowing
5. Multiple trajectories

Reference(s)

[1] W. L. Stutzman, G. A. Thiele, Antenna Theory and Design 3rd Ed., John Wiley & Sons, 2012.
[2] C. A. Balanis, Antenna Theory, Analysis and Design 4rd Ed., John Wiley & Sons, 2005.
[3] J. D. Parsons, Mobile radio propagation channel, John Wiley &Sons, 2000
[4] Andrea Goldsmith, Wireless Communication, Cambridge University Press, 2005

[5] F. P. Fontan, P. M. Espineira, Modeling the Wireless Propagation Channel, a Simulation Approach with matlab, John Wiley & Sons, 2008.

Prerequisite(s)

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COURSE	Name	: Scientific Writing
	Code	: EE185201
	Credit(s)	: 2
	Semester	: II

Description of Course

Scientific Writing course discusses the method of writing scientific documents, especially for thesis proposals at the master level. Lecture materials include various, characteristics and functions of scientific documents and parts of scientific documents. Indonesian language citation, plagiarism and grammar will also be discussed. Through this lecture students will develop the skills to write academic documents that are useful for their future success.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Being able to recognize and describe an academic document.

Specific Skill

Being able to describe procedures for making academic documents.

General Skill

Being able to make an academic document.

Attitude

Demonstrating an attitude of being responsible for work in his area of expertise independently.

Main Subjects

1. Introduction: types, functions and characteristics of scientific documents.
2. Parts of scientific documents: opening (front matter).
3. Parts of scientific documents: contents or torso (body).
4. Parts of scientific documents: cover (end matter).
5. Illustration on scientific documents.
6. Citation: source, writing, and plagiarism.
7. Indonesian language spelling and grammar: spelling, words, sentences, and paragraph.

Reference(s)

[1] Program Pasca Sajana ITS, Pedoman Penyusunan Tesis Tahun 2014.
[2] Tim Pengembang Pedoman Bahasa Indonesia, PEDOMAN UMUM EJAAN BAHASA INDONESIA, Edisi 4, Badan Pengembangan dan Pembinaan Bahasa Kementerian Pendidikan dan Kebudayaan, 2016.

[3] Adjat Sakri, Bangun Paragraf Bahasa Indonesia, Penerbit ITB, 1993
[4] Adjat Sakri, Bangun Kalimat Bahasa Indonesia, Penerbit ITB, 1994
[5] L.C. Perelman, J. Paradis, and E. Barrett. The Mayfield Handbook of Technical and Scientific Writing. New York, NY: McGraw-Hill, 1997. ISBN: 9781559346474.

Prerequisite(s)

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COURSE		
	Name	: Digital Communication Systems
	Code	: EE185231
	Credit(s)	: 3
	Semester	: II

Description of Course

Digital Communication System is a compulsory course that discusses the technique of transmitting message (data) signals in digital format using a single carrier signal / wave in order that digital message signals can be sent over AWGN channels or Fading flat channels with the least possible error. It also discusses transmission techniques using binary and M-ary digital modulation techniques: PSK, ASK, FSK both binary and M-ary, OQPSK, MSK and MQAM. It then discusses the optimum matched filter and correlator receiver and maximum likelihood detector. The course also discusses the neighboring spectral meeting signal linear bandpass modulation results. Last, the course discusses equalizer techniques to overcome distortion due to channel filtering and flat fading effects.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts of message signal transmission in digital format using passband modulation techniques with a single binary and m-ary carrier signal so that the power and bandwidth requirements are more efficient and more resistant to AWGN channel interference and flat fading channels.

Specific Skill

Able to identify the problem of message transmission in digital format, able to calculate power requirements and transmission bandwidth and be able to solve the problem of message signal transmission by applying modulation techniques using a single carrier signal and combine it with optimum matched filter or correlator receiver technique and maximum likelihood optimum detection technique and zero equalizer forcing.

General Skill

Able to perform communication signal processing for digital signal transmission by applying modulation techniques: PSK, ASK, FSK binary and M-ary based software (MATLAB)

Attitude

Demonstrate a responsible attitude towards work in the field of high speed data transmission independently.

Main Subjects

1. The Concept of Signal and Spectrum.
2. The concept of formatting an analog signal into a digital signal.
3. The concept of optimum Matched filter and correlator receiver.
4. The concept of signal space and the Gram-Schimdt algorithm.
5. The concept of binary and M-ary digital modulation and demodulation.
6. The concept of coherent and non-coherent recipients.
7. The concept of calculating the performance of digital communication systems.
8. The concept of meeting the linear bandpass modulation signal spectrum.
9. The concept of limited and free ISI band signal delivery and the equalizer concept.
10. Simulation of digital communication systems using MATLAB software.

Reference(s)

[1] Bernard Sklar and Pabitra Kumar Ray, Digital communications: Fundamentals and Applications, 2nd Edition, PEARSON, 2014.
[2] Hwei Hsu, Ph.D., Schaum's outline of theory and problems of Analog and Digital Communications, 2nd Edition, Mc-Graw Hill, 2003.
[3] John G. Proakis, Digital communications, 3rd Edition, Mc-Graw Hall, 1995.
[4] Tri T. Ha, Theory and Design of Digital Communication Systems, cambridge University Press, 2011.

[5] Michel C. Jeruchim, Philip Balaban, and K. Sam Shanmugan. Simulation of communication systems: modeling, methodology and techniques, 2nd Edition, Kluwer Academic Publishers, New York, 2002.

Prerequisite(s)

Random Process and Signal Processing

COURSE		
	Name	: Network Engineering
	Code	: EE185232
	Credit(s)	: 3
	Semester	: II

Description of Course

Network Engineering course studies the theory, design, implementation and management of network technology between office workstations (LAN), between offices in metropolitan areas (MANs), across cities (WAN) and also international networks (GAN). It also discusses about cable and wireless networks, including broadband Internet access technology, interconnection technology, network convergence, how to manage / configure network equipment and services in various network environments.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic concepts of network basics, TCP / IP protocols (addressing, routing and transport), Internet security.

Specific Skill

Able to analyze the quality of services in the internet network and do trouble shooting if there are problems in the network.

General Skill

Able to use network admin tools and software to manage networks including network security and bandwidth sharing

Attitude

Demonstrating the attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Concept, architecture and network protocol
2. Physical network topology
3. Network devices
4. 7 layers of OSI and 4 layers of TCP / IP
5. IP address, subnetting and Domain name system
6. Routing
7. Management, monitoring and management of network traffic
8. Quality of network services (QOS)
9. Network Troubleshooting
10. Network security

Reference(s)

[1] D. Comer, Internetworking With TCP/IP, Volume 1: Principles Protocols, and Architecture, 5th edition, 2006.
[2] D. Medhi and K. Ramasamy, Network Routing, Mogran Kaufmann, 2007.
[3] M. Hassan and R. Jain, High Performance TCP/IP Networking: Concepts, Issues, and Solutions, Prentice-Hall, 2003.
[4] G. Varghese, Network Algorithmics, Mogran Kaufmann, 2004.

Prerequisite(s)

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COURSE	Name	: Multimedia Signal Processing
	Code	: EE185331
	Credit(s)	: 2
	Semester	: III

Description of Course

This course discusses the basic principles of image and video coding in the context of the generating and distributing of multimedia content through communication systems and networks. The topics discussed were: representation, acquisition and display of color and video images; sampling images and videos on spatial domains and time and their relation to the frequency domain; the working principle of the human vision system and its relation to light and color theory; application of information theory for coding without loss and with losses; predictive coding and coding transformation; image coding principle; the principle of video coding based on motion compensation and the use of optimization techniques in the coder design; and examples of standard video coding techniques and their development.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of representation, acquisition and coding of images and videos related to color theory and the application of information theory to design image and video coding.

Specific Skill

Able to design colored image and video acquisition and coding systems with information theory principles and analyze their performance.

General Skill

Able to use software and tools to implement image and video coding with Matlab and VcDemo.

Attitude

Demonstrating attitude of being responsible for the work in his/her area of expertise independently.

Main Subjects

1. Introduction to encoding multimedia signals
2. Formation of images in human vision systems and cameras
3. Human visual system and color theory
4. Representation, acquisition and display of images and videos
5. Source coding without losses
6. R-D theory and quantization
7. Predictive coding and transformation coding
8. Encoding the image
9. Video coding

10. Standard video coding techniques and their development

Reference(s)

[1] Jens-Rainer Ohm, “Multimedia Signal Coding and Transmission,” Springer-Verlag, 2015.
[2] John W. Woods, “Multidimensional Signal, Image, and Video Processing and Coding,” 2nd ed., Academic Press, 2012.
[3] William A. Pearlman & Amir Said, “Digital Signal Compression: Principles and Practice,” Cambridge University Press, 2011.

Prerequisite(s)

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COURSE	Name	: Thesis
	Code	: EE185401
	Credit(s)	: 8
	Semester	: IV

Description of Course

The Thesis course is a capstone project for the master program as one of the requirements to complete the master program study. Thesis research is the culmination of all knowledge gained by students during the study and scientific validation and expertise that has been obtained. Students must write the results of their research in the Thesis book and take the Thesis examination, and publish the results of their thesis research in scientific journals as one of the graduation requirements.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

(KU06) Capable of managing, developing and maintaining networking with colleagues, peers within the broader institutes and research community.

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S08) Internalizing values, norms and academic ethics

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of scientific and engineering comprehensively, and factual knowledge about information and communication technology and the latest technology to develop procedures and strategies needed for the analysis and design of systems in the field of Electrical Engineering and its applications which are the topic of discussion.

Specific Skill

Being able to formulate and compile engineering problem solving, produce system designs and implement alternative engineering problem solving by expanding knowledge that adapts changes in science or technology in the field of Electrical Engineering which is the topic of discussion.

General Skill

Being able to produce a feasible thesis to be published in scientific journals by utilizing both software / hardware technology in conducting experiments related to system analysis and design which is the topic of discussion.

Attitude

Striving maximally in solving problems in the field of Electrical Engineering which is the topic of discussion to achieve perfect results.

Main Subjects

1. Introduction (Background, Problem Formulation, Objectives, Contributions)
2. Research Studies and Basic Theory
3. Research Methodology
4. Research Results and Discussion
5. Conclusions and Suggestions

Reference(s)

[1] Supporting textbooks
[2] Papers from supporting journals or conferences
[3] Pedoman Penyusunan Thesis, Program Pascasarjana ITS, 2014.
[4] Pedoman Penyusunan Tesis, Departemen Teknik Elektro, http://teras.ee.its.ac.id/

Prerequisite(s)

Scientific Writing

COURSE	Name	:	Wireless and Mobile Communication Systems
	Code	:	EE185530
	Credit(s)	:	2
	Semester	:	

Description of Course

The Wireless and Mobile Communication System course discusses the characteristics of mobile radio channels, the principles of wireless communication systems, technology standards and wireless communication system architecture, multiple access techniques, orthogonal modulation, MIMO. Furthermore, discussions of performance analysis and planning and performance of mobile wireless communication networks are also performed.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Bekerja sama untuk dapat memanfaatkan semaksimal mungkin potensi yang dimiliki. (S12)

Course Learning Outcomes

Knowledge

Students are aware of the development of wireless communication systems and networks, and understand the planning and performance of wireless communication networks.

Specific Skill

1. Able to explain the basic principles of wireless communication systems and channels.
2. Able to explain the techniques and engineering of wireless communication systems, especially multiple access techniques, orthogonal modulation, MIMO.
3. Able to explain technology and standards of wireless and mobile communication systems.
4. Able to explain wireless communication network planning. and move
5. Able to evaluate the performance of wireless communication networks.

General Skill

Able to explain the concept of wireless communication technology.

Able to explain the characteristics of mobile communication channel media.

Attitude

Demonstrating attitude of being responsible for the work in his/her area of expertise independently.

Main Subjects

1. Wireless communication systems and channels
2. Technique of wireless communication systems, especially multiple access techniques, orthogonal modulation, MIMO
3. Wireless and Mobile Communication Technology and Standards
4. Planning on wireless communication networks
5. Performance of Wireless Communication Networks

Reference(s)

[1] K Daniel Wong, Fundamentals of Wireless Communication Engineering Technologies, John Willey & Sons, 2012
[2] Farooq Khan, LTE for 4G Mobile Broadband Air Interface Technologies and Performance, Cambridge UP, 2009
[3] K. Sharon Evans, Telecommunications Network Modelling, Planning and Design, The Institution of Engineering and Technology, 2004
[4] D. Tse, P. Viswanath, “Fundamentals of Wireless Communications”, Cambridge University Press, 2005.
[5] T.S. Rappaport, "Wireless Communications Principles and Pracitces", 2nd ed., Prentice-Hall, 2002.

Prerequisite(s)

Digital Communication Systems

COURSE	Name	: Broadcast Engineering
	Code	: EE185531
	Credit(s)	: 2
	Semester	:

Description of Course

The Broadcasting Engineering course provides a basic broadcasting system that is part of the field of Multimedia Telecommunications Engineering. This course examines the standards and regulations in the fields of analog and digital broadcasting, broadcasting business models, to the basic design of analog and digital broadcasting systems, including technology to optimization of parameters of digital broadcasting techniques and measurement of performance associated with channel conditions, as well as the desired amount and quality of transmission.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts, principles, and procedures for designing the broadcasting system, which involves 3 main aspects, namely the regulatory aspect, aspects of the broadcasting business implementation model, and aspects of analog and digital broadcasting technology.

Specific Skill

Able to formulate engineering through survey budget design and link budget design and selection of analog and digital broadcasting parameters in order to obtain a broadcasting system with adequate service and quality coverage in accordance with applicable standards and regulations in the broadcasting field, including alternative solutions to other problems

General Skill

Having the ability to design analog and digital broadcasting systems by taking into account the aspects of broadcasting; transmission media (terrestrial, satellite and via cable); and signal reception, based on the results of analysis of information and data.

Attitude

Demonstrate learning outcomes for law obedience through regulation learning and working together to make the most of their potential.

Main Subjects

1. Definition and introduction of broadcasting systems
2. Telecommunications Law and Broadcasting Law
3. Ministerial Decree (KM) concerning Broadcasting (Masterplan etc.)
4. Design of Analog and Digital Broadcasting Systems: Regulation, Business and Technology Models
5. Link budget design in radio systems based on KM
6. Link budget design in analog television systems based on KM
7. Digital Broadcasting Standards
8. Digital audio and video techniques, Source Encoding Techniques
9. Channel Encoding Technique (Error Correction)
10. Digital Modulation Techniques in Broadcasting, including COFDM techniques
11. Digital Video Broadcasting (DVB-T, DVB-T2, DVT-T2 Lite)
12. Basic optimization of digital broadcast transmission parameters
13. Frequency Allocation Technique: MFN-SFN
14. Measurement of Digital Broadcast performance

Reference(s)

[1] UU Telekomunikasi (Telecommunications Law)
[2] UU Penyiaran (Broadcasting Law)
[3] KM. 15/2003, KM 76/2003 and its successor
[4] ETSI EN.744
[5] K. Blair B & Jerry W, “Television and Audio Handbook for technician and Engineer”, McGraw-Hill, 1990
[6] Walter Fischer, Digital Video & Audio Broadcasting Technology: A Practical Engineering Guide, , 3rd Edition, Rohde-Schwarz, Springer-Verlag, 2010
[7] Endroyono, dkk., “Modul Ajar Kuliah Rekayasa Penyiaran S2”, 2017

Prerequisite(s)
- Propagation and Radiation - Digital Communication Systems - Multimedia Signal Processing

COURSE	Name	: Radar Signal Processing
	Code	: EE185532
	Credit(s)	: 2
	Semester	:

Description of Course

Pengolahan Sinyal Radar merupakan mata kuliah pilihan yang membahas teknik-teknik pengolahan sinyal pada radar dengan antena tunggal maupun jamak, untuk tujuan kompresi pulsa dan penekanan clutter, optimisasi arus pencatu dan konfigurasi array pada radar phased-array, dan desain waveform pada radar MIMO.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Course Learning Outcomes

Knowledge

Menguasai konsep-konsep pengolahan sinyal untuk radar.

Specific Skill

Mampu melakukan pengolahan sinyal untuk radar.

General Skill

Mampu melakukan pengolahan sinyal untuk radar berbasis perangkat lunak (Matlab)

Attitude

Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang radar secara mandiri.

Main Subjects

1. Konsep radar
2. Thresholding
3. Kompresi pulsa
4. Pengolahan Doppler
5. Penjejakan obyek bergerak
6. Penekanan clutter
7. Konsep radar phased-array
8. Array sparsing
9. Konsep radar MIMO
10. Desain waveform

Reference(s)

[1] Mark Richards, James Scheer, William Holm, Principles of Modern Radar Volume I: Basic Principles, SciTech, 2010.
[2] William Melvin, James Scheer, Principles of Modern Radars Volume III: Advanced Techniques, SciTech, 2013.
[3] Wulf-Dieter Wirth, Radar Techniques Using Array Antennas, IEE, 2001.

[4] Jian Li, Petre Stoica, MIMO Radar Signal Processing, John Wiley & Sons, 2009.

Prerequisite(s)

- Random Process and Signal Processing
- Propagation and Radiation

COURSE	Name	: Multi Antenna Communication Systems
	Code	: EE185533
	Credit(s)	: 2
	Semester	:

Description of Course

Mata kuliah Sistem Komunikasi Antena Jamak membahas sistem komunikasi yang memanfaatkan antena jamak baik dalam bentuk antena larik adaptif (adaptive array) maupun dalam konfigurasi MIMO.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes
Knowledge Menguasai konsep sistem komunikasi dengan antena larik adaptif dan sistem komunikasi MIMO. Specific Skill Mampu menganalisis sistem komunikasi dengan antena larik dan sistem komunikasi MIMO. General Skill Mampu mengevaluasi sistem komunikasi dengan antena larik dan sistem komunikasi MIMO dengan perangkat lunak (Matlab). Attitude Mampu menunjukkan sikap bertanggung jawab dalam mengembangkan ilmu di bidang sistem komunikasi dengan antena jamak.

Main Subjects
1. Model low-pass sistem dan sinyal komunikasi digital serta kinerja sistem komunikasi digital pada kanal AWGN 2. Pemodelan respon kanal fading 3. Kinerja sistem komunikasi digital pada kanal frequency-flat slow Rayleigh fading 4. Diversity pada penerima (MRC) 5. Diversity pada pemancar (Metode Alamouti dan STBC) 6. Analisis SVD dan kapasitas teoritis kanal MIMO 7. Multipleks spasial (BLAST) 8. Multipleks spasial pada kanal MIMO frequency-selective 9. Sistem komunikasi kooperatif 10. Phased array dan sintesis antena larik 11. Teknik deteksi arah kedatangan sinyal 12. Teknik antena larik adaptif 13. Kinerja sistem komunikasi akses jamak dengan antena larik adaptif

Reference(s)

[1] John Proakis, Masoud Salehi, Digital Communications, McGraw-Hill, 2005.
[2] David Tse, Pramod Viswanath, Fundamentals of Wireless Communications, Cambridge University, 2005.
[3] Constantine Balanis, Antenna Theory Analysis and Design, ed. 3, Wiley-Interscience, 2005.
[4] Frank Gross, Smart Antennas with Matlab, McGraw-Hill, 2015.
[5] Nathan Blaunstein, Christos Christodoulou, Radio Propagation and Adaptive Antennas for Wireless Communication Networks, Wiley, 2014.

Prerequisite(s)

- Propagation and Radiation
- Digital Communication Systems

COURSE			
	Name	:	Internet Engineering
	Code	:	EE185534
	Credit(s)	:	2
	Semester	:	

Description of Course

Mata huliah ini memberikan pengenalan akan konsep dasar teknologi Internet dan web termasuk arsitektur, protokol dan aplikasi. Materu kuliah meliputi: Pengantar sejarah internet dan layanan Internet, dasar-dasar jaringan, protokol TCP / IP (pengalamatan, routing dan transport), pemrograman jaringan, pemrograman web, layanan web, server web dan keamanan Internet. Sedangkan evaluasi teridiri dari kuis, tugas, ujian tengah semester dan ujian akhir semester.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Menguasai konsep dasar dasar-dasar jaringan, protokol TCP / IP (pengalamatan, routing dan transport), pemrograman jaringan, pemrograman web, layanan web, server web dan keamanan Internet.

Specific Skill

Mampu menganalisis kualitas layanan dalam jaringan internet dan melakukan trouble shooting jika terjadi permasalahan dalam jaringan.

General Skill

Mampu menggunakan tool dan software admin jaringan untuk memanajemen jaringan termasuk security jaringan dan pembagian bandwidth.

Attitude

Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri.

Bekerja sama untuk dapat memanfaatkan semaksimal mungkin potensi yang dimiliki.

Main Subjects

1. Konsep dan sejarah internet
2. Client server
3. Arsitektur Internet
4. Protocol Internet
5. Routing
6. Router Design
7. IP Switching
8. IPv6
9. Mobility

Reference(s)

[1] D. Comer, Internetworking With TCP/IP, Volume 1: Principles Protocols, and Architecture, 5th edition, 2006.
[2] D. Medhi and K. Ramasamy, Network Routing, Mogran Kaufmann, 2007.
[3] M. Hassan and R. Jain, High Performance TCP/IP Networking: Concepts, Issues, and
[4] Solutions, Prentice-Hall, 2003.
[5] G. Varghese, Network Algorithmics, Mogran Kaufmann, 2004.

Prerequisite(s)

Network Engineering

COURSE			
	Name	:	Multicarrier Communication Systems
	Code	:	EE185535
	Credit(s)	:	2
	Semester	:	

Description of Course

Sistem Komunikasi Multicarrier merupakan mata kuliah pilihan yang membahas teknik transmisi sinyal pesan (data) kecepatan tinggi menggunakan sinyal/ gelombang pembawa jamak secara serentak/multipleksing dengan tujuan agar sistem komunikasi digital lebih tahan terhadap gangguan kanal lintasan jamak berupa redaman frequency selective fading. Membahas teknik transmisi multicarrier khususnya teknik orthogonal frequency division multiplexing (OFDM) dan teknik generalized frequency division multiplexing (GFDM). Membahas teknik akses jamak code division multiple access (CDMA) menggunakan teknik multipleksing multicarrier yaitu teknik MC-CDMA dan membahas gabungan teknik diversitas multiple-input-muliple-output (MIMO) dan teknik mulipleksing multicarrier yang disebut dengan teknik MIMO-OFDM.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Menguasai konsep-konsep transmisi sinyal kecepatan tinggi secara serentak (multipleksing) menggunakan sinyal pembawa jamak (multicarrier) sehingga kebutuhan bandwidth menjadi lebih hemat dan lebih tahan terhadap gangguan kanal yang lebih kompleks khususnya adalah gangguan kanal frequency selective fading.

Specific Skill

Mampu mengidentifikasi permasalahan transmisi data kecepatan tinggi dan mampu menyelesaikan permasalahan dengan mengaplikasikan teknik transmisi menggunakan sinyal pembawa jamak (multicarrier) dan menggabungkannya dengan teknik lain yaitu teknik akses jamak CDMA dan teknik diversitas MIMO sehingga kinerja sistem komunikasi menjadi lebih baik.

General Skill

Mampu melakukan pengolahan sinyal komunikasi untuk transmisi data kecepatan tinggi dengan mengaplikasikan teknik multiplek-sing multicarrier berbasis perangkat lunak (MATLAB)

Attitude

Menunjukkan sikap bertanggung-jawab atas pekerjaan di bidang transmisi data kecepatan tinggi secara mandiri.

Main Subjects

1. Konsep komunikasi digital kanal jamak dalam AWGN.
2. Konsep modulasi multicarrier/orthogonal fre-quency division multiplexing (OFDM).
3. Karakteristik OFDM.
4. Konsep generalized frequency division multiplexing (GFDM).
5. Konsep MC-CDMA.
6. Konsep MIMO-OFDM.
7. Simulasi sistem komunikasi multicarrier menggunakan software MATLAB.

Reference(s)

[1] Lie-Liang Yang, Multicarrier communications. John Wiley & Sons, 2009.
[2] Simon Litsyn, Peak power control in multicarrier communications. Cambridge University Press, 2007.
[3] Man-On Pun, Michele Morelli, and CC Jay Kuo. Multi-carrier techniques for broadband wireless communications: a signal processing perspective. 2007.
[4] Carl R. Nassar, Bala Natarajan, Zhiqiang Wu, David A. Wiegandt, S. Alireza Zekavat, and Steve Shattil. Multi-carrier technologies for wireless communication. Springer Science & Business Media, 2006.
[5] Emad Hassan, Multi-Carrier Communication Systems with Examples in MATLAB®: A New Perspective, CRC Press, 2016.

Prerequisite(s)

- Random Process and Signal Processing
- Digital Communication Systems

COURSE		
	Name	: Information Security and Cryptography
	Code	: EE185536
	Credit(s)	: 2
	Semester	:

Description of Course
Dengan semakin pesatnya perkembangan jaringan komunikasi dan internet dan semakin luasnya penggunaan perangkat serta data yang terhubung ke jaringan, tantangan terhadap keamanan informasi dan jaringan semakin penting. Pada mata kuliah ini mahasiswa akan mempelajari permasalahan keamanan dan teknik untuk mengatasinya dari dua aspek, yaitu aspek teori informasi dan aspek komputasi atau kriptografi. Secara khusus akan dasar teori informasi, kapasitas keamanan, keamanan efektif, pengkodean yang aman, pembangkitan kunci rahasia, teori bilangan dan finite field teknik-teknik kriptografi, baik simetrik dan asimetrik, serta algoritma-algoritma untuk melindungi integritas data.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Course Learning Outcomes

Knowledge

Menguasai tantangan dan konsep keamanan pada sistem komunikasi dan jaringan untuk distribusi data dari aspek teori informasi dan aspek komputasi, serta teknik-teknik berbasis kriptografi untuk mengatasi permasalahan keamanan dan melindungi integritas data.

Specific Skill

Mampu menjelaskan prinsip dari keamanan lapisan fisik dan mengimplementasika pembangkitan kunci rahasia dan menjelaskan teknik-teknik kriptografi simetrik dan asimetrik serta penerapannya untuk mengatasi permasalahan keamanan pada sistem komunikasi dan jaringan.

General Skill

Mampu menggunakan perangkat lunak dan tool untuk mengimplementasikan teknik-teknik kriptografi dan simulasi sistem keamanan di jaringan, misal Matlab dan ns-3.

Attitude

Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri.

Main Subjects

1. Pengantar tentang konsep keamanan pada sistem komunikasi dan jaringan
2. Dasar teori informasi dan keamanan lapisan fisik
3. Kapasitas keamanan
4. Pembangkitan kunci rahasia

5. Dasar-dasar teori bilangan
6. Block Cipher dan Data Encryption Standard (DES)
7. Dasar-dasar finite field
8. Advanced Enryption Standard (AES)
9. Kriptografi kunci publik dan RSA
10. Keamanan jaringan nirkabel

Reference(s)

[1] William Stallings, “Cryptography and Network Security: Principles and Practice,” 7th ed., Pearson, 2017.
[2] Jonathan Katz & Yehuda Lindell, “Introduction to Modern Cryptography,” 2nd ed., CRC Press, 2015.
[3] Rafael F. Schaefer, Holger Boche, Ashish Khisti, & H. Vincent Poor, “Information Theoretic Security and Privacy of Information Systems,” Cambridge University Press, 2017.

Prerequisite(s)

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COURSE		
	Name	: Software Defined Radio
	Code	: EE185537
	Credit(s)	: 2
	Semester	:

Description of Course

Mata kuliah ini membahas prinsip dan teknik-teknik sistem radio digital, software-defined radio (SDR), software radio dan radio kognitif. Untuk menunjang pemahaman permasalahan dan desain SDR akan dipelajari dasar desain sistem RF dan arsitektur penerima dan pemancar, dilanjutkan dengan pembahasan berbagai platform untuk membangun SDR dan software radio beserta desain laju sampling. Selanjutnya akan dipelajari berbagai konsep dan pendekatan sistem radio kognitif dan arsitektur yang telah diusulkan, yang dilanjutkan dengan jaringan radio kognitif dan dynamic spectrum access. Mahasiswa juga akan mensimulasikan dan mengimplementasikan sistem yang dipelajari pada perangkat lunak dan platform SDR yang tersedia di laboratorium, yaitu WARP dan Ettus.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Course Learning Outcomes

Knowledge

Menguasai konsep dan prinsip software defined radio baik sebagai pemancar dan penerima serta konsep dan teknik-teknik pada radio kognitif.

Specific Skill

Mampu mendesain sistem pemancar dan penerima dengan software defined radio serta menganalisis unjuk kerjanya dan mampu mendesain sistem radio kognitif.

General Skill

Mampu menggunakan perangkat lunak dan tool untuk mengimplementasikan dan mensimulasikan software defined-radio dan radio kognitif dengan Matlab, WARP dan Ettus.

Attitude

menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri.

Main Subjects

1. Pengantar tentang software defined radio dan radio kognitif
2. Dasar-dasar desain RF dan sistem komunikasi nirkabel
3. Arsitektur penerima
4. Arsitektur pemancar
5. Sistem radio digital
6. Software-defined radio dan software radio
7. Dasar-dasar radio kognitif
8. Spectrum sensing

9. Jaringan radio kognitif
10. Dynamic spectrum access

Reference(s)

[1] Behzad Razavi, “RF Microelectronics,” 2nd ed., Prentice Hall, 2012.
[2] Tony J. Rouphael, “RF and Digital Signal Processing for Software-Defined Radio: A Multi-Standard Multi-Mode Approach,” Elsevier, 2009.
[3] Charles W. Bostian, Nicholas J. Kaminski & Almohanad S. Fayed, “Cognitive Radio Engineering,” Scitech, 2016.
[4] Ezio Biglieri et al., “Principles of Cognitive Radio,” Cambridge University Press, 2013.

Prerequisite(s)

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COURSE	Name	: Advanced Electromagnetics
	Code	: EE185538
	Credit(s)	: 2
	Semester	:

Description of Course

Mata kuliah Elektromagentik Lanjut membahas tentang Aplikasi elektromagnetik untuk Telekomunikasi, teori mikrostrip, antena mikrostrip, filter mikrostrip, teori elektromagnetik metamaterial, aplikasi metamaterial.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S08) Internalizing values, norms and academic ethics.

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Konsep dan prinsip keilmuan secara komprehensif, dan untuk mengembangkan prosedur dan strategi yang diperlukan untuk analisis dan perancangan sistem dalam Teknologi Elektromganetik untuk Aplikasi di bidang Telekomunikasi Multimedia.

Specific Skill

Mampu menyusun penyelesaian permasalahan rekayasa dan menganalisis dalam perancangan antena, filter, dalam ranah teknologi mickrostrip dan pemanfaatan metamaterial memperbaiki kinerja sistem telekomunikasi multimedia dengan melakukan pendalaman atau perluasan teknologi microstrip dan elektromagentik metamaterial untuk aplikasi bidang telekomunikasi multimedia.

General Skill

Mampu menggunakan dan memanfaat software simulator dan MatLab dalam melakukan eksperimen penerapan teknologi microstrip dan elektromagnetik metamaterial.

Attitude

Internalizing values, norms and academic ethics

Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri.

Main Subjects

1. Aplikasi elektromagnetik untuk Telekomunikasi
2. Teori mikrostrip
3. Antena mikrostrip
4. Filter mikrostrip
5. Teori dasar dan aplikasi elektromagnetik metamaterial

Reference(s)

[1] Balanis, “ Antena Teori, Analysis and Design”, John Wiley & Sons, Inc, 1997.
[2] JR James & PS Hall, “Handbook of Microstrip Antennas”, IEE, 1989.
[3] Jia-Sheng Hong & M.J. Lancester, “Microstrip Filters for RF/Microwave Applications”, John Woley & Sons, Inc, 2001.
[4] Christophe Caloz & Tatsuo Itoh, “Electromagnetic Metamaterials: Transmission Line Theory & Microwave Applications”, John Woley & Sons, Inc, 2006.

Prerequisite(s)

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COURSE	Name	: Information Theory and Coding
	Code	: EE185539
	Credit(s)	: 2
	Semester	:

Description of Course

Teori Informasi dan Pengkodean merupakan mata kuliah pilihan yang membahas tentang konsep Entropy dan kapasitas kanal maksimum, dua konsep pengkodean yaitu pengkodean sumber dan pengkodean kanal dan bagaimana mekanisme penambahan dan pengurangan redundansi bit-bit pesan yang tepat pada kedua jenis pengkodean ini sehingga dapat didisain sistem komunikasi digital yang efisien dalam hal kebutuhan daya dan bandwidth.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Menguasai konsep dan teori informasi dan kapasitas kanal transmisi sinyal digital, menguasai konsep pengurangan radundansi pada pengkodean sumber untuk penghematan bandwidth dan menguasai konsep penambahan bit-bit redundan/parity check pada pengkodean kanal untuk penghematan daya.

Specific Skill

Mampu menggabungkan kedua konsep pengkodean sumber dan pengkodean kanal secara komprehensif dalam rekayasa sistem komunikasi digital sehingga permasalahan dalam transmisi data yang meliputi keterbatasan bandwidth kanal dan keterbatasan ketersediaan daya dapat diatasi.

General Skill

Mampu menerapkan dua jenis pengkodean yaitu pengkodean sumber dan pengkodean kanal, dan mampu menggabungkan keduanya secara komprehensif dan mengimplementasikanya dalam sistem komunikasi digital berbasis perangkat lunak (MATLAB) sehingga didapatkan peningkatan kinerja sistem komunikasi digital.

Attitude

Menunjukkan sikap bertanggung-jawab atas pekerjaan di bidang transmisi sinyal/pesan digital secara mandiri.

Main Subjects

1. Konsep dan teori Informasi.
2. Konsep pengkodean sumber dalam system komunikasi digital: kode Shannon-Fano, kode Huffman dan kode Lempel-Ziv.
3. Konsep perhitungan kapasitas kanal komunikasi.
4. Konsep aljabar koding: group, field dan ruamg vector, Galois field orde prima dan polynomial primitive.
5. Konsep pengkodean kanal: perhitungan syndrome, array standard dan pengkodean kode sederhana: kode repetisi dan kode Hamming.
6. Konsep pengkodean kanal : kode blok linier.
7. Konsep pengkodean kanal : kode siklik.
8. Konsep pengkodean kanal: kode konvolusional.
9. Konsep dekode kode konvolusional : Diagram trellis dan algorithma Viterbi.
10. Simulasi pengkodean sumber dan pengkodean kanal menggunakan MATLAB.

Reference(s)

[1] K. Sam Shanmugan, Digital and Analog Communication Systems, 1st Edition,
[2] Hwei Hsu, Ph.D., Schaum's outline of theory and problems of Analog and Digital Communications, 2nd Edition, Mc-Graw Hill, 2003.
[3] John G. Proakis, Digital communications, 3rd Edition, Mc-Graw Hall, 1995.
[4] Shu Lin and Daniel J Costello, Jr, “Error Control Coding Fundamentala and Application”, Prentice-Hall Inc., 1983.
[5] Stephen B Wicker, “Error Control Systems for Digital Communication and Storage,

Prerequisite(s)

- Random Process and Signal Processing
- Digital Communication Systems

COURSE	Name	: Wireless Sensor Networks
	Code	: EE185630
	Credit(s)	: 2
	Semester	:

Description of Course

Berkat pertumbuhan yang pesat teknologi MEMS, nano dan sistem komunikasi nirkabel, perangkat sensor dan transceiver menjadi semakin kecil, murah dan dapat digelar pada jumlah yang banyak untuk berbagai aplikasi yang beragam: kesehatan, pertanian, pemantauan struktur, smart grid, dll. Pada mata kuliah ini mahasiswa akan mempelajari prinsip dasar dan teknik terkait dari jaringan sensor nirkabel (JSN), yaitu: arsitektur simpul, physical layer, protokol MAC, protokol routing dan jaringan, sekuriti, estimasi terdistribusi dan manajemen enerji. Selain itu pada perkuliahan akan diimplementasikan model dan aplikasi JSN dengan simulasi dan platform sesungguhnya.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Course Learning Outcomes

Knowledge

Menguasai konsep dan teknik-teknik pada jaringan sensor nirkabel: arsitektur perangkat, protokol MAC dan jaringan, konsep penginderaan spasial, agregasi dan komputasi data terdistribusi, serta contoh-contoh aplikasinya .

Specific Skill

Mampu menjelaskan prinsip kerja dari perangkat JSN, protokol-protokol untuk jaringan nirkabel ad hoc serta mampu menganalisa unjuk kerja JSN dari aspek kapasitas, throughput, penggunaan enerji, dan komputasi dan pengolahan sinyal dalam jaringan.

General Skill

Mampu menggunakan perangkat lunak dan tool untuk simulasi dan pengembangan JSN, misal: Matlab, TinyOS, ns-3.

Attitude

menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri.

Main Subjects

1. Pengantar tentang perkembangan, contoh dan aplikasi jaringan sensor nirkabel
2. Faktor-faktor penting pada desain JSN
3. Arsitektur simpul JSN
4. Lapisan fisik
5. Lapisan Medium Access Control (MAC)
6. Lapisan jaringan

7. Algoritma-algoritma hemat enerji
8. Teknik-teknik lokalisasi
9. Estimasi terdistribusi
10. Pengolahan sinyal dalam jaringan
11. Keamanan pada JSN

Reference(s)

[1] Waltenegus Dargie & Christian Poellabuer, “Fundamentals of Wireless Sensor Networks: Theory and Practice,” 2nd ed., Wiley, 2010.
[2] Ian F. Akyildiz & Mehmet Can Vuran, “Wireless Sensor Networks,” Wiley, 2010.

Prerequisite(s)

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COURSE			
	Name	:	Microwave Circuits
	Code	:	EE185631
	Credit(s)	:	2
	Semester	:	

Description of Course
Mata kuliah Rangkaian Gelombang Mikro ini merupakan mata kuliah pilihan yang memiliki capaian pembelajaran teori Spektrum frekuensi, teori tentang bumbung gelombang persegi, circular dan elliptical, Sumber gelombang mikro: klystron, magnetron, Gunn diode, microwave integrated circuit, teori Penguat gelombang mikro : TWT, klystron, magnetron, LNA, parametric amplifier, konsep Mixer dan modulator, Komponen pasif : attenuator, termination, short, joint, rotary joint, detector, transition, coupler, directional coupler, isolator, circulator, standing wave detector, sliding crew tuner, phase shifter, magic tee, splitter, combiner, horn, resonator, window, slotted line, filter dan YIG filter, Teknologi microstrip, dan teknik pengukuran.

Learning Outcomes
Knowledge
(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.
Specific Skill
(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Course Learning Outcomes

Knowledge

Menguasai konsep sistem gelombang mikro dan mengetahui komponen-komponen sistem gelombang mikro, dan prinsip kerja sistem-sistem gelombang mikro.

Specific Skill

Mampu mendesain sistem gelombang mikro dan aplikasinya.

General Skill

Mampu menggunakan pengetahuan tentang gelombang mikro untuk implementasi dalam kehidupan sehari-hari.

Attitude

Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri.

Bekerja sama untuk dapat memanfaatkan semaksimal mungkin potensi yang dimiliki.

Main Subjects

1. Spektrum frekuensi, review teori tentang bumbung gelombang persegi, circular dan elliptical
2. Sumber gelombang mikro
3. Penguat gelombang mikro
4. Mixer dan modulator
5. Komponen pasif
6. Teknologi microstrip
7. Teknik pengukuran

Reference(s)

[1] Robert E. Collin, Fundamental for Microwave Engineering 2nd Edition, IEEE Press, 2000
[2] Pekka Eskelinen, Introduction to RF Equipment and System Design, Artech House, 2004
[3] David Pozar, Microwave Engineering 2nd Edition, John Wiley, 1998
[4] Allan Scout, Understanding Microwave, John Wiley, 1993 (pp10, 29, Ch.6 (-6.2))
[5] Devendra K. Misra, Radio Frequency and Microwave Communication Circuits : Analysis and Design – 2nd edition, John Wiley, 2004
[6] I. A. Glover, S. R. Pennock and P. R. Shepherd, Microwave Communications Engineering Volume 1 : “Microwave Devices Circuits and Subsystems, John Wiley, 2005

Prerequisite(s)
Propagation and Radiation

COURSE	Name	:	Optical Networks and Communication Systems
	Code	:	EE185632
	Credit(s)	:	2
	Semester	:	

Description of Course

Matakuliah ini membahas tentang sistem komunikasi yang menggunakan media serat-optik, mulai dari mempelajari konsep serat-optik, pemancar optik, detektor optik, disain transmisi analog dan digital, hingga memahami jaringan optic lokasl dan global. Yang tidak kalah pentingnya adalah mempelajari aspek standard dan teknik pengukuran siskom optik.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU12) Mampu mengimplementasikan teknologi informasi dan komunikasi dalam konteks pelaksanaan pekerjaannya.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Menguasai konsep, prinsip, dan prosedur perancangan sistem sistem komunikasi optic dan jaringannya, mulai dari aspek fisik cahaya dan perambatannya hingga memahami dan mampu memilih media dan parameter yang tepat dalam disain dan aplikasi sistem atau jaringan komunikasi optik.

Specific Skill

Mampu memformulasikan rekayasa melalui rancangan survey dan desain link budget dan mampu melakukan perencanaan sistem dan jaringan komunikasi optik sesuai dengan regulasi, termasuk mampu melakukan pengukuran kinerja sistem dan kualitas yang memadai sesuai standard dan regulasi yang berlaku di bidang komunikasi dan jaringan optik, termasuk alternatif penyelesaian permasalahan pada sistem.

General Skill

Mempunyai kemampuan perancangan sistem komunikasi dan jaringan optic, baik analog dan digital, mulai dari pemilihan elemen, parametrisasi hingga rancangan jaringan khusus.

Attitude

Menunjukkan hasil belajar untuk taat hukum melalui pembelajaran regulasi dan bekerja sama untuk memanfaatkan semaksimal mungkin potensi yang dimiliki.

Main Subjects

1. Definisi dan pengantar sistem komunikasi dan jaringan optik
2. Sistem komunikasi menggunakan cahaya
3. Struktur serat optic, cara fabrikasi dan parameter kunci serat-optik

4. Rambatan gelombang dalam serat dan jenis degradasi optic
5. Link Budget Optik
6. Pemancar optic (optical Sources)
7. Penyambungan dan koneksi daya optic (power launching & coupling)
8. Deteksi cahaya dan receiver optic.
9. Jaringan analog dan digital
10. Multipleksing optic: WDM, WDMA
11. Penguat optic
12. Jaringan Lokal dan Global Optik
13. Pengukuran perangkat dan kinerja sistem optik

Reference(s)

[1] UU Telekomunikasi dan ITU G Optical
[2] Gerd Keiser, ”Optical Fiber Communications” 3rd edition, 2000
[3] Joseph C. Palais, “Fiber Optic Communications”, Prentice-Hall, 4th Ed, 1998
[4] Paul E. Green Jr., “Fiber Optic Network”, Prentice-Hall, 1993
[5] Govind P. Agrawal, “Fiber Optic Communication Systems”, Willey Interscience, 1992
[6] Endroyono, Handout: Sistem Komunikasi dan Jaringan Optik, Elektro

Prerequisite(s)

- Propagation and Radiation
- Digital Communication Systems

COURSE			
	Name	:	Satellite Communication Systems
	Code	:	EE185633
	Credit(s)	:	2
	Semester	:	

Description of Course

Mata kuliah Sistem Komunikasi Satelit secara garis besar membahas konsep orbit satelit, sistem satelit termasuk ruas satelit dan ruas bumi, efek propagasi radio pada komunikasi satelit, desain sistem komunikasi satelit, konstelasi satelit, desain jaringan satelit, akses jamak pada sistem komunikasi satelit, dan aplikasi satelit untuk penginderaan jauh.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

Course Learning Outcomes

Knowledge

Konsep dan prinsip keilmuan sistem, subsistem, dan jaringan satelit komunikasi, serta aplikasinya untuk navigasi dan penginderaan jauh.

Specific Skill

Mampu memformulasikan permasalahan rekayasa di bidang sistem komunikasi satelit dan menerapkan metode ilmiah dalam menyelesaikannya.

General Skill

Mampu memahami secara kritis substansi makalah ilmiah tingkat internasional dan menggunakannya dalam penelitian dan pengembangan di bidang sistem komunikasi satelit.

Attitude

Mampu menunjukkan sikap bertanggung jawab dalam mendesain jaringan satelit dan sistem penginderaan jauh dengan baik dan benar.

Main Subjects

1. Orbit satelit dan pengarahan antena stasiun bumi
2. Link budget untuk komunikasi satelit
3. Konstelasi satelit dan jaringan satelit multi-beam
4. Sistem komunikasi akses jamak dan interferensi
5. Sistem navigasi berbasis satelit
6. Penginderaan jauh berbasis satelit

Reference(s)

[1] Dennis Roddy, Satellite Communications, ed. 4, McGraw-Hill, 2006.
[2] Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, ed. 2, Wiley, 2002.
[3] Erich Lutz, Markus Werner, Axel Jahn, Satellite Systems for Personal and Broadband Communications, Springer-Verlag, 2000.

[4] Aboelmagd Noureldin, Tashfeen B. Karamat, Jacques Georgy, Fundamentals of Inertial Navigation, Satellite-Based Positioning and Their Integration, Springer, 2013.
[5] James Campbell, Randolph Wynne, Introduction to Remote Sensing, ed. 5, Guilford Press, 2011.

Prerequisite(s)

- Propagation and Radiation
- Digital Communication Systems

COURSE		
	Name	: Communication System and Network Protocol Engineering
	Code	: EE185634
	Credit(s)	: 2
	Semester	:

Description of Course

Mata kuliah Jaringan Komunikasi Nirkabel membahas prinsip dasar protokol komunikasi, metode dan teknik deskripsi formal protokol, pengembangan protokol komunikasi: proses, desain, verifikasi, evaluasi kinerja, implementasi dan pengujian; serta kasus rekayasa protokol internet.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Menguasai perkembangan teknologi sistem dan jaringan komunikasi nirkabel, dan menguasai perencanaan dan kinerja jaringan komunikasi nirkabel.

Specific Skill

Mampu menjelaskan dasar protokol komunikasi; metode dan teknik deskripsi formal protokol komunikasi; pengembangan protokol komunikasi: proses, desain, verifikasi, evaluasi kinerja; dan implementasi dan pengujian protokol serta kasus rekayasa protokol internet.

General Skill

Mampu menjelaskan konsep teknologi komunikasi nirkabel dan karakteristik media kanal komunikasi bergerak.

Attitude

Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri.

Main Subjects

1. Dasar protokol komunikasi
2. Metode dan teknik deskripsi formal protokol komunikasi.
3. Pengembangan protokol komunikasi: proses, desain, verifikasi, evaluasi kinerja
4. Implementasi dan pengujian protokol serta kasus rekayasa protokol internet.

Reference(s)

[1] Harmurt König, Protocol Engineering, Springer, 2003
[2] Richard Lai, Ajin Jirachiefpattana, Communication Protocol Specification and Verification, Springer Science+Business Media, 1998
[3] Behrouz A. Forouzan, TCP/IP Protocol Suite, Mc. Graw Hill, 2010
[4] Thi-Thanh-Mai-Houang, Computer Network, the Internet and Next Generation Networks, Peter Lang, 2012.
[5] Andrei Gurtov, Host Identity Protocol, Wiley, 2008

Prerequisite(s)

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COURSE	Name	:	Special Topics in Telecommunications
	Code	:	EE185635
	Credit(s)	:	2
	Semester	:	

Description of Course

Mata kuliah Topik Khusus Telekomunikasi Multimedia memberikan kesempatan kepada mahasiswa untuk mempelajari secara fundamental dan rinci mengenai pengembangan ilmu pengetahuan dan/atau teknologi di bidang Telekomunikasi Multimedia yang dianggap penting untuk diketahui oleh mahasiswa tingkat Magister. Materi yang dibahas mencakup teori latar belakang, teori dan konsep dasar, pengembangan varian metode atau algoritma, evaluasi kinerja, dan konsep aplikasi.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Konsep dan prinsip keilmuan ilmu pengetahuan dan/atau teknologi Telekomunikasi Multimedia yang menjadi topik bahasan.

Specific Skill

Mampu memformulasikan permasalahan rekayasa di bidang ilmu pengetahuan dan/atau teknologi Telekomunikasi Multimedia yang menjadi topik bahasan.

General Skill

Mampu memahami secara kritis substansi makalah ilmiah tingkat internasional dan menggunakannya dalam penelitian dan pengembangan di bidang ilmu pengetahuan dan/atau teknologi Telekomunikasi Multimedia yang menjadi topik bahasan.

Attitude

Mampu menunjukkan sikap bertanggung jawab mengembangkan ilmu pengetahuan dan/atau teknologi Telekomunikasi Multimedia yang menjadi topik bahasan.

Main Subjects

1. Konsep dan teori latar belakang atau penunjang
2. Konsep dan teori dasar
3. Pengembangan varian metode atau algoritma
4. Evaluasi kinerja
5. Konsep implementasi

Reference(s)

[1] Buku teks yang mendukung.

[2] Makalah dari jurnal atau konferensi yang mendukung.

Prerequisite(s)

- Random Process and Signal Processing
- Propagation and Radiation
- Digital Communication Systems
- Network Engineering

COURSE		
	Name	: Signal and System Analysis
	Code	: EE185730
	Credit(s)	: 2
	Semester	:

Description of Course

Mata kuliah analisis sinyal dan sistem membahas tentang representasi sinyal dan sistem baik waktu kontinu maupun waktu diskrit, konsep sistem LTI waktu kontinu, transformasi Fourier waktu kontinu dan aplikasinya, konsep sistem LTI waktu diskrit, transformasi Fourier waktu diskrit dan aplikasinya, transformasi Z, transformasi Z balik dan aplikasinya, proses sampling dan rekonstruksi sinyal.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential

Course Learning Outcomes

Knowledge

Menguasai konsep sinyal dan sistem linear dalam ranah waktu, ranah frekuensi dan frekuensi kompleks.

Specific Skill

Mampu menganalisis sinyal dan sistem linear time-invariant ranah waktu kontinu dan ranah waktu diskrit.

General Skill

Mampu menggunakan software Matlab/Simulink untuk melakukan visualisasi dan eksperimentasi konsep sinyal dan sistem linear.

Attitude

Menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri.

Bekerja sama untuk dapat memanfaatkan semaksimal mungkin potensi yang dimiliki.

Main Subjects

1. Konsep Sinyal dan Sistem.
2. Sistem LTI Waktu Kontinu.
3. Transformasi Fourier Waktu Kontinu.
4. Sistem LTI Waktu Diskrit.
5. Transformasi Fourier Waktu Diskrit.
6. Transformasi Z.
7. Sampling dan rekonstruksi sinyal.

Reference(s)

[1] V. Oppenheim, A and T. Young, Ian : "Signal and Systems", Prentice-Hall of India, New Delhi 1990.
[2] John G Proakis and Dimitris G, Manokalis, Digital Signal Processing: Principles, algoritms and applications, 4th
[3] Edition, Pearson International Edition, Pearson Prentice-Hall, NewJersey, 2007.
[4] Monson H Hayes, Digital Signal Processing, Schaum's Outline Series, McGraw-Hill Companies, Inc., USA, 1999
[5] Viney K Ingle and John G Proakis, Digital Signal Processing using Matlab, 3rd Ed., CENGAGE Learning, USA, 2012.

Prerequisite(s)

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COURSE	Name	: Electromagnetics
	Code	: EE185731
	Credit(s)	: 2 Credit
	Semester	:

Description of Course
Mata kuliah yang membahas teori dasar medan elektromagnetik, Persamaan-persamaan Maxwell, Bidang Gelombang Seragam, Pantulan dan Dispersi Gelombang Bidang, Bumbung Gelombang, Radiasi elektromagnetik dan radiasi.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes
Knowledge Menguasai konsep medan magnet statis, konsep medan elektromagnet dinamis, persamaan Maxwell serta aplikasinya. Konsep gelombang bidang, pantulan dan dispersigelombang, bumbung gelombang dan radiasi. Specific Skill Mampu menganalisis persoalan-persoalan medan magnet statis dan medan elektromagnet dinamis serta mampu menganalisis perambatan gelombang datar serbasama di berbagai medium, pantulan, dan disperse gelombang.
Main Subjects
1. Persamaan Maxwell 2. Bidang Gelombang Seragam 3. Pantulan dan Dispersi Gelombang Bidang 4. Bumbung Gelombang 5. Radiasi Elektromagnetik dan Antena
Reference(s)
[1] Elektromagnetika, edisi ke-7, William H. Hayt dan John A. Buck, Penerbit Erlangga, 2006 [2] Electromagnetics, Joseph A. Edminister, Schaums Outline Series Mc Graw Hill Book Company, 1979 [3] Fundamentals of Applied Electromagnetics, Fawwas T. Ulaby, Prentice Hall International, 2001
Prerequisite(s)
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4. Electronic Engineering

COURSE	Name	: Statistical Methods and Optimization
	Code	: EE185101
	Credit(s)	: 2
	Semester	: I

Description of Course

In this course, students learn the two main topics, namely: (1) statistical methods needed to design research as well as to analyze and interpret the measurements and simulations; (2) the basics and methods of optimization needed to find solutions to various technical problems encountered in research, for example: linear programming, convex optimization, iterative methods, optimization inspired by nature: genetic algorithms, etc.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and methods of statistical analysis of measurement data and mastering the optimization method for a problem in engineering in the field of electrical engineering

Specific Skill

Able to design experiments and calculate statistical analysis on measurement data and be able to define optimization problems and find optimal solutions

General Skill

Able to use software and tools for statistical analysis and optimization, e.g. Matlab and R.

Attitude

show the attitude of being responsible for the work in his area of expertise independently

Main Subjects

1. Introduction
2. Descriptive statistics
3. Experimental design
4. Univariate, multivariate and variance analysis
5. Application of statistical methods
6. Optimization problems
7. Mathematical optimization
8. Completion of analytical optimization
9. Completion of numerical optimization

10. Dynamic programming
11. Introduction to meta-heuristics and evolutionary algorithms

Reference(s)

[1] William M. Mendenhall & Terry L. Sincich, "Statistics for Engineering and the Sciences," 6th ed., CRC Press, 2016.
[2] Jay Devore, "Probability and Statistics for Engineering and the Sciences," 9th ed., CENGAGE Learning, 2016.
[3] William Navidi, "Statistics for Engineers and Scientists," 3rd ed., McGraw-Hill, 2011.
[4] Jorge Nocedal & Stephen J. Wright, "Numerical Optimization," 2nd ed., Springer, 2006.
[5] Edwin K.P. Chong & Stanislaw H. Zak, "An Introduction to Optimization," 4th ed., John Wiley & Sons, 2013
[6] Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, "Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization," John Wiley & Sons, 2017.

Prerequisite(s)

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COURSE		
	Name	: Introduction to Research
	Code	: EE185102
	Credit(s)	: 2
	Semester	: I

Description of Course

The Introduction to Research course is a course that delivers or prepares students to be able to develop research ideas and plan research activities and plan writing a thesis proposal. In this course, students will be given material on basic knowledge and basic preparation before formulating the problems to be examined in their thesis proposal. The material to be taught includes: Searching for scientific articles, index measuring scientific articles and researchers, Introduction to research fields in the Laboratory of each area of expertise, definition of problems in research, differences in research projects and work projects, understanding of hypotheses, Novelty, Plagiarism, methods and methodology , types of research, types of data collection methods and data collection techniques (surveys, questionnaires, interviews, measurements, data mining) and fishbone diagrams.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the procedures for scientific article search and flow in ran. Understanding hypotheses, novelty, plagiarism, types of research in the laboratory and procedures for writing fishbone research diagrams, as well as various data collection techniques in research so that the thesis proposal plan can be prepared better.

Specific Skill

Being able to browse scientific articles of interest, is able to develop a formulation of research problems that have the potential to be used as research themes in his thesis proposal, and contain elements of novelty and avoid plagiarism.

General Skill

Able to develop research plans that contain novelty ranging from building hypothesis, formulating problems and planning research methods

Attitude

Demonstrate honesty in developing research themes, open to suggestions and input and responsible for avoiding plagiarism.

Main Subjects

1. The procedure for a scientific article search

2. Introduction to Research
3. Hypothesis in research
4. An understanding of Novelty in research
5. Plagiarism
6. Data collection techniques in research
7. Types of research
8. Citation and use of Reference (s)
9. The 1st Lab-Research theme
10. The 2nd Lab-Research theme
11. The 3rd Lab-Research theme
12. The 4th Lab-Research theme
13. Preparation of Fishbone Diagram

Reference(s)

[1] Research Methodology., A Step by step guide for beginners., Ranjit Kumar., 3rd Edition., 2011
[2] Research Methodology: Methods and Techniques., 2nd Revised Edition., C.R. Kothari., New Age International Publisher., 2004
[3] Research and Methodology: Tools and Techniques., Prabhat Pandey, Meenu Mishra Pandey, 2015

Prerequisite(s)

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COURSE	Name	: Transducers
	Code	: EE185141
	Credit(s)	: 3 Credit
	Semester	: I

Description of Course

The course of Transducers discusses: Temperature Sensors including Resistance Temperature Detector, Thermistor, Semiconductor Temperature Sensor, Thermocouple, Pyroelectric Sensor, and Noncontact Infrared Thermometers; Force and Pressure Sensors including Piezoresistive and Piezoelectric Gauges; Photodetectors including Photocathode, Photomultiplier Tube, Photoconductive, Photodiode, Phototransistor, and Charge-Coupled Device; Acoustic Sensors including Microphones, Ultrasonic Transducers, and Ultrasonic Imaging; Position & Displacement Transducers including Linear Variable Differential Transformer, Optical Encoder, Photonic Distance Sensor, Hall Effect Sensor, Inductive Proximity Sensor, Flowmeters, Inertial Measurement Unit sensors, and Motors; Chemical Sensors including Humidity & Moisture Sensors, Metal Oxide Chemical Sensors, Spectrophotometer, Photoplenthysmography, pH Measurement, and Dissolved Oxygen Sensors.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently

Course Learning Outcomes

Knowledge

Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design of transducers in the areas of electronics.

Specific Skill

Able to compose problem solving in transducers through depth and breadth of knowledge which adapts to changes in science and technology in electronics.

General Skill

Being able to improve the capacity of learning independently for the analysis, simulation, design, and application of transducers.

Attitude

Demonstrating attitude of responsibility regarding the analysis, simulation, design, and application of transducers independently.

Main Subjects

1. Temperature Sensors
2. Force and Pressure Sensors
3. Photodetectors
4. Acoustic Sensors
5. Displacement Transducers
6. Chemical Sensors
7. The applications of transducer technology

Reference(s)
[1] Muhammad Rivai, 2018. Diktat: Transduser. [2] Jacob Fraden, 2016. Handbook of Modern Sensors: Physics, Designs, and Applications
Prerequisite(s)
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COURSE			
	Name	:	Microelectronic Systems
	Code	:	EE185142
	Credit(s)	:	3
	Semester	:	I

Description of Course

This course studies the Microelectronic Systems consisting of a computer-based electronic systems, microprocessors, and microcontrollers. This course consists of the development of the microprocessor to the microcontroller, the types of microcontrollers, programming languages, and their implementation which includes MCS-51 microcontrollers, AVRs, 32-bit ARMs, and System on Chips. Applications that are often used are for electronic system controllers.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently..

(S10) Internalizing spirit of independence, struggle and entrepreneurship.

(S11) Trying his/her best to achieve perfect results.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic concepts of microprocessors, microprocessor hardware design principles, programming languages on microprocessors and microprocessor system design stages.

Specific Skill

Able to use MCS51 microcontroller, AVR type, 32 bit ARM type and able to use embedded system board.

General Skill

Able to use ICT tools to design electronic systems using MCS51 microcontroller, AVR type, 32 bit ARM type and embedded system board.

Attitude

Able to internalize the spirit of independence, struggle, and entrepreneurship.

Main Subjects

1. MCS-51 Microcontroller
2. GPIO, Timer, Counter, Interupt, Serial Communication, I2C, CAN, Onewire
3. Assembly programming language for MCS 51
4. Basic Compiler and C++ for MCS 51
5. AVR Microcontroller
6. ARM 32bit Microcontroller
7. Raspberry Pi

Reference(s)

[1] Rachmad Setiawan, Mikrokontroler MCS51, Graha Ilmu 2006
[2] Matt Richardson, Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly Media, 2012
[3] ARM Cortex M0 Nuvoton NuMicro, dalam bentuk CD
[4] Manual Book STM32
[5] Robert Love, Linux Kernel Development, Addison-Wesley, 2010

Prerequisite(s)

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COURSE	Name	: Scientific Writing
	Code	: EE185201
	Credit(s)	: 2
	Semester	: II

Description of Course

Scientific Writing course discusses the method of writing scientific documents, especially for thesis proposals at the master level. Lecture materials include various, characteristics and functions of scientific documents and parts of scientific documents. Indonesian language citation, plagiarism and grammar will also be discussed. Through this lecture students will develop the skills to write academic documents that are useful for their future success.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Being able to recognize and describe an academic document.

Specific Skill

Being able to describe procedures for making academic documents.

General Skill

Being able to make an academic document.

Attitude

Demonstrating an attitude of being responsible for work in his area of expertise independently.

Main Subjects

1. Introduction: types, functions and characteristics of scientific documents.
2. Parts of scientific documents: opening (front matter).
3. Parts of scientific documents: contents or torso (body).
4. Parts of scientific documents: cover (end matter).
5. Illustration on scientific documents.
6. Citation: source, writing, and plagiarism.
7. Indonesian language spelling and grammar: spelling, words, sentences, and paragraph.

Reference(s)

[1] Program Pasca Sajana ITS, Pedoman Penyusunan Tesis Tahun 2014.
[2] Tim Pengembang Pedoman Bahasa Indonesia, PEDOMAN UMUM EJAAN BAHASA INDONESIA, Edisi 4, Badan Pengembangan dan Pembinaan Bahasa Kementerian Pendidikan dan Kebudayaan, 2016.

[3] Adjat Sakri, Bangun Paragraf Bahasa Indonesia, Penerbit ITB, 1993
[4] Adjat Sakri, Bangun Kalimat Bahasa Indonesia, Penerbit ITB, 1994
[5] L.C. Perelman, J. Paradis, and E. Barrett. The Mayfield Handbook of Technical and Scientific Writing. New York, NY: McGraw-Hill, 1997. ISBN: 9781559346474.

Prerequisite(s)

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COURSE	Name	: Electronic Circuit Systems
	Code	: EE185241
	Credit(s)	: 3
	Semester	: II

Description of Course

This course discusses the analysis, design, and implementation of analogue and digital circuits in electronic systems. Analogue circuit implementation is focused on operational amplifier design in CMOS VLSI from simulation to IC layout, as well as opamp-based circuit design. Digital circuits implementations uses FPGA technology and emphasised for signal processing applications.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

Attitude

(S09) To show responsibility on their works in the field of expertise.

Course Learning Outcomes

Knowledge

Mastering the concepts and engineering principles to develop procedures and strategies needed for the analysis, design, and implementation of analogue and digital electronic systems, with emphasis on analogue IC design and digital logic circuit implementation on FPGA technology.

Specific Skill

Able to design CMOS analogue circuits and implement digital logic circuits on FPGA technology as alternative solutions for engineering problems in the field of electronics, considering factors such as economy, public health and safety, culture, society, and the environment.

General Skill

Able to undertake the study and analysis on analogue and digital circuits technology.

Attitude

Showing responsibility in the field of expertise.

Main Subjects

1. Principles of electronic circuits analysis, covering diode, bipolar transistors, and field-effect transistors circuits.
2. Principles of operational amplifier circuits, including oscilators and filters.
3. Principles of integrated circuits (IC) technology, fabrication process, layout, mask/layer, and design rules, as well as IC design software tools, synthesis, and verification.
4. CMOS operational amplifier circuit design, from simulation to layout.
5. Hardware description language for the implementation of combinational and sequential digital circuits.
6. FPGA technology and architecture as digitally configurable device.
7. Arithmetic digital circuits implementation.

8. Signal processing systems implementation on FPGA.
Reference(s)
[1] R. Jacob Baker, “CMOS Circuit Design, Layout, and Simulation”, 2nd edition, IEEE Press, Wiley-Interscience, 2005, USA. [2] Adel Sedra, Kenneth Smith, “Microelectronic Circuits: Theory and Applications”, 6th edition, Oxford University Press, 2011. [3] Ben Streeman, Sanjay Banerjee, “Solid State Electronic Devices”, 6th edition, Pearson, 2006.
Prerequisite(s)
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COURSE			
	Name	:	Multidimensional Signal Processing
	Code	:	EE185242
	Credit(s)	:	3
	Semester	:	II

Description of Course

Multidimensional Signal Processing Course discusses about discriminant theories and algorithms, discrete systems and discrete transformations and the concept of LTI discrete time systems, multidimensional system applications in the field of images and video. In particular, the topics covered are the implementation of multidimensional discrete signals and systems, multidimensional discrete Fourier (DFT, FFT) analysis, cosmic discrete transformation (DCT), 2D Finite Impulse Response filter (FIR), 2D Infinite Impulse Response (IIR) filter, 2D bank filter, as well as discrete wavelet theory and transformation.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently

(S12) Working together to be able to make the most of his/her potential

Course Learning Outcomes

Knowledge

Mastering the concept of multidimensional discrete signals and systems, and discrete transformations in the realm of complex, frequency and frequency domains, as well as the design of wavelets and multidimensional digital filters IIR and FIR.

Specific Skill

Able to analyze discrete, multidimensional discrete signals, systems and transformations in the realm of complex, frequency and frequency domains and the design of wavelets and digital filters IIR and FIR.

General Skill

Able to use Matlab/Simulink software for visualization and experimentation of multidimensional discrete signal and system, and discrete concepts, wavelet, and digital filter designs of IIR and FIR.

Attitude

Demonstrating attitude of responsibility on work in his/her field of expertise independently

Working together to be able to make the most of his/her potential

Main Subjects

1. Signal Concept and discrete multidimensional system.
2. 2D LTI Discrete time system.
3. Frequency Analysis of Signal and 2D LTI discrete time System.
4. Sampling and Reconstruction.

5. Transformation-Z.
6. 2D-DFT, 2D-FFT and 2D-DCT.
7. Digital FIR and IIR Filter Design
8. Introduction of Wavelet and Haar Wavelets

Reference(s)

[1] John W. Woods, "Multidimensional Signal, Image, and Video

[2] Processing and Coding," 2nd ed., Academic Press, 2012.

[3] Saeed V. Vaseghi, Multimedia Signal Processing, Joh Wiley & sons Ltd., England, 2007.

[4] Jae S Lim, Two Dimensional Signal and Image Processing, 7th

[5] Prentice-Hall, NewJersey, 1990.

[6] Viney K Ingle and John G Proakis, Digital Signal Processing using Matlab, 3rd Ed., CENGAGE Learning, USA, 2012.

Prerequisite(s)

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COURSE			
	Name	:	Intelligent Electronic Systems
	Code	:	EE185341
	Credit(s)	:	2
	Semester	:	III

Description of Course

The Intelligent Electronics Systems course learns about machine learning, fuzzy systems, and genetic algorithms. Problems in machine learning include supervised learning (regression and classification) and unsupervised learning (clustering). Neural networks and deep neural networks are specifically discussed to solve machine learning problems. In the fuzzy system section, we discuss the fuzzy concepts and their applications in decision making, classification & pattern recognition, and control systems. In the final section, we discuss genetic algorithm to solve problems in optimization.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and applications of intelligent electronic systems.

Specific Skill

Able to realize machine learning based on smart electronic systems, fuzzy systems and genetic algorithms.

General Skill

Able to implement intelligent electronic systems for certain applications.

Attitude

Demonstrate an attitude of working independently, creatively, and innovatively in problem solving.

Main Subjects

1. Machine learning
2. Neural network
3. Deep neural network
4. Fuzzy system
5. Genetic algorithm

Reference(s)

[1] Nikhil Buduma and Nicholas Lacascio, Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, O’Reilly Media Inc, 2017

[2] Ethem Alpaydin, Introduction to machine learning, The MIT Press, 2010

[3] Timothy J. Ross, Fuzzy logic with engineering applications, John Wiley & Sons Ltd, 2010

[4] Randy L. Haupt and Sue Ellen Haupt, Practical genetic algorithms, John Wiley & Sons, Inc, 2004

[5] Madan M. Gupta, Liang Jin, and Noriyasu Homma, Static and Dynamic Neural Networks: from Fundamentals to Advanced Theory, John Wiley & Sons Inc, 2003

Prerequisite(s)

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COURSE		
	Name	: Thesis
	Code	: EE185401
	Credit(s)	: 8
	Semester	: IV

Description of Course

The Thesis course is a capstone project for the master program as one of the requirements to complete the master program study. Thesis research is the culmination of all knowledge gained by students during the study and scientific validation and expertise that has been obtained. Students must write the results of their research in the Thesis book and take the Thesis examination, and publish the results of their thesis research in scientific journals as one of the graduation requirements.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

(KU06) Capable of managing, developing and maintaining networking with colleagues, peers within the broader institutes and research community.

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S08) Internalizing values, norms and academic ethics

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of scientific and engineering comprehensively, and factual knowledge about information and communication technology and the latest technology to develop procedures and strategies needed for the analysis and design of systems in the field of Electrical Engineering and its applications which are the topic of discussion.

Specific Skill

Being able to formulate and compile engineering problem solving, produce system designs and implement alternative engineering problem solving by expanding knowledge that adapts changes in science or technology in the field of Electrical Engineering which is the topic of discussion.

General Skill

Being able to produce a feasible thesis to be published in scientific journals by utilizing both software / hardware technology in conducting experiments related to system analysis and design which is the topic of discussion.

Attitude

Striving maximally in solving problems in the field of Electrical Engineering which is the topic of discussion to achieve perfect results.

Main Subjects

1. Introduction (Background, Problem Formulation, Objectives, Contributions)
2. Research Studies and Basic Theory
3. Research Methodology
4. Research Results and Discussion
5. Conclusions and Suggestions

Reference(s)

[1] Supporting textbooks
[2] Papers from supporting journals or conferences
[3] Pedoman Penyusunan Thesis, Program Pascasarjana ITS, 2014.
[4] Pedoman Penyusunan Tesis, Departemen Teknik Elektro, http://teras.ee.its.ac.id/

Prerequisite(s)

Scientific Writing

COURSE		
	Name	: Electronic Control System Design
	Code	: EE185540
	Credit(s)	: 2
	Semester	:

Description of Course
The electronic control system design course discusses the design of electronic control systems and their digital realization based on microcomputers. At the beginning, the control system design is focused on the state variable method. Pole placement design and state observers are an important part of design. Linear quadratic optimal control is the final discussion of the state variable method. Furthermore, we discuss the nonlinear control system. The discussion ends with a knowledge-based tool for control system which includes neural networks and fuzzy contol.

Learning Outcomes
Knowledge
(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.
Specific Skill
(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.
General Skill
(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concept of designing a digital electronic control system.

Specific Skill

Able to design and realize microcomputer-based digital electronic control systems.

General Skill

Able to complete the design and realization of electronic control systems for particular applications.

Attitude

Demonstrate an attitude of working independently, creatively, and innovatively in problem solving.

Main Subjects

1. Overview control design
2. Digital control theory and practice
3. State variable methods in automatic control
4. Nonlinear control systems
5. Knowledge-based tools for control system

Reference(s)

[1] C. James Taylor, Peter C. Young, Arun Chotai, True digital control: statistical modelling and non-minimal state space design, John Wiley & Sons Ltd, 2013
[2] Ioan D. Landau and Gianluca Zito, Digital control systems: design, identification and implementation, Springer-Verlag, 2006
[3] Chi-Tsong Chen, Analog and Digital Control System Design, Saunders College Publishing, 2005

[4] V. Bobal, J. Böhm, J. Fessl and J. Machacek, Digital self-tuning controllers : Algorithms, Implementation and Applications, Springer-Verlag London Limited, 2005

[5] M Gopal, Digital Control and State Variable Methods: Conventional and Neural-Fuzzy Control System, McGraw-Hill Education 2004

Prerequisite(s)

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COURSE			
	Name	:	Robotics and Automation
	Code	:	EE185541
	Credit(s)	:	2
	Semester	:	

Description of Course

The Robotics and Automation course discusses manipulators and mobile robots. In the first part, we discuss about manipulator forward and inverse kinematics, newton-euler & lagrangian dynamics, and motion planning. Manipulator control is more detailed about motion control, force / impedance control, impedance & interaction control, and coordinated motion control. Next, we discuss about mobile robot sensors, locomotion, kinematic models, and motion control. Next, discussed about mobile robot localization systems, map representation, and autonomous map building. In the final section we discuss the mobile robot path planning, obstacle avoidance, and navigation architectures.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts of robotics and automation and their applications in various fields.

Specific Skill

Able to understand the overall system of manipulators and mobile robots.

General Skill

Able to design robotics and automation systems for particular applications.

Attitude

Demonstrate an independent, creative, and innovative attitude in problem solving.

Main Subjects

1. Introduction to robotics and automation
2. Manipulator of kinematics, dynamics and motion planning
3. Manipulator control
4. Mobile robot sensors, locomotion, kinematics, and motion control
5. Mobile robot localization
6. Mobile robot planning and navigation

Reference(s)

[1] Roland Siegwart, Illah R. Nourbakhsh, and Davide Scaramuzza, Introduction to Autonomous Mobile Robots, The MIT Press, 2011

[2] Farbod Fahimi, Autonomous Robots: Modeling, Path Planning, and Control, Springer Science+Business Media LLC, 2009
[3] Thomas R. Kurfess, Robotics and automation handbook, by CRC Press LLC, 2005

Prerequisite(s)
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COURSE		
	Name	: Computer-based Visual Perception
	Code	: EE185542
	Credit(s)	: 2
	Semester	:

Description of Course

This course studies advanced visual sensing (visual perception of an image) using a camera that includes image acquisition techniques with cameras, image processing, image analysis, and computer-based image understanding. The application used is to create color segmentation, blob counters, camera-based human machine interactions, mouse cameras, and other applications.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU09) Being able to develop themselves and compete in national and international level.

(KU10) Being able to implement the principle of sustainability in developing knowledge.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S10) Internalizing spirit of independence, struggle and entrepreneurship.

(S11) Trying his/her best to achieve perfect results.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering image acquisition techniques using cameras, segmentation, object recognition, image understanding, stereo images, and motion analysis (motion analysis).

Specific Skill

Able to implement the concept of image segmentation techniques, object recognition, image understanding, stereo images, and motion analysis for issues related to engineering problems.

General Skill

Able to use Visual Studio software and OpenCv software.

Attitude

Able to internalize the spirit of independence, struggle, and entrepreneurship.

Main Subjects

1. Definition, use, and application of image processing
2. Devices used for image processing
3. Binary Image Processing: (1) Threshold, (2) Adaptive Threshold, (3) Histogram, (4) Edge Detection, (5) Blob Analysis, (6) Image Compression, (7) Background Substraction, (8) Filter , (9) Contour
4. Features on Image: (1) Edge, (2) Corner, (3) PointTemplate Matching: (1) SAD, (2) SSD, (3) Cross Corelation, (4) Cross Corellation Coefficient
5. Motion Analysis, Mean Shift
6. Pattern Analysis, PCA, Gabor Filter,LBP, Viola Jones
7. Stereo Vision

Reference(s)

[1] Buku Ajar Penginderaan Visual Berbasis Komputer (Textbook of Computer-based Machine Vision), Ronny Mardiyanto, 2018
[2] Linda G. Shapiro, Computer Vision, Prentice-Hall, Inc., 2001
[3] Milan Sonka dkk, Image Processing: Analysis, and Machine Vision, Brooks and Cole Publishing, 1998.
[4] Ramesh Jain, Machine Vision, McGraw-Hill, Inc., 1995
[5] Gary Bradski and Adrian Kaehler, Learning OpenCV: Computer Vision with OpenCV Library, O'Reilly Media, Inc., 2008

Prerequisite(s)

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COURSE			
	Name	:	Optoelectronics and Laser Technology
	Code	:	EE185543
	Credit(s)	:	2
	Semester	:	

Description of Course

The course of Optoelectronics and Laser Technology discusses: The Properties of Light including Polarization, Interference, Diffraction, Light Spectrum, and Monochromator; Modulation of Light; Display Devices including Light Emitting Diode, Plasma Display, Liquid Crystal Display; Lasers including Laser Stimulation Techniques, Q-Switching; Photodetectors including Photocathode, UVTRON, Photomultiplier, Photoconductive, Photodiode, Photovoltaic, Charge-coupled Device; Optical Fibers including Fiber Dispersions, Multimode Step-index Fibers, Inter-modal Dispersion, Single-mode Fiber, Graded-index Fiber, Material Dispersion, Fiber Losses, Optical Time-Domain Reflector; Integrated Optics including Waveguide Fabrication, Directional Coupler, Splitter, Wavelength Multiplexer, Interferometric Filter, Optical Switch, Optical Amplifier; Optical Communication System; Applications of Optoelectronics and Laser Technology.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts, principles of design procedure for optoelectronic device technology systems and its applications in telecommunications or electronics.

Specific Skill

Being able to describe the analysis, simulation, design, and application of optoelectronic devices.

General Skill

Being able to apply the analysis, simulation, design, and application of optoelectronic devices.

Attitude

Demonstrating attitude of responsibility regarding the analysis, simulation, design, and application of optoelectronic devices independently.

Main Subjects

1. The Properties of Light
2. Modulation of Light
3. Display Devices
4. Lasers
5. Photodetectors
6. Optical Fibers
7. Integrated Optics
8. Optical Communication System

9. Applications of Optoelectronics and Laser Technology

Reference(s)

[1] Muhammad Rivai, 2018. Diktat: Opto-Elektronika dan Teknologi Laser.
[2] S.O. Kasap, Optoelectronics & Photonics: Principles & Practices, Prentice Hall, 2012.

Prerequisite(s)

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COURSE			
	Name	:	Anatomy and Physiology
	Code	:	EE185544
	Credit(s)	:	2
	Semester	:	

Description of Course

Anatomy and Physiology course studies the basics of human body anatomy which include cell anatomy and physiology, tissue anatomy and physiology, neural network systems, biolytic activity in the brain, skeletal system, muscular tissue system, biolytic activity in muscles, cardiovascular system, activity biolytics in the heart, pulmonary system, and review of journals in applied physiology, biomechanics.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the basic principles of cell anatomy and physiology to the human organ system to develop procedures and strategies needed for system analysis and design in the field of biomedical engineering.

Specific Skill

Able to develop solutions to biomedical engineering problems by deepening or expanding the anatomy and physiology of human organs.

General Skill

Able to improve the capacity of scientific learning anatomy and physiology of human organs independently.

Attitude

Demonstrate attitude of responsibility for work in the field of anatomy and physiology of human organs independently.

Main Subjects

1. Scope of anatomy and physiology
2. Cell anatomy and physiology
3. Tissue anatomy and physiology
4. Nervous system
5. Skeletal system, muscular system
6. Cardiovascular system
7. Pulmonary system
8. Study journals in applied physiology, biomechanics

Reference(s)

[1] Wynn Kapit et. al.,Anatomy coloring book, Benjamin Cumings Science Publishing, USA, 3rd Ed, 2002.
[2] Wynn Kapit et. al., Physiology coloring book, Benjamin Cumings Science Publishing, USA, 2nd Ed, 2000.
[3] Frederic H Martini et. al., Fundamentals of anatomy and physiology, Prentice Hall Intl. Inc., USA, 5th Ed, 2001.

[4] Roger M Enoka, Neuromechanics of human movement, Human Kinetics, USA, 3rd Ed, 2002.

Prerequisite(s)
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COURSE	Name	:	Biomedical Measurement and Instrumentation
	Code	:	EE185545
	Credit(s)	:	2
	Semester	:	

Description of Course

The Biomedical Measurement and Instrumentation Course is a course that studies the principles of biopotential measurement and the design of its instruments, including: biomedical sensor basis, current and future biomedical instrumentation techniques, understanding transducers and biopotentials as input to biomedical instrumentation. The course is also aimed to understand computer-based biomedical instrumentation techniques, maintenance and security of biomedical instrumentation.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic concepts of biomedical measurement and instrumentation

Specific Skill

Able to design and realize biomedical measurement and instrumentation systems.

General Skill

Able to use software to do simulations

Attitude

Demonstrate the attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Basic Concepts of Biomedical Instrumentation
2. Biopotentials and basic laws related to currents in biological networks
3. Principles of transducers and types of biomedical electrodes
4. Biopotential amplifiers and instrumentation for ECG, EEG, EMG, analog filtering, strengthening models, equipment for monitoring and patient care
5. EMG and EEG
6. Blood Pressure measurement
7. Biomedical wireless monitoring system, Telemonitoring & Telemedicine
8. Lab instrumentation, diagnostics, radioisotopes and X-rays

9.	Electric safety of medical equipment.

Reference(s)

[1] Design and Development of Medical Electronic Instrumentation: A Practical Perspective of the Design, Construction, and Test of Medical Devices, D. PRUTCHI, M. NORRIS (2005)
[2] Sensor in medicine
[3] Medical Instrumentation, Webster
[4] Medical Physics, J.R. Cameron, J.G. Skofronick
[5] Handbook of medical instrumentation

Prerequisite(s)

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COURSE			
	Name	:	Biomedical Engineering
	Code	:	EE185546
	Credit(s)	:	2
	Semester	:	

Description of Course

The Biomedical Engineering Course is a course that discusses the contribution of engineering fields in medicine and biology that are multidisciplinary. Course materials discussed in this course include the scope of biomedical engineering, physiology systems, biomedical system modeling, bioelectric phenomena, biomechanical concepts, biomaterial concepts, imaging medical, prothese and artificial organs, clinical engineering, medical ethics.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of physiological system modeling and biomedical related fields

Specific Skill

Able to model physiological systems and present bioelectric phenomena, and biomedical related fields

General Skill

Able to use software to model physiological systems

Attitude

Demonstrating the attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Introduction to Biomedical Engineering
2. Physiological System Modeling
3. Bioelectric signals
4. Medical Imaging Concept
5. Prothese and Artificial Organ
6. Medical Ethics

Reference(s)

[1] J Bronzino (Ed), Biomedical Engineering Handbook, IEEE Press.
[2] RB Northrop, Introduction to Dynamic Modeling of Neuro-sensory Systems, CRC Press, 2001.
[3] IEEE Trans Biomedical Engineering.

[4] J Moore and G Zouridakis, Biomedical Technology and Devices Handbook, CRC Press, 2004.
[5] J Tan (Ed), E-Health Care Information System, Jossey-Bass, 2005.

Prerequisite(s)

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COURSE			
	Name	:	Biomedical Signal Analysis
	Code	:	EE185547
	Credit(s)	:	2
	Semester	:	

Description of Course

Biomedical Signal Analysis Course is a course that studies the basics of generating signals from a biological system. The signal will then be processed and extracted to obtain certain characteristics of the signal. Analysis is carried out on the characteristics obtained for the purposes of the biomedical field. Some mathematical tools are used in developing biomedical signal analysis.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes
Knowledge
Mastering the concepts and principles of biomedical signal analysis to develop procedures and strategies needed for system analysis and design in the field of biomedical engineering.
Specific Skill
Able to develop solutions to biomedical engineering problems by deepening or expanding scientific analysis of biomedical signals.
General Skill
Able to improve the capacity of scientific learning anatomy and physiology of human organs independently.
Attitude
Demonstrate an attitude of responsibility for work in the field of anatomy and physiology of human organs independently.

Main Subjects

1. Electro physiology of heart
2. ECG analysis
3. Myoelectric signal
4. EOG analysis
5. Digital Filter for signal processing
6. Processing and analysis of human movement signals
7. Frequency-based analysis and Time-Frequency analysis

Reference(s)

[1] JL Semlow, Biosignal and Biomedical Image Processing, Marcell Dekker Inc., 2004.
[2] J Bronzino (Ed), Biomedical Engineering Handbook, IEEE Press.
[3] Metin Akay (Ed), Biomedical Signal Detection, IEEE Press.

Prerequisite(s)

COURSE		
	Name	: Special Topics In Electronics
	Code	: EE185548
	Credit(s)	: 2
	Semester	:

Description of Course

This course deals with specific topics in electronic technology or related to current development in electronics technology, which has not been discussed in other courses, interdisciplinary, or possibly a trend in the future. The topics covered can also be directed to support the research topic of the student in particular and more in-depth. It is expected to prepare students to familiarize themselves with the current developments of one or more specific topics in the field of electronics from sources of reputable publications, such as artificial intelligence, sensor technology, micro and nanoelectronics technology, and robotics.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

Attitude

(S09) Demonstrate a responsible attitude towards the work in the field of his/her expertise independently.

Course Learning Outcomes

Knowledge

Understand the latest developments of special topics in the field of electronics.

Specific Skill

Able to study and implement the initial design of a problem on a specific topic in electronics.

General Skill

Able to do literature review of topics in the field of electronics comprehensively and critically.

Attitude

Demonstrate a responsible attitude towards the work in his own field of expertise independently.

Main Subjects

1. Literature review.
2. Simulation technique.
3. Implementation of electronics system.
4. Project

Reference(s)
[1] Some relevant textbooks. [2] Relevant Journals and proceedings.
Prerequisite(s)
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COURSE		
	Name	: Electronic Circuit Analysis and Design
	Code	: EE185740
	Credit(s)	: 2
	Semester	:

Description of Course

Electronic Circuit Analysis and Design couse provides students with a basic understanding of the characteristics of Bipolar transistor amplifier circuit, FET and Op-Amp (Operational amplifier) both DC and AC small signal amplifier at low, medium and high frequency. It also discusses negative and positive feedback concepts, feedback amplifier circuit, comparator, voltage level detector, hysteresis, and analog computer, integrator, differentator, as well as active filter Butterworth LPF, HPF, BPF, and BSF that are implemented in operational amplifier.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in BJT, FET, and Op-Amp amplifiers

Specific Skill

Able to analysis and design BJT, FET, and Op-Amp amplifier circuits as well as comparator, oscillator, analog computers, and Op-Amp active filters

General Skill

Able to analysis and design electronic circuits in the electrical system by using BJT, FET dan Op Amp.

Attitude

Able to demonstrate attitude of responsibility on work in his/her field of expertise in analysis and design of electronic circuits independently

Main Subjects

1. Basic Characteristics Of bipolar transistor
2. Bipolar transistor DC Biased Circuits
3. Small signal analysis of BJT amplifiers
4. Basic Characteristics Of FET (JFET dan MOSFET)
5. FET DC biased circuits
6. Small signal analysis of FET amplifiers
7. Basic Characteristics of Op-Amp and Op Amp negative feedback amplifier
8. Op-Amp positive feedback circuits, comparator and voltage level detector
9. Signal generator and Wien oscillator
10. Analog computer (Integrator, differentiator, adder)

11. Butterworth Op Amp active filter (LPF, HPF, BPF, BSF)

Reference(s)

[1] Diktat Kuliah Analisis dan Disain Rangkaian Elektronika, Hendra Kusuma 2018
[2] Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Ed., Pearson Education Inc., 2013
[3] Robert F Coughlin, Frederick F Driscoll, Operational Amplifier and Linear Integrated Circuit, Prentice-Hall International, 2001.
[4] Alexander Charles K., Sadiku Matthew O. N., Fundamentals of Electric Circuit, 5th Ed., McGraw-Hill, New York, 2013.

Prerequisite(s)

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COURSE	Name	: Circuit Analysis Technique
	Code	: EE185741
	Credit(s)	: 2
	Semester	:

Description of Course

The course of Circuit Analysis Technique discusses (review) the concept of electric circuit and its analysis. The learning materials include: circuit elements (sources and components), Basic law of circuits (Ohm and Kirchhoff's Law), circuit analysis (nodes and mesh), and Some important circuit techniques (superposition, thevenin and Norton equivalent circuit, maximum power transfer). The next topics of discussion are the transient response of step units (order 1 and order 2), steady state analyzes of sinusoid signal, power calculations on an ac circuits, polyphase circuits, and magnetic coupling circuits.

Learning Outcomes

Knowledge

(P02) Mastering the concepts, procedures and principles of engineering and making them possible in the form of procedures necessary for the analysis and design of systems in the field of power systems, control systems, multimedia telecommunications, or electronics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently

Attitude

(S09) Demonstrate a responsible attitude towards the work in the field of his/her expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concept of electric circuits and its analysis for the purpose of analysis and system design in the field of electrical technology.

Specific Skill

Able to describe the procedure of electric circuit analysis in the field of electrical technology.

General Skill

Able to improve the capacity of learning independently.

Attitude

Demonstrate responsible attitude toward the work in his/her own field of expertise related to electrical circuitry.

Main Subjects

1. Circuit elements (sources and components).
2. Basic law of circuits (Ohm and Kirchhoff's Law).
3. Circuit analysis (nodes and mesh).
4. Some useful/important circuit techniques (superposition, thevenin and Norton equivalent circuit, maximum power transfer).
5. Transient response of step units (order 1 and order 2).
6. Steady state analyzes of sinusoid signal.
7. Power calculations on an ac circuits.
8. Polyphase circuits.
9. Magnetic coupling circuits.

Reference(s)

[1] CK Aexander and MNO Sadiku, Fundamental of Electric Circuit, McGraw Hill, 8th Edition, 2013.
[2] WH Hayt, JE Kemmerly, and SM Durbin, Engineering Circuit Analysis, McGraw Hill, 8th Edition, 2007.

Prerequisite(s)

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COURSE			
	Name	:	Numerical Analysis and Dynamic Programming
	Code	:	EE185742
	Credit(s)	:	2
	Semester	:	

Description of Course

The course of Numerical Analysis and Dynamic Programming discusses the basic understanding of numerical algorithms and skills for applying numerical algorithms to solve math problems in computer; Solving a mathematical problems using numerical algorithm approach that includes Error Analysis, Number Representation, Taylor Theorem, Non-Linear Equations, Linear Equations, Regression, Interpolation, Numerical Integration, Numerical Differentiation, and Differential Equations.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU07) Being able to improve the capacity of learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the numerical analysis and dynamic programming related to the field of electronics.

Specific Skill

Being able to formulate engineering problems with new ideas of numerical analysis and dynamic programming for the development of technology in electronics.

General Skill

Being able to improve the capacity of learning independently for the numerical analysis and dynamic programming.

Attitude

Demonstrating attitude of responsibility regarding the numerical analysis and dynamic programming independently.

Main Subjects

1. Error Analysis, Number Representation, Taylor Theorem
2. Non-Linear Equations
3. Linear Equations
4. Regression
5. Interpolation
6. Numerical Integration
7. Numerical Differentiation
8. Differential Equations

Reference(s)

[1] Greenbaum and T. P. Chartier. Numerical Methods: Design, Analysis and Computer Implementation of Algorithms. Princeton University Press, 2012.
[2] W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery. Numerical Recipes: The Art of Scientific Computing. Cambridge University Press, 2007.
[3] L. R. Scott. Numerical Analysis. Princeton University Press, 2011.
[4] E. Suli, D. F. Mayers. An Introduction to Numerical Analysis. Cambridge University Press, 2003.

Prerequisite(s)

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5. Multimedia Intelligent Network

COURSE	Name	: Statistical Methods and Optimization
	Code	: EE185101
	Credit(s)	: 2
	Semester	: I

Description of Course

In this course, students learn the two main topics, namely: (1) statistical methods needed to design research as well as to analyze and interpret the measurements and simulations; (2) the basics and methods of optimization needed to find solutions to various technical problems encountered in research, for example: linear programming, convex optimization, iterative methods, optimization inspired by nature: genetic algorithms, etc.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and methods of statistical analysis of measurement data and mastering the optimization method for a problem in engineering in the field of electrical engineering

Specific Skill

Able to design experiments and calculate statistical analysis on measurement data and be able to define optimization problems and find optimal solutions

General Skill

Able to use software and tools for statistical analysis and optimization, e.g. Matlab and R.

Attitude

show the attitude of being responsible for the work in his area of expertise independently.

Main Subjects

1. Introduction
2. Descriptive statistics
3. Experimental design
4. Univariate, multivariate and variance analysis
5. Application of statistical methods
6. Optimization problems
7. Mathematical optimization
8. Completion of analytical optimization
9. Completion of numerical optimization

10. Dynamic programming
11. Introduction to meta-heuristics and evolutionary algorithms

Reference(s)

[1] William M. Mendenhall & Terry L. Sincich, “Statistics for Engineering and the Sciences,” 6th ed., CRC Press, 2016.
[2] Jay Devore, “Probability and Statistics for Engineering and the Sciences,” 9th ed., CENGAGE Learning, 2016.
[3] William Navidi, “Statistics for Engineers and Scientists,” 3rd ed., McGraw-Hill, 2011.
[4] Jorge Nocedal & Stephen J. Wright, “Numerical Optimization,” 2nd ed., Springer, 2006.
[5] Edwin K.P. Chong & Stanislaw H. Zak, “An Introduction to Optimization,” 4th ed., John Wiley & Sons, 2013
[6] Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, “Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization,” John Wiley & Sons, 2017.

Prerequisite(s)

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COURSE	Name	: Introduction to Research
	Code	: EE185102
	Credit(s)	: 2
	Semester	: I

Description of Course

The Introduction to Research course is a course that delivers or prepares students to be able to develop research ideas and plan research activities and plan writing a thesis proposal. In this course, students will be given material on basic knowledge and basic preparation before formulating the problems to be examined in their thesis proposal. The material to be taught includes: Searching for scientific articles, index measuring scientific articles and researchers, Introduction to research fields in the Laboratory of each area of expertise, definition of problems in research, differences in research projects and work projects, understanding of hypotheses, Novelty, Plagiarism, methods and methodology , types of research, types of data collection methods and data collection techniques (surveys, questionnaires, interviews, measurements, data mining) and fishbone diagrams.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control

systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the procedures for scientific article search and flow in ran. Understanding hypotheses, novelty, plagiarism, types of research in the laboratory and procedures for writing fishbone research diagrams, as well as various data collection techniques in research so that the thesis proposal plan can be prepared better.

Specific Skill

Being able to browse scientific articles of interest, is able to develop a formulation of research problems that have the potential to be used as research themes in his thesis proposal, and contain elements of novelty and avoid plagiarism.

General Skill

Able to develop research plans that contain novelty ranging from building hypothesis, formulating problems and planning research methods

Attitude

Demonstrate honesty in developing research themes, open to suggestions and input and responsible for avoiding plagiarism.

Main Subjects

1. The procedure for a scientific article search

2. Introduction to Research
3. Hypothesis in research
4. An understanding of Novelty in research
5. Plagiarism
6. Data collection techniques in research
7. Types of research
8. Citation and use of Reference (s)
9. The 1st Lab-Research theme
10. The 2nd Lab-Research theme
11. The 3rd Lab-Research theme
12. The 4th Lab-Research theme
13. Preparation of Fishbone Diagram

Reference(s)

[1] Research Methodology., A Step by step guide for beginners., Ranjit Kumar., 3rd Edition., 2011

[2] Research Methodology: Methods and Techniques., 2nd Revised Edition., C.R. Kothari., New Age International Publisher., 2004

[3] Research and Methodology: Tools and Techniques., Prabhat Pandey, Meenu Mishra Pandey, 2015

Prerequisite(s)

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COURSE			
	Name	:	Mobile Computing
	Code	:	EE185151
	Credit(s)	:	3
	Semester	:	I

Description of Course

In this course, students will learn about mobile platform and special features for mobile devices. Topics studied include developing mobile platforms, mobile device interfaces, personalization and authentication.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of mobile application development

Specific Skill

Able to build distributed applications with complex widgets.

General Skill

Able to do prototyping from cloud service-based applications and communication systems

Attitude

Demonstrating attitude of being responsible for the work in his/her area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Low-level network services at moving platform
2. The principle of developing mobile applications
3. Network service-based interaction style.
4. Personalization, profiling and authentication
5. Principles of contact-based development and telephone systems
6. Networking and cloud services

Reference(s)

[1] Adem Karahoca, Advances and Applications in Mobile Computing, ISBN 978-953-51-0432-2, 236 pages, Publisher: InTech, Chapters published March 30, 2012 under CC BY 3.0 license
[2] Mark L. Murphy, Beginning Android (Expert's Voice in Open Source) Paperback – 1 Jun 2009
[3] Yu-Kwong Ricky Kwok, Vincent K.N. Lau, “Wireless Internet and Mobile Computing: Interoperability and Performance”, Wiley-IEEE Press, 2007. (Google Book)

[4] 3. D.P. Agrawal and Q.-A. Zeng, “Introduction to Wireless and Mobile Systems”, 2nd edition, Thomson Learning, 2006.

Prerequisite(s)

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COURSE		
	Name	: Soft Computing
	Code	: EE185152
	Credit(s)	: 3
	Semester	: I

Description of Course

In this course, students will learn machine learning inspired by the biological domain. Topics to be studied include: basic types of neural networks, multi layer perceptrons, unsupervised neural networks, fuzzy logic, and genetic algorithms. The learning methods used are lectures, discussions, reading, solving practice questions, quizzes, case studies, examinations, and final projects.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts of soft computing, artificial neural networks, fuzzy logic and Evolutionary Algorithm.

Specific Skill

Able to identify and choose the right soft computing technology to solve problems and build solutions.

General Skill

Students are able to implement soft computing to solve problems.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Neural Network: the concept of neural network; supervised learning: perceptron and multilayer perceptron; unsupervised learning: self-organizing map, Hopfield, ART.
2. Fuzzy Logic: fuzzy set theory, fuzzy system, membership function, rule based, and inference engine development.
3. Evolutionary Algorithm: genetic algorithm, genetic programming, ant colony method, particle swarm optimization, artificial immune system.

4. Hybrid Algorithm: neuro-fuzzy method, neuro-ga method, fuzzy-ga method, immune-evolutionary.

Reference(s)

[1] Jang JSR. “ Neuro Fuzzy & Soft Computing” Prentice Hall, 1997
[2] Mauridhi Hery Purnomo. ”Supervised Learning Neural Networks” Graha Ilmu. 2006

Prerequisite(s)

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COURSE		
	Name	: Scientific Writing
	Code	: EE185201
	Credit(s)	: 2
	Semester	: II

Description of Course

Scientific Writing course discusses the method of writing scientific documents, especially for thesis proposals at the master level. Lecture materials include various, characteristics and functions of scientific documents and parts of scientific documents. Indonesian language citation, plagiarism and grammar will also be discussed. Through this lecture students will develop the skills to write academic documents that are useful for their future success.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Being able to recognize and describe an academic document.

Specific Skill

Being able to describe procedures for making academic documents.

General Skill

Being able to make an academic document.

Attitude

Demonstrating an attitude of being responsible for work in his area of expertise independently.

Main Subjects

1. Introduction: types, functions and characteristics of scientific documents.
2. Parts of scientific documents: opening (front matter).
3. Parts of scientific documents: contents or torso (body).
4. Parts of scientific documents: cover (end matter).
5. Illustration on scientific documents.
6. Citation: source, writing, and plagiarism.
7. Indonesian language spelling and grammar: spelling, words, sentences, and paragraph.

Reference(s)

[1] Program Pasca Sajana ITS, Pedoman Penyusunan Tesis Tahun 2014.
[2] Tim Pengembang Pedoman Bahasa Indonesia, PEDOMAN UMUM EJAAN BAHASA INDONESIA, Edisi 4, Badan Pengembangan dan Pembinaan Bahasa Kementerian Pendidikan dan Kebudayaan, 2016.

[3] Adjat Sakri, Bangun Paragraf Bahasa Indonesia, Penerbit ITB, 1993
[4] Adjat Sakri, Bangun Kalimat Bahasa Indonesia, Penerbit ITB, 1994
[5] L.C. Perelman, J. Paradis, and E. Barrett. The Mayfield Handbook of Technical and Scientific Writing. New York, NY: McGraw-Hill, 1997. ISBN: 9781559346474.

Prerequisite(s)

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COURSE		
	Name	: Cloud Computing
	Code	: EE185251
	Credit(s)	: 3
	Semester	: II

Description of Course

In this course, students will study cloud computing, from applications and administration to programming and infrastructure. The main goal is parallel programming techniques for cloud computing and large-scale distributed systems that make up the cloud infrastructure. The topics include broad-based cloud computing, cloud systems, parallel cloud processing, distributed storage systems, virtualization, security in cloud systems, and multicore operating systems.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Able to understand the basic concepts of cloud computing paradigm, characteristics, advantages and challenges posed by various models and services in cloud computing.

Specific Skill

Able to explain system virtualization, networking and storage and outline its role in enabling cloud computing system models.

General Skill

Abto to apply the basic concepts of cloud infrastructure to obtain power balance, efficiency and costs to be applied to tough, elastic and cost-effective cloud applications.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Introduction: Definition and evolution of Computing Models of Technology, Services and Application of Cloud Computing Layers and Popular Cases of Cloud Use Benefits, Risks, and Challenges of Cloud Model Economic Computing and SLA Topics on Cloud Security
2. Cloud Infrastructure: Design of IT Tools and Equipment, Requirements, Power, Efficiency & Power Redundancy Calculation, Cloud Software
3. Virtualization: Virtualization (CPU, Memory, I / O)

4. Cloud Storage: Introduction to Storage Systems Concept of Distributed File System Cloud Storage (HDFS, Ceph FS) Cloud Database (HBase, MongoDB, Cassandra, DynamoDB) Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph)
5. Distributed Programming: Programming Model for Cloud Data-Parallel Analysis with Hadoop MapReduce (YARN)

Reference(s)

[1] Igor Faynberg, Kui-Lan Lu, and Dor Skuler, Cloud Computing: Business Trends and Technologies, Wiley, 2015

Prerequisite(s)

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COURSE		
	Name	: Multimedia Signal Processing
	Code	: EE185252
	Credit(s)	: 3
	Semester	: II

Description of Course

This course studies the concept of signal processing for multimedia applications, continuous signals, digital signals, fourier transforms, FFT, discrete cosine transcription and multimedia compression.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Able to understand basic concepts and techniques in processing multimedia signals based on current multimedia technology standards.

Specific Skill

Able to explain multimedia signal processing principles based on multimedia technology today.

General Skill

Able to apply the knowledge to certain multimedia problems and projects.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Digital Signal Processing: Wave, Amplitude, Frequency and phase, Signal to Noise ratio, digital signal filter.
2. Fourier transform: Components of audio and video data frequency, frequency dominance, fourier theorem 1 D and 2D, magnitude, phase and time frequency representation.
3. Digital Filters: Low Pass Filters, High Pass Filters, Band-Pass Filters, Fourier Transforms and Convolutions.
4. Data Multimedia: Discrete and continuous media, analog / digital conversion, text, audio, graphics, images and video.
5. Compression algorithm: Shannon and Kolmogorov, Lossless and Loss Compression, Lossless compression algorithm, Repetitive Sequence Suppression, Run-Length Encoding, Pattern Substitution, Entropy Encoding, Shannon-Fano Algorithm, Huffman Coding, Arithmetic Coding

Reference(s)

[1] Alan C. Bovik, "Handbook of Image and Video Processing ", Academic Press, 2000
[2] Rafel C. Gonzalez, "Digital Image Processing", 3rd Ed., Pearson Education, 2008

Prerequisite(s)

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COURSE			
	Name	:	Modern Computing Network
	Code	:	EE185351
	Credit(s)	:	3
	Semester	:	III

Description of Course

This course studies modern computers, internet of things protocols and technologies, the latest technology in the field of computer networks, namely communication skills without requiring human-to-human or human interaction with computers. IoT can be composed of several sensor nodes that are equipped by data processors, memory, batteries and wireless communication equipment (Wireless Sensor Node / WSN). The sensor node sends data to the Sink and sink sends data to the Server or Cloud Storage via the internet network.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Able to understand the basic concepts of the internet and the internet of things working.

Specific Skill

Able to determine the performance of packet-based real time networks.

General Skill

Able to apply modern computer concepts in fields: agriculture, transportation, health and several other fields.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Internet and Internet of Things: layers, protocols, packages, services, network packet performance, sensor networks.
2. Transport services: TCP, UDP, skoet programming.
3. Network layer: routing algorithm, (Link, DV), IP-addresses, DNS, NAT and routers.
4. Local Area Networks, MAC level, link protocols.
5. Mobile network: roaming and handoffs, mobile IP.
6. IoT: Application and architecture, case study in industry.

Reference(s)

[1] Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
[2] Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2014.
[3] Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013

Prerequisite(s)

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COURSE		
	Name	: Thesis
	Code	: EE185401
	Credit(s)	: 8
	Semester	: IV

Description of Course

The Thesis course is a capstone project for the master program as one of the requirements to complete the master program study. Thesis research is the culmination of all knowledge gained by students during the study and scientific validation and expertise that has been obtained. Students must write the results of their research in the Thesis book and take the Thesis examination, and publish the results of their thesis research in scientific journals as one of the graduation requirements.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

(KU06) Capable of managing, developing and maintaining networking with colleagues, peers within the broader institutes and research community.

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S08) Internalizing values, norms and academic ethics

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of scientific and engineering comprehensively, and factual knowledge about information and communication technology and the latest technology to develop procedures and strategies needed for the analysis and design of systems in the field of Electrical Engineering and its applications which are the topic of discussion.

Specific Skill

Being able to formulate and compile engineering problem solving, produce system designs and implement alternative engineering problem solving by expanding knowledge that adapts changes in science or technology in the field of Electrical Engineering which is the topic of discussion.

General Skill

Being able to produce a feasible thesis to be published in scientific journals by utilizing both software / hardware technology in conducting experiments related to system analysis and design which is the topic of discussion.

Attitude

Striving maximally in solving problems in the field of Electrical Engineering which is the topic of discussion to achieve perfect results.

Main Subjects

1. Introduction (Background, Problem Formulation, Objectives, Contributions)
2. Research Studies and Basic Theory
3. Research Methodology
4. Research Results and Discussion
5. Conclusions and Suggestions

Reference(s)

[1] Supporting textbooks
[2] Papers from supporting journals or conferences
[3] Pedoman Penyusunan Thesis, Program Pascasarjana ITS, 2014.
[4] Pedoman Penyusunan Tesis, Departemen Teknik Elektro, http://teras.ee.its.ac.id/

Prerequisite(s)

Scientific Writing

COURSE			
	Name	:	Distributed Database Management System
	Code	:	EE185550
	Credit(s)	:	2
	Semester	:	

Description of Course

This course explains the basics of distributed database systems which include architecture, design, query processing and optimization and transactions.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of business intelligence based on mathematical models, the concept of decision making and the concept of data warehouse.

Specific Skill

Able to begin processing to eliminate outliers, design business intelligence systems and build data mining applications and business intelligence.

General Skill

Able to median and build a data warehouse for business intelligence projects.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.
Working together to be able to make the most of their potential.

Main Subjects

1. Introduction to DDBS
2. Distributed Database Management System Architecture
3. Distributed Database Design
4. Semantics Data Control
5. Query Processing Issues
6. Distributed Query Optimization
7. Transaction Management
8. Concurrency Control
9. Reliability
10. Parallel Database Systems

Reference(s)

[1] Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, Second Edition, 2006.

[2] Ian H.Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, Second Edition, 2005.
[3] Nong Ye, The handbook of data mining, Lawrence Erlbaum Associates, Inc., 2003.

Prerequisite(s)
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COURSE		
	Name	: e-Health
	Code	: EE185551
	Credit(s)	: 2
	Semester	:

Description of Course

This course is preparing student to understand the basic principle of e-Health system or telemedicine. This course consists of: history of e-health system, basic system of e-health, design of e-health, e-health system for stroke patient, Diabetic e-health monitoring, Tele-imaging technique, introduction to wireless technology, e-Health based on wireless system, Data management in e-Health system, e-Health monitoring system, data warehouse for e-health and data security.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Students understand the scope and parts of the e-Health system, the basic principles of e-Health implementation, implementation of wireless technology in e-Health applications, Embedded System technology bases, Data warehousing techniques and medical data security.

Specific Skill

Students are able to implement simple e-Health applications such as ECG data monitoring and data analysis and storage techniques.

General Skill

Able to explain the history, scope and basic principles of implementing e-Health systems, important aspects of the e-Health system, Technique for implementing wireless technology for e-Health applications and medical data security techniques

Attitude

Demonstrate honesty in developing research themes, open to suggestions and input and responsible for avoiding plagiarism.

Main Subjects

1. History and coverage of the e-Health system
2. Devices and parts that support e-Health system
3. Basic wireless technology for implementing e-Health systems
4. Short-range radio wave technology
5. Embedded System technology basis and application examples
6. Data ware housing for e-Health application
7. Data security system
8. Medical data encryption techniques (image data)

Reference(s)
[1] Bernard Fong, A.C.M. Fong, C.K.Li., Telemedicine Technology: Information Technologies in Medicine and Telehealth., Wiley, 2011. [2] Data Ware House, Tutorial Point., Simply East Learning., Tutorial Point, 2014. [3] Data Communication and Networking., 4th Edition., Behrouz A Forouzan., 2007.
Prerequisite(s)
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COURSE	Name	: Business Intelligence
	Code	: EE185552
	Credit(s)	: 2
	Semester	:

Description of Course

The Business Intelligence course discusses the scope and background of data mining and the types of data that can be mined. Besides, it provides an understanding of data patterns that can be mined such as frequent patterns, associations and correlations, classification, prediction, clustering, and patterns in various applications such as data streams, sequence data, WEB data.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts of business intelligence, data mining, data warehousing, knowledge management, and business intelligence implementation techniques.

Specific Skill

Able to build Business Intelligence solutions using data warehouses and OLAP technology for data mining, applying prediction techniques for data mining such as loss functions, linear and non-linear models and applying clustering methods for data mining such as partitional, discriminative and generative hierarchies, and kohonen networks.

General Skill

Able to design and build a data warehouse for business intelligence projects.

Attitude

Demonstrating attitude of being responsible for the work in his/her area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Introduction to business intelligence.
2. Data mining.
3. Data warehousing
4. Knowledge management
5. Implementation of business intelligence.

Reference(s)
[1] Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, Second Edition, 2006. [2] Ian H.Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, Second Edition, 2005. [3] Nong Ye, The handbook of data mining, Lawrence Erlbaum Associates, Inc., 2003.
Prerequisite(s)
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COURSE		
	Name	: Biometric System
	Code	: EE185553
	Credit(s)	: 2
	Semester	:

Description of Course

Students will have knowledge of biometrics systems using either single or multi-capital to identify someone based on physical attributes or behavior of people such as faces, fingerprints, sounds and iris.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and relationships of biometric systems ranging from sensors, extraction features, decision making and databases.

Specific Skill

Able to identify typical features obtained from an individual's physical parts including fingerprints, iris and sound

General Skill

Being able to build applications to identify or verify someone based on features typical of a person's physical part.

Attitude

Demonstrating attitude of being responsible for the work in his/her area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Multimodal sensor.
2. Extraction of features in different modalities such as fingerprints, sounds, faces.
3. Feature-based verification and identification method techniques.

Reference(s)

[1] Anil K. Jain, Patrick Flynn, Arun A. Ross, “Handbook of Biometrics”, Springer Publishing Company, Incorporated ©2010, ISBN:1441943757

[2] Negin, T. A. Chmielewski, M. Salganicoff, T. A. Camus,U. M. C. von Seelan, P. L. Venetianer, and G. G. Zhang, “An Iris Biometric System for Public and Personal Use”, IEEE Computer, 33(2):70–75, February 2000.

[3] M. S. Nixon, J. N. Carter, D. Cunado, P. S. Huang, and S. V. Stevenage, ”Automatic Gait Recognition. In A. K. Jain, R. Bolle, and S. Pankanti, editors, Biometrics: Personal Identification in

Networked Society", pages 231–249. Kluwer Academic Publishers, London, UK, 1999.
[4] L. O'Gorman, "Comparing Passwords, Tokens, and Biometrics for User Authentication", Proceedings of the IEEE, 91(12):2019–2040, December 2003.

Prerequisite(s)
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COURSE	Name	: Intelligent Pattern Recognition
	Code	: EE185554
	Credit(s)	: 2
	Semester	:

Description of Course

In this course, basic concepts, theories and algorithms for pattern recognition are used to study computer vision, voice recognition, data mining, statistics, information recovery and bio informatics. The topics of the course include: Bayesian decision theory, parametric and non-parametric learning, data grouping, component analysis of support vector machine and deep learning.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concepts and methods related to pattern recognition and machine learning.

Mastering the concept of features and being able to find features that are suitable for grouping a pattern.

Mastering algorithms and methods for grouping data based on features that have been found.

Specific Skill

Able to group and match data based on linear and non linear models.

Able to apply data dimension reduction method using principal component analysis (pca).

General Skill

Being able to build feature-based pattern recognition applications that have been found to be applied in the field of biometrics, voice recognition, robotics and computer vision.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Bayes Decision Theory: Discriminant function, normal distribution, density probability estimation function, Bayesian classification.

2. Linear classification: Perceptron algorithm, Least Suquare method.
3. Non-linear classification: Perceptron's Multilayer, backpropagation algorithm, Decision Trees, Combinations of Classifiers, Boosting
4. Feature selection: Data Preprocessing, ROC Curves, Class Separability Measures, Feature Subset Selection, Bayesian Information Criterion
5. Dimensity reduction: Base Vectors, Singular Value Decomposition, Independent Component Analysis, Kernel PCA, Wavelets
6. Matching templates
7. Classification based on context classification

Reference(s)

[1] R. Duda, et al., Pattern Classification, John Wiley & Sons, 2001.
[2] T. Hastie, et al., The Elements of Statistical Learning, Spinger, 2009.
[3] C. Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Prerequisite(s)

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COURSE		
	Name	: Grid Computing
	Code	: EE185555
	Credit(s)	: 2
	Semester	:

Description of Course

This course learns about the basics of distributed computing, middleware for grid computer systems, cloud computing, cloud systems, parallel processing in cloud, distributed storage systems, virtualization, security in cloud systems, and multicore operating systems.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of Grid computer systems to solve scientific problems on a large scale.

Specific Skill

Able to install and configure a grid middleware system using Globus.

General Skill

Able to evaluate and use grid computing resources using textual and graphical interfaces.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. The basic concept of a distributed system.
2. Cluster computing model.
3. Cluster-based grid computing.
4. The concept of Peer to peer on the Grid.
5. Grid Computing Middleware
6. Cloud Computing
7. Programming for distributed data, reduce maps.
8. Cloud security

Reference(s)

[1] K. Hwang, G. Fox and J. Dongarra, Distributed and Cloud Computing Morgan Kaufmann Publishers, 2012. (ISBN 978-0-12-385880-1
[2] Wan Fokkink, “Distributed Algorithms: An Intuitive Approach”, MIT Press, 2013.

Prerequisite(s)
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COURSE		
	Name	: Human-Computer Interaction
	Code	: EE185556
	Credit(s)	: 2
	Semester	:

Description of Course

In this course, students will learn about various kinds of interactions between computers and humans and their supporting theories and technologies. The topics taught include the history of Human Computer Interaction, interaction support media, usability principles, prototyping and natural language.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of human and computer interaction and its supporting factors.

Specific Skill

Able to apply an interactive design process and design principles to design the HCI system.

General Skill

Able to analyze HCI problems on ubiquitous computing, virtual reality, multimedia and the world wide web environment.

Attitude

Demonstrating attitude of being responsible for the work in his/her area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Definition and history of Human Computer Interaction. Including explanation of computer factors and human factors
2. Human Computer Interaction Media
3. Various types of interaction styles and examples
4. Paradigm of computer use
5. Stages in Task Centered User Interface Design (TCUID)
6. Lo-fi and Hi-fi Prototyping
7. Visual Programming for the interface

Reference(s)

[1] Human-Computer Interaction (3rd Edition), Prentice Hall; December 20, 2003 by Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale

[2] The Human–Computer Interaction Handbook Fundamentals, Evolving Technologies, and Emerging Applications Second Edition, Andrew Sears and Julie A. Jacko.
[3] GUI Bloopers 2.0, Common User Interface Design Don’ts and Dos, Jeff Johnson, ELSEVIER

Prerequisite(s)

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COURSE		
	Name	: Computer Vision
	Code	: EE185557
	Credit(s)	: 2
	Semester	:

Description of Course
Computer vision learns techniques like how a machine can interact with the outside world through visual perception using images obtained from a camera. To achieve this, the course studies image formation, camera models, light and color, features, corner point detection, bolb detection, descriptor. The course also covers visual geometry, stereo vision, multiiew stereo and visual traking and optical flow.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of the formation of a pinhole camera-based image model.

Specific Skill

Able to analyze the relationship between the image coordinate system, the camera and the world coordinate system.

General Skill

Able to use software related to computer vision for 3-dimensional feature extraction and visualization obtained from multiview imagery.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Transformation of geometry, homogeneous coordinate systems, duality of points and lines.
2. Corner point feature, two image correspondence.
3. Find two image homography using the direct linear transform (DLT) method
4. Pinhole camera models, intrinsic parameters and extrinsic parameters
5. Calibration of intrinsic and extrinsic parameters.
6. Epipolar geometrid and fundamental matrix.
7. Triangulation and 3D reconstruction.

Reference(s)

[1] Richard Hartley and Andrew Zisserman,Multiple View Geometry in Computer Vision Second Edition,Cambridge University Press, March 2004.
[2] Richard Szeliski, Computer Vision: Algorithms and Applications, 2010
[3] Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011
[4] Trucco and Verri, Introductory Techniques for 3D Computer Vision, Prentice Hall, 1998

Prerequisite(s)

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COURSE	Name	:	Special Topics in Mutimedia Inteligent Network
	Code	:	EE185558
	Credit(s)	:	2
	Semester	:	

Description of Course

In this course students will study specific topics related to the Multimedia Smart Network, and students are able to explain the related technological developments and all aspects that support them and are able to compile scientific papers related to these specific topics.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Students understand specific topics related to the Multimedia Smart Network, and are able to explain related technological developments and all aspects that support them, and are able to compile scientific papers related to the specific topic.

Specific Skill

Students are able to explain technological developments that are appointed as special topics, and create papers related to the review of these specific topics and examples of their implementation.

General Skill

Students are able to design and analyze technology applications that are appointed as special topics.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. About the latest technology that is appointed as a special topic related to Multimedia Smart Networks.
2. The basic principles and parts of the latest technology that are appointed as special topics related to the Multimedia Smart Network.
3. Implementation of the latest technology that is appointed as a special topic related to the Multimedia Smart Network to overcome problems in the community.
4. Related technological developments.
5. Supporting aspects.
6. Preparation of scientific papers related to the specific topic.

Reference(s)
[1] Relevant references are appointed as specific topics related to Multimedia Smart Networks. [2] Paper related to the latest technology that is appointed as the special topic related to Multimedia Smart Network.

Prerequisite(s)
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COURSE		
	Name	: Multimedia in Network
	Code	: EE185559
	Credit(s)	: 2
	Semester	:

Description of Course

This course studies architecture, flow diagrams and multimedia features in the network and communication protocols available in several network applications.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the mechanism or protocol for high-speed multimedia streaming on cable networks and wireless networks.

Specific Skill

Able to design highspeed LAN and link layers to support multimedia and real time applications.

General Skill

Able to build multimedia applications in the network using the existing distributed technology technology with socket programming, MPEG and media API compression techniques

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Multimedia Processing, Video coding.
2. Standard Multimedia: JPEG / JPEG-2000, H.26x, MPEG-1/4/7, AVC, Scalable Video Coding
3. Multimedia Networking: End-to-End QoS for Video Delivery, Wireless Video, Error Control on Video Streaming, Cross-Layer Video Adaptation.
4. Network layer for Multimedia communication: Internet Multicast Model, Internet Group Management Protocol (IGMP), Group Shared Tree and Source Based Tree, Multicast Routing Algorithm
5. System architecture Multimedia Streaming: Real-time Streaming, On-demand Streaming, Streaming Server design, Buffering and Scheduling Techniques.

Reference(s)

[1] J.K. Kurose, Computer Networking: A Top-down Approach Featuring the Internet, 5th ed., Addison-Wesley, 2010.

[2] K.R. Rao, Z.S. Bojkovic and D.A. Milovanovic, Multimedia Communication Systems: Techniques, Standards, and Networks, Prentice-Hall PTR, 2002.
[3] S. Vegesna, IP Quality of Service, Prentice-Hall PTR, 2001. 4. Colin Perkins, RTP: Audio and Video for the Internet, Addison-Wesley, 2003. 5. A. Dashti, S.H. Kim, C. Shahabi an d R. Zimmermann, Streaming Media Server Design, Prentice-Hall PTR, 2002

Prerequisite(s)
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COURSE			
	Name	:	Game Engine
	Code	:	EE185650
	Credit(s)	:	2
	Semester	:	

Description of Course

This course learns game machine exploitation using unity and blender to build 3-dimension games by considering animation models, rendering, physical models and collision detection collisions.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes
Knowledge Mastering the concept of rendering, physical concepts, 3D dimensional concepts to be applied to 3D games. **Specific Skill** Able to build games using object-based game machines by applying mechanical and physical concepts. **General Skill** Able to apply the principles of 3D games by using a blender or unity game machine. **Attitude** Demonstrating attitude of being responsible for the work in his area of expertise independently. Working together to be able to make the most of their potential.
Main Subjects
1. Game machine architecture 2. Physics: Detection of collisions, particle systems, rigid body motion 3. Animation and Modeling 4. Rendering 5. Gameplay: Game worlds, Object models, Scripting
Reference(s)
[1] Mathematics for 3D Game Programming & Computer Graphics. Eric Lengyel. ISBN 1-58450-277-0. [2] 3D Game Engine Architecture: Engineering Real-Time Applications with Wild Magic. David H. Eberly. ISBN 0-122290-64-X. 5. Large-Scale C++ Software Design. John Lakos. ISBN 0-201633- 62-0.
Prerequisite(s)
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COURSE		
	Name	: 3D Modelling Design
	Code	: EE185651
	Credit(s)	: 2
	Semester	:

Description of Course

In this course, students will learn about the interactive concept of computer 3D design modeling and its implementation in the computer program. Topics taught include basic 3D modeling, 2D coordinates, 3D coordinates, rotational transformation, scale transformation, translational translation, view, projection, lighting, shading, maping texture, raster, aniamasi and ray tracing, implementation using openGL.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Able to explain the concept of 3D model design and the implementation to 2D screen computer screen.

Specific Skill

Able to analyze local coordinate system relations between 3D objects to build objects of complex objects.

General Skill

Able to implement 3D modeling concepts using openGL.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Basic Concepts of 3D Modeling: Basic OpenGL, Lines, Polygons, and Color.
2. 2D / 3D transformation: 2D / 3D coordinates, translation, scaling, rotation, and combination.
3. Viewing and Projection: Virtual Camera Concept, FPS Camera, Third Person Camera, Prespective Projection, and Orthogonal Projection.

4. Lighting and Shading: Lighting Concepts, Ambient Lighting, Diffuse Lighting, Specular Lighting, Phong Shading, and Phong-Blinn Shading.
5. Texture Mapping: Basic Texture Mapping, 2D Texture, 3D Texture, Texture Filtering, Mipmaps, and Non-Color Texture.
6. Rasterization: Scan Conversion, DDA, Bresenham, Rasterization for Polygon, and Antialiasing.
7. Programmable Graphics Hardware: Basic Shader Programming, Vertex Shader, Pixel / Fragment Shader, and Geometry Shader.
8. 2D / 3D Animation: Basic 2D / 3D Animation, Keyframe Animation, Computer Animation, Quaternions, Motion Capture, and Physically Based Animation.
9. Ray Tracing, Spatial Data Structures, and Globall Illumination: Basic Concepts of Ray Tracing, BRDF, Radiosity, Photon Mapping, Precomputed Radiance Transfer (PRT), Subsurface Scattering, Hierarchical Bounding Volume, Regular Grids, Octrees, and BSP Trees.

Reference(s)

[1] Raghu Ramakrishnan and Johannes Gerhrke. 2003. Database Management Systems, 3 edition, McGraw-Hill. ISBN: 978-0071231510.

[2] Principles Of Distributed Database Systems, Third Edition 2011. M. Tamer Özsu • Patrick Valduriez

Prerequisite(s)

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COURSE	Name	:	Scenario Management for Immersive Environments
	Code	:	EE185652
	Credit(s)	:	2
	Semester	:	

Description of Course

In this course, scenario management for games in an immersive environment is studied which includes interaction between humans and virtual environments, environmental designs that resemble actual and virtual reality to create experiences for users according to the original.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the concept of immersive environments in games related to assets, actors, virtual environment design and character development.

Specific Skill

Able to explain the concept of relationships between assets, actors and imersive environments to create experiences for users.

General Skill

Able to develop immersive games using input devices such as sensors, video cameras, wiimotes and kinnect.

Attitude

Demonstrating attitude of being responsible for the work in his area of expertise independently.

Working together to be able to make the most of their potential.

Main Subjects

1. Introduction, game study.
2. 3D game programming concept.
3. Building effective game play.
4. Building a Game character.
5. Story writing.
6. Sounds and music for games.
7. Environment, buildings, weather and sky.
8. Casual game

Reference(s)

[1] Erik Bethke, Game Development and Production, Wordware Publishing, Inc., 2003
[2] Chris Crawford, The Art of Computer Game Design
[3] Andrew Rollings and Ernest Adams on Game Design, New Riders Publishing, 2003

Prerequisite(s)

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COURSE	Name	: Network Game Programming
	Code	: EE185653
	Credit(s)	: 2
	Semester	:

Description of Course

This course studies network architecture for multipayer games, network communication, network programming, internet protocols, game services to build in-game logic to apply to multiplayer games.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes
Knowledge Understanding the concept of computer networks and protocols to build multiplayer game logic. **Specific Skill** Able to explain network topology to be applied in multiplayer games. **General Skill** Able to develop computer programs to build a simple multiplayer game. **Attitude** Demonstrating attitude of being responsible for the work in his area of expertise independently. Working together to be able to make the most of their potential.
Main Subjects
1. Internet and protocol. 2. Data transmission over the internet. 3. Network Topology. 4. Logic game for multiplayer games. 5. Multiplayer game architecture. 6. Game servers and network programming.
Reference(s)
[1] Erik Bethke, Game Development and Production, Wordware Publishing, Inc., 2003 [2] Chris Crawford, The Art of Computer Game Design [3] Andrew Rollings and Ernest Adams on Game Design, New Riders Publishing, 2003
Prerequisite(s)
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COURSE		
	Name	: Artificial Intelligent for Game
	Code	: EE185654
	Credit(s)	: 2
	Semester	:

Description of Course
This course studies artificial intelligence in games that include path finding, path planning, rule-based systems and implementation of tactics in the game using artificial intelligence against a non playable character.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge
Able to identify artificial intelligence techniques that are appropriate for a type of game to control non playable characters.
Specific Skill
Able to design and implement powerful artificial intelligence algorithms in a game related to NPC movements.
General Skill
Able to build an artificial intelligence based game engine for a game.
Attitude
Demonstrating attitude of being responsible for the work in his area of expertise independently.
Working together to be able to make the most of their potential.

Main Subjects

1. Introduction to Artificial Intelligence
2. Movement and Steering Behavior Algorithm.
3. NPC Motion and Coordination
4. Pathfnding.
5. Decision Making and Uncertainty
6. Scripting Tools and Action Execution
7. Learning mechanism.

Reference(s)

[1] Ian Millington. Articial Intelligence for Computer Games, econd edition. Morgan Ko�man, 2009.
[2] Brian Schwab. AI Game Engine Programming. Charles River Media, 2004.

Prerequisite(s)

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6. Telematics

COURSE	Name	:	Statistical Methods and Optimization
	Code	:	EE185101
	Credit(s)	:	2
	Semester	:	I

Description of Course
In this course, students learn the two main topics, namely: (1) statistical methods needed to design research as well as to analyze and interpret the measurements and simulations; (2) the basics and methods of optimization needed to find solutions to various technical problems encountered in research, for example: linear programming, convex optimization, iterative methods, optimization inspired by nature: genetic algorithms, etc.
Learning Outcomes
Knowledge (P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career. **Specific Skill** (KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts and methods of statistical analysis of measurement data and mastering the optimization method for a problem in engineering in the field of electrical engineering.

Specific Skill

Able to design experiments and calculate statistical analysis on measurement data and be able to define optimization problems and find optimal solutions.

General Skill

Able to use software and tools for statistical analysis and optimization, e.g. Matlab and R.

Attitude

show the attitude of being responsible for the work in his area of expertise independently.

Main Subjects

1. Introduction
2. Descriptive statistics
3. Experimental design
4. Univariate, multivariate and variance analysis
5. Application of statistical methods
6. Optimization problems
7. Mathematical optimization
8. Completion of analytical optimization
9. Completion of numerical optimization

10. Dynamic programming
11. Introduction to meta-heuristics and evolutionary algorithms

Reference(s)

[1] William M. Mendenhall & Terry L. Sincich, “Statistics for Engineering and the Sciences,” 6th ed., CRC Press, 2016.
[2] Jay Devore, “Probability and Statistics for Engineering and the Sciences,” 9th ed., CENGAGE Learning, 2016.
[3] William Navidi, “Statistics for Engineers and Scientists,” 3rd ed., McGraw-Hill, 2011.
[4] Jorge Nocedal & Stephen J. Wright, “Numerical Optimization,” 2nd ed., Springer, 2006.
[5] Edwin K.P. Chong & Stanislaw H. Zak, “An Introduction to Optimization,” 4th ed., John Wiley & Sons, 2013
[6] Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, “Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization,” John Wiley & Sons, 2017.

Prerequisite(s)

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COURSE	Name	: Introduction to Research
	Code	: EE185102
	Credit(s)	: 2
	Semester	: I

Description of Course

This course is preparing student to formulate research ideas, planning research activities and writing the thesis proposals. In this course students will be given materials on basic knowledge of research before formulating the topics to be studied in their thesis. The materials include: defining problem in research, the difference between research project and practical/work project, understanding the hypothesis, novelty, plagiarism (including in method and methodology), types of research (qualitative and quantitative), types of collecting data method and techniques (survey, questionnaire, interview, measurement, data mining), and fishbone diagram.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrate a responsible attitude towards the work in the field of his/her expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Students understand the hypothesis, novelty, plagiarism and the types of research and various techniques of data retrieval in research so that the thesis proposal then can be prepared better.

Specific Skill

Students are able to develop a research problem that has the potential to be his/her research idea in their thesis, and contains elements of novelty and avoid plagiarism.

General Skill

Able to develop research plans that contain novelty starting from building a hypothesis, defining problem formulation and developing research methodology plan.

Attitude

Shows an honest attitude in developing the research topic, open to suggestions and inputs and responsible to avoid plagiarism activities.

Main Subjects

1. Introduction to Research
2. Hypothesis in research
3. Understanding of Novelty in research
4. Plagiarism
5. Data collection techniques in research
6. Types of Research

7. Citation and use of Reference (s)
8. Signal Processing research
9. Smart City research field
10. Game Tech Research Field
11. Research Field on Data Communication / Telecommunications
12. Research Field on Computer Networks / Telecommunications
13. Research Field on Intelligent System
14. Research Field on Image Processing

Reference(s)

[1] Research Methodology., A Step by step guide for beginners., Ranjit Kumar., 3rd Edition., 2011
[2] Research Methodology: Methods and Techniques., 2nd Revised Edition., C.R. Kothari., New Age International Publisher., 2004
[3] Research and Methodology: Tools and Techniques., Prabhat Pandey, Meenu Mishra Pandey, 2015

Prerequisite(s)

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COURSE		
	Name	: ICT System and Network
	Code	: EE185161
	Credit(s)	: 3
	Semester	: I

Description of Course

The course of ICT Systems and Networks consists of basic theory of system, ICT system, basic of Information technology, ICT in organization, Initiating ICT system, ICT system evaluation, Computer Network and Wireless technology, Long-term ICT planning, ICT development strategy, case studies: ICT implementation in Smart City, ICT in medicine and ICT for government.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering basic theory of system, ICT system, basic of Information technology, ICT in organization, Initiating ICT system, ICT system evaluation, Computer Network and Wireless technology, Long-term ICT planning, ICT development strategy, case studies: ICT implementation in Smart City, ICT in medicine and ICT for government.

Skill

Able to implement ICT system design, ICT system evaluation, Information Technology in Medical and governmental field and ICT blue-print planning.

Main Subjects

1. Basic theory of system
2. ICT system and Design
3. Basics of Information Technology,
4. ICT in Organization
5. Initiating ICT system
6. ICT system evaluation
7. Computer Network and Wireless technology
8. Long-term ICT planning
9. ICT development strategy, case studies: ICT implementation in Smart City, ICT in medicine and ICT for government.

Reference(s)

1. Management Information System., James A Obrien and George Marakas., 10th Edition., 2011
2. Conceptual Foundations of the Balanced Scorecard., Robert S. Kaplan., 2010
3. Internet of Things, An Overview : Understanding the issues and challenges in a more conencted world., 2015.

4. An Introduction to Wireless technology., F Ricci., 2011
Prerequisite(s)
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COURSE		
	Name	: Network Management
	Code	: EE185162
	Credit(s)	: 3
	Semester	: I

Description of Course

Network Management course is a course that delivers/prepare students to be able to understand developing formulations related to network management. In this course, students study material on basic knowledge and basic understanding of network management objectives, network management standards, fault management, configuration management, performance management, and security management.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Students understand the purpose and intent of the management of the standard network and the model so that the research can carry out initial studies, formulate problems, and optimal.

Specific Skill

Students are able to provide an understanding of basic knowledge and basic understanding of network management objectives, network management standards, fault management, configuration management, performance management, and security management, as well as their implementation

General Skill

Students are able to understand developing formulations related to network management.

Attitude

Demonstrate honest, thorough, scientific and ethical attitudes in developing and implementing in the field of network management.

Main Subjects

1. Data Communication and Network Management Overview
2. Review of Computer Network Technology
3. Basics: Standards and Models
4. Fault Management
5. Configuration Management
6. Performance Management
7. Security Management

Reference(s)
[1] Alexander Clemn, Network Management Fundamentals, Cisco Press Fundamentals series, 2007, ISBN: 9781587201370,1587201372. [2] Arne Mikalsen, Per Borgesen, Local Area Network Management, Design & Security, Wiley, 2002, ISBN: 9780471497691,047149769X [3] Benoit Claise, Ralf Wolter, Network Management: Accounting and Performance Strategies, Cisco Press,2007, ISBN: 9781587051982,1587051982
Prerequisite(s)
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COURSE	Name	: Scientific Writing
	Code	: EE185201
	Credit(s)	: 2
	Semester	: II

Description of Course

Scientific Writing course discusses the method of writing scientific documents, especially for thesis proposals at the master level. Lecture materials include various, characteristics and functions of scientific documents and parts of scientific documents. Indonesian language citation, plagiarism and grammar will also be discussed. Through this lecture students will develop the skills to write academic documents that are useful for their future success.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Being able to recognize and describe an academic document.

Specific Skill

Being able to describe procedures for making academic documents.

General Skill

Being able to make an academic document.

Attitude

Demonstrating an attitude of being responsible for work in his area of expertise independently.

Main Subjects

1. Introduction: types, functions and characteristics of scientific documents.
2. Parts of scientific documents: opening (front matter).
3. Parts of scientific documents: contents or torso (body).
4. Parts of scientific documents: cover (end matter).
5. Illustration on scientific documents.
6. Citation: source, writing, and plagiarism.
7. Indonesian language spelling and grammar: spelling, words, sentences, and paragraph.

Reference(s)

[1] Program Pasca Sajana ITS, Pedoman Penyusunan Tesis Tahun 2014.
[2] Tim Pengembang Pedoman Bahasa Indonesia, PEDOMAN UMUM EJAAN BAHASA INDONESIA, Edisi 4, Badan Pengembangan dan Pembinaan Bahasa Kementerian Pendidikan dan Kebudayaan, 2016.

[3] Adjat Sakri, Bangun Paragraf Bahasa Indonesia, Penerbit ITB, 1993
[4] Adjat Sakri, Bangun Kalimat Bahasa Indonesia, Penerbit ITB, 1994
[5] L.C. Perelman, J. Paradis, and E. Barrett. The Mayfield Handbook of Technical and Scientific Writing. New York, NY: McGraw-Hill, 1997. ISBN: 9781559346474.

Prerequisite(s)

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COURSE		
	Name	: ICT Management and Audit
	Code	: EE185261
	Credit(s)	: 3
	Semester	: II

Description of Course

This course material discusses the principle and model of national governance, Corporate IT Business Alignment, Enterprise IT Governance Framework, Basic IT audit and control, IT audit processes, organization and IT audit planning, IT procurement and implementation, operations and IT support, case study of ICT Audit and Fraud in company and government organization.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the principle and model of national governance, Corporate IT Business Alignment, Enterprise IT Governance Framework, Basic IT audit and control, IT audit processes, organization and IT audit planning, IT procurement and implementation, operations and IT support, case study of ICT Audit and Fraud in company and government organization.

Skill

Able to explain and implement model of national governance, Corporate IT Business Alignment, one aspect of Enterprise IT Governance Framework, Basic IT audit and control, IT audit processes, organization and IT audit planning, IT procurement and implementation, operations and IT support.

Main Subjects

1. The principle and model of national governance
2. Corporate IT Business Alignment
3. Enterprise IT Governance Framework
4. Basic IT audit and control
5. IT audit processes
6. Organization and IT audit planning
7. IT procurement and implementation
8. Operations and IT support
9. Case study of ICT Audit and Fraud in company and government organization.

Reference(s)

[1] Kementerian Kominfo, PANDUAN UMUM TATA KELOLA TEKNOLOGI INFORMASIDAN KOMUNIKASI NASIONAL, Permen Kominfo 41, 2007

[2] Wim Van Grembergen, Enterprise Governance of Information Technology, Springer, 2009
[3] JAMES A. HALL, INFORMATION TECHNOLOGY AUDITING and ASSURANCE, Cengage Learning Inc., 2011
[4] Sandra Senft, Frederick Gallegos, Information Technology Control and Audit, CRC Press, 2009
[5] Peraturan perundangan Republik Indonesia terkait dengan TIK Pemerintahan

Prerequisite(s)

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COURSE	Name	: e-Government and Smart City
	Code	: EE185262
	Credit(s)	: 3
	Semester	: II

Description of Course

This course is preparing student to understand the basic concept of Smart City and e-Government so that in the near future they can implmement this concept into governmental works. The course material consists of the background of e-Government and Smart City, basic prinsiple of e-Government and good governance, Sistem planning and evaluation, aspects in Good Governance (Transparancy, openess and public participation), Smart City as the implementation of e-Government, the construction of Smart City, Parameters for Smart term, Emerging data, smart power control and the role of sensors for Smart City application, Smart water management and traffic control.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work of his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic concept of e-Government and Smart City, basic prinsiple of e-Government and good governance, Sistem planning and evaluation, aspects in Good Governance (Transparancy, openess and public participation), Smart City as the implementation of e-Government, the construction of Smart City, Parameters for Smart term, Emerging data, smart power control and the role of sensors for Smart City application, Smart water management and traffic control.

Specific Skill

Able to analize and explain the most important aspects in e-Government, the implementation of tranparancy, openess and public participation in developing Smart City. Smart city as a solution for future problem such as health, environment, power system management and traffic control for human safety project.

General Skill

Able to explain the most important aspects in e-Government and Smart City, basic prinsiple of e-Government and good governance, Sistem planning and evaluation, aspects in Good Governance (Transparancy, openess and public participation), Smart City as the implementation of e-Government, the construction of Smart City, Parameters for Smart city, Emerging data, smart power control and the role of sensors for Smart City application, Smart water management, smart investment and smart traffic control in the city.

Attitude
Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Main Subjects

1. History of e-Government
2. Basic prinsiple of e-Government and good governance
3. Sistem planning and evaluation
4. Aspects in Good Governance (Transparancy, openess and public participation)
5. Smart City as the implementation of e-Government
6. Design of Smart City
7. Smart parameter for A City
8. Emerging data in Smart City
9. Smart power control as one aspect in Smart City
10. Smart Building and Smart water management
11. Intelligence Traffic Control system for Smart City

Reference(s)

[1] Smart Cities Concept and Challenges: Bases for the Assessment of Smart City Projects., Andres Monzon(&) Transport Research Centre, Universidad Politécnica of Madrid, 2015.
[2] SMART CITIES READINESS GUIDE The planning manual for building tomorrow's cities today ., Smart Cities Council., 2013
[3] Smart city concept model – Guide to establishing a model for data interoperability., BSI Standards Publication., 2014

Prerequisite(s)

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COURSE			
	Name	:	Information System and Networks Security
	Code	:	EE185361
	Credit(s)	:	2
	Semester	:	III

Description of Course

Learning Outcomes

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE			
	Name	:	Thesis
	Code	:	EE185401
	Credit(s)	:	8
	Semester	:	IV

Description of Course

The Thesis course is a capstone project for the master program as one of the requirements to complete the master program study. Thesis research is the culmination of all knowledge gained by students during the study and scientific validation and expertise that has been obtained. Students must write the results of their research in the Thesis book and take the Thesis examination, and publish the results of their thesis research in scientific journals as one of the graduation requirements.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(P03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia

telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

(KK04) Being able to implement alternative solutions of engineering problems by concerning in factors of economy, public health and safety, culture, social, and environment.

General Skill

(KU01) Being able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology which concerns and applies the humanities value in accordance with their field of expertise, prepares scientific conception and result of study based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on a college page, as well as papers published in scientific journals accredited or accepted in international journals.

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

(KU03) Being able to formulate ideas, result of thought, and scientific arguments in a responsible and academic manner, and communicate them through the media to the academic community and the wider community.

(KU04) Being able to identify the scientific field that becomes the object of his research and positions into a research map developed through interdisciplinary or multidisciplinary approach.

(KU05) Being able to take decisions in the context of solving problems of science and technology development that concerns and implements the humanities value based on analytical or experimental studies of information and data.

(KU06) Capable of managing, developing and maintaining networking with colleagues, peers within the broader institutes and research community.

(KU07) Being able to improve the capacity of learning independently.

(KU09) Being able to develop themselves and compete in national and international level.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S08) Internalizing values, norms and academic ethics.

(S11) Trying his/her best to achieve perfect results.

Course Learning Outcomes

Knowledge

Mastering the concepts and principles of scientific and engineering comprehensively, and factual knowledge about information and communication technology and the latest technology to develop procedures and strategies needed for the analysis and design of systems in the field of Electrical Engineering and its applications which are the topic of discussion.

Specific Skill

Being able to formulate and compile engineering problem solving, produce system designs and implement alternative engineering problem solving by expanding knowledge that adapts changes in science or technology in the field of Electrical Engineering which is the topic of discussion.

General Skill

Being able to produce a feasible thesis to be published in scientific journals by utilizing both software / hardware technology in conducting experiments related to system analysis and design which is the topic of discussion.

Attitude

Striving maximally in solving problems in the field of Electrical Engineering which is the topic of discussion to achieve perfect results.

Main Subjects

1. Introduction (Background, Problem Formulation, Objectives, Contributions)
2. Research Studies and Basic Theory
3. Research Methodology
4. Research Results and Discussion
5. Conclusions and Suggestions

Reference(s)

[1] Supporting textbooks
[2] Papers from supporting journals or conferences
[3] Pedoman Penyusunan Thesis, Program Pascasarjana ITS, 2014.
[4] Pedoman Penyusunan Tesis, Departemen Teknik Elektro, http://teras.ee.its.ac.id/

Prerequisite(s)

Scientific Writing

COURSE	Name	: Big Data and Cloud Computing
	Code	: EE185560
	Credit(s)	: 2
	Semester	:

Description of Course

Learning Outcomes

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE		
	Name	: Strategic Management
	Code	: EE185561
	Credit(s)	: 2
	Semester	:

Description of Course

Learning Outcomes

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE	Name	: Internet Engineering
	Code	: EE185562
	Credit(s)	: 2
	Semester	:

Description of Course

This course provides an introduction to the basic concepts of Internet and web technologies including architecture, protocols and applications. The materials include: Introduction to internet history and Internet services, network basics, TCP / IP protocols (addressing, routing and transport), network programming, web programming, web services, web servers, Internet security, media analisis technique and tools, introduction to e-commerce, internet as social engineering.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic concepts of network, TCP / IP protocol (addressing, routing and transport), Network programming, Web programming, Web services, Web server, Streaming Server and Internet security.

Skill

Students will be able to build a simple Local Area Network (LAN), Perform basic configuration for routers and switches, and implement IP addressing schemes, configure the internet network equipment such as routers and servers.

Main Subjects

1. Introduction to internet history
2. Internet services and network system,
3. TCP / IP protocols (addressing, routing and transport)
4. Network programming
5. Web programming and Web services
6. Internet security
7. Media sosial analisis technique and tools,
8. Introduction to e-commerce
9. Internet as social engineering and social changer

Reference(s)

[1] D. Comer, Internetworking With TCP/IP, Volume 1: Principles Protocols, and Architecture, 5th edition, 2006.
[2] D. Medhi and K. Ramasamy, Network Routing, Mogran Kaufmann, 2007.

[3] M. Hassan and R. Jain, High Performance TCP/IP Networking: Concepts, Issues, and Solutions, Prentice-Hall, 2003.
[4] G. Varghese, Network Algorithmics, Mogran Kaufmann, 2004.

Prerequisite(s)

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COURSE	Name	: Business Intelligence
	Code	: EE185563
	Credit(s)	: 2
	Semester	:

Description of Course

This course teaches students the principle and concept of Business Intelligence to run good organizational governance. Starting from: basic business intelligence concepts, History and objectives of Business Intelligence, Business Intelligence work scheme, process and decision-making level Organization, Information System in Organization, Data-Mining Techniques, Data Processing for Analysis, Personal Knowledge and Organizational Knowledge, Employment Security, Decision Support System in organization, Expert System and Data Visualization Techniques.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK02) Being able to compose problem solving in engineering through depth and breadth of knowledge which adapts to changes in science and technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU02) Being able to perform academic validation or studies in accordance with their areas of expertise in solving problems in relevant communities or industries through the development of knowledge and expertise.

Attitude

(S09) Demonstrate a responsible attitude towards the work in the field of his/her expertise independently.

Course Learning Outcomes

Knowledge

Mastering the principles and concepts of Business Intelligence in organization, the purpose and implementation of Business Intelligence, the business intelligence work scheme, Implementing Information Systems in organization, the process and level of decision making Organization, the conception of Personal Knowledge and Organizational Knowledge in organization, the conception of Employment Security and its prevention techniques, Decision support system using Data mining techniques, Expert System Technique to support the decision making, Data Visualization Techniques in the framework of DCS.

Skill

Able to explain the principles and concepts of Business Intelligence or Business Intelligence to run the organization's governance, the history and purpose of Business Intelligence in the organization, the process and level of decision making Organization, the conception of Personal Knowledge and Organizational Knowledge in the governance of business organizations, the conception of Employment Security and its prevention techniques, applying Decision Support System using Data Mining technique, Data Visualization Techniques

Main Subjects

1. History and conception of Business Intelligence (BI) for the Organizations

2. Organizational Decision Making
3. Conception of Knowledge Management in BI
4. Data Management
5. Decision Support System
6. Expert System
7. Data Visualization Technique

Reference(s)

[1] Business Intelligence and Data Mining., Anil K Maheswari., 2015.
[2] Decision Support and Business Intelligence Systems: 9th Edition., Efraim Turban, Ramesh E Sharda, Dursun Delen
[3] Best Practice in Business Intelligence and Data ware housing., TDWI Vol 24., 2007.
[4] Introduction to the SAS®9 Business Intelligence Platform: A Tutorial., Greg Nelson Thot Wave Technologies, Chapel Hill, North Carolina.
[5] The Bumper Book of Business Intelligence, Matillion Business Intelligence.

Prerequisite(s)

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COURSE		
	Name	: Biometrics System
	Code	: EE185564
	Credit(s)	: 2
	Semester	:

Description of Course

Learning Outcomes

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE	Name	:	Performance Management
	Code	:	EE185565
	Credit(s)	:	2
	Semester	:	

Description of Course

This course discusses the basic concept of ICT services, ICT services vs Demand, standards of system reliability and quality of information technology services, including voice, data and video in the network; business and management to maintain the reliability of infrastructure, network, system and application/software, and the quality of information technology services, performance measurement and reporting, optimization in planning, information technology service management framework.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the principles and concepts of standard of system reliability and quality of information technology services, including voice, data and video in the network; business and management to maintain the reliability of infrastructure, network, system and application / software, and the quality of information technology services, performance measurement and reporting, optimization in planning, information technology service management framework.

Skill

Able to explain the principle and concept of system reliability and quality of information technology services, including voice, data and video in the network; business and management to maintain the reliability of infrastructure, network, system and application / software, and the quality of information technology services, performance measurement and reporting, optimization in planning, information technology service management framework.

Main Subjects

1. ICT services and Demand
2. System reliability and quality of ICT services
3. Including voice, data and video in the network
4. Management of the reliability of infrastructure, network, system and application / software,
5. Management the quality of information technology services
6. Performance measurement and reporting
7. Optimization in planning of ICT services
8. Information technology service management framework.

Reference(s)

[1] Lazzaroni, Massimo, Reliability Engineering Basic Concepts and Applications in ICT, 2011
[2] Martin L. Shooman, Reliability of Computer Systems and Networks, John Willey & Sons, 2002 Janice Reynold
[3] Michael Tortorella, Reliability, Maintainability, and Supportability: Best Practices for Systems Engineers, Wiley, 2015
[4] Paul L Della Maggiora et al, Performance and Fault Management, Cisco Press, 2000

Prerequisite(s)

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COURSE	Name	: Multimedia Signal Processing
	Code	: EE185566
	Credit(s)	: 2
	Semester	:

Description of Course

This course discusses the concept of signal processing for multimedia applications, starting from : basic concept of multimedia, including text, voice, image and video, Image processing, audio processing and text processing, basic concept of continuous signals and digital signals, Fourier transform, Fast-Fourier Transform (FFT), discrete cosine transran and multimedia compression/video compression and video streaming.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the principle and concept of signal processing for multimedia applications, including basic concept of multimedia, including text, voice, image and video, Image processing, audio processing and text processing, basic concept of continuous signals and digital signals, Fourier transform, Fast-Fourier Transform (FFT), discrete cosine transran and multimedia compression/video compression and video streaming.

Skill

Able to explain the principle and concept of signal processing for multimedia applications, including basic concept of multimedia, including text, voice, image and video, Image processing, audio processing and text processing, basic concept of continuous signals and digital signals, Fourier transform, Fast-Fourier Transform (FFT), discrete cosine transran and multimedia compression/video compression and video streaming. Able to solve special case in multimedia processing field.

Main Subjects

1. Concept of signal processing for multimedia applications
2. Basic concept of multimedia, including text, voice, image and video
3. Image processing
4. Audio processing
5. Text processing
6. Basic concept of continuous signals and digital signals
7. Fourier Transform and Fast-Fourier Transform (FFT)

8. Discrete cosine transform
9. Multimedia compression/video compression
10. Streaming Multimedia

Reference(s)

[1] Alan C. Bovik, "Handbook of Image and Video Processing ", Academic Press, 2000
[2] Rafel C. Gonzalez, "Digital Image Processing", 3rd Ed., Pearson Education, 2008
[3] A Handbook : Time-series Analysis, Signal Processing and Dynamics., DSG Pollock, University of London, 1999

Prerequisite(s)

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COURSE			
	Name	:	Analysis and System Reliability
	Code	:	EE185567
	Credit(s)	:	2
	Semester	:	

Description of Course

This course material consists of basic principle and implementation of design system and its analysis techniques. The subjects will include: system definition, aspects in the system, hierarchy in system, functional system, prototyping, modeling, performance of a system and performance analysis of a system and adaptive system including Structured System, Object-Oriented system and Agile system or intelligent system.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic principle and implementation of design system and its analysis techniques, including system definition, aspects in the system, hierarchy in system, functional system, prototyping, modeling, performance of a system and performance analysis of a system and adaptive system including Structured System, Object-Oriented system and Agile system or intelligent system.

Skill

Able to explain the basic principle and implementation of A system and its analysis techniques, hierarchy of A system, functional system, prototyping, modeling, performance of a system and performance analysis of a system and adaptive system including Structured System, Object-Oriented system and Agile system or intelligent system.

Main Subjects

1. Basic principle of System
2. Design system
3. Organization of A system
4. Hierarchy of system
5. Functional system
6. Prototyping technique
7. Modeling A System
8. Performance of A system
9. Performance analysis of a system
10. Type of System: Structured System, Object-Oriented system and Agile system or intelligent system.

Reference(s)

[1] System Analysis and Design, 9th Edition, Gary B Shelly, Harry J Rosenblat., 2012.

[2] Systems Engineering Fundamentals, Supplementary Text Prepared by the Defense Acquisition University Press Fort Belvoir, Virginia 22060-5565, 2001.

[3] Systems, Analysis and Design 5th edition., Dennis, Wixom, Roth., 2012.

Prerequisite(s)
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COURSE	Name	: Random Processes in Telematics
	Code	: EE185568
	Credit(s)	: 2
	Semester	:

Description of Course

Various signals and phenomena in communication systems and networks can be modeled as a random process, which can then be used to analyze the performance of a system or design a particular technique. In this course, students will study probabilities, random variables, random vectors, random processes, and calculation methods. In addition, the main statistical signal processing techniques for telematics will also be studied.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge
Mastering the concepts of probability and random processes, as well as the calculation methods to be applied to various problems in the field of telematics.
Special Skill
Able to model various kinds of random signals, transform them on systems and phenomena that exist in telematics, and be able to calculate probabilities and other statistical quantities.
General Skills
Able to use software and tools to implement statistical signal processing on various problems in telematics, eg Matlab.
Attitude
Demonstrating attitude of being responsible for the work in his area of expertise independently.

Main Subjects

1. Probability theory
2. Random Variables
3. Functions of random variables
4. Random vector, random sequence and matrix computation
5. Moment of random variable
6. Random processess
7. System, noise and power spectral
8. Parameter estimation
9. Hypotesis and detection
10. Applicatons of statistic signal processing

Reference(s)
[1] Henry Starks & Hohn W. Woods, “Probability, Statistics and Random Processes for Engineers,” 4thed., Pearson, 2012. [2] John J. Shynk, “Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications,” Jong Wiley & Sons, 2013. [3] Umberto Spagnolini, “Statistical Signal Processing in Engineering,” John Wiley & Sons, 2018.

Prerequisite(s)
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COURSE			
	Name	:	Special Topics in Telematics
	Code	:	EE185569
	Credit(s)	:	2
	Semester	:	

Description of Course

This course materials consist of introducing new technology and system in Telematics, including the advance knowledge on how this new technology works such as new technique for virtual operation using motion capture data, advance biometrics system, infrared technology in medicine or nano technology. Review technique regarding this new technology and its implementation is also discussed, besides reviewing new branch of sciences and its contribution to human's life.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential

Course Learning Outcomes

Knowledge

Mastering the new technology and system in Telematics field, including the advance knowledge on how this new technology works such as new technique for virtual operation using motion capture data, advance biometrics system, infrared technology in medicine or nano technology. Review technique regarding this new technology and its implementation is also discussed, besides reviewing new branch of sciences and its contribution to human's life.

Skill

Able to explain the development of new technology in the field of telematics and its implementation in human's life, including the advance knowledge on how this new technology works. Able to review technique regarding this new technology and its implementation, besides reviewing new branch of sciences and its contribution to human's life.

Main Subjects

1. Technology Innovation
2. Novelty in technology (Nano technology)
3. New technology and system in Telematics
4. Advance knowledge of new technology
5. Advance biometrics system
6. Nano technology.
7. Review technique on science
8. Reviewing new branch of sciences and its contribution to human's life.

Reference(s)

[1] Advansed Materials of Micro and Nano Technology., Valeriy Skryshevsky, Anatoliy Evtukh, Valeriy Lozovski, Oleg Tretyak., Institute of High Technology, Taras Shevchenko National University of Kyiv., 2016
[2] Nanoscience Nanotechnologies and Nanophysics., C. Dupas P. Houdy M. Lahmani., Springer 2004.
[3] ADVANCES IN TELEMEDICINE: APPLICATIONS IN VARIOUS MEDICAL DISCIPLINES AND GEOGRAPHICAL REGIONS., Edited by Georgi Graschew and Theo A. Roelofs., Croatia, 2011.

Prerequisite(s)

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COURSE		
	Name	: Intelligence System
	Code	: EE185660
	Credit(s)	: 2
	Semester	:

Description of Course

This course materials consists : basic concept of intelligent system, Intelligent system application: from searching techniques, classification, clustering and optimization, Random theory and statistical computation, Genetic Algorithm, searching technique, non-deterministic searching, logical agents, knowledge-based agents, forward and backward chaining, classification techniques (K-NN), Reasoning Techniques, Bayes rules, K-Means Clustering, Artificial Neural-Network and Machine Learning.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

Course Learning Outcomes

Knowledge

Mastering the basic concept of intelligent system, Intelligent system application for searching, classification, clustering and optimization, random theory and statistical computation, Genetic Algorithm, searching technique, non-deterministic searching, logical agents, knowledge-based agents, forward and backward chaining, classification techniques (K-NN), Reasoning Techniques, Bayes rules, K-Means Clustering, Artificial Neural-Network and Machine Learning.

Skill

Able to develope his/her own algorithm to solve some specific problems given by the lecturer, including in the field of searching, optimising and classification.

Main Subjects

1. Basic concept of intelligent system
2. Intelligent system application for searching, classification, clustering and optimization
3. Random theory and statistical computation
4. Genetic Algorithm
5. Searching technique and non-deterministic searching
6. Logical agents and knowledge-based agents
7. Forward and backward chaining
8. Classification techniques (K-NN), K-means Clustering
9. Reasoning Techniques, Bayes rules
10. Artificial Neural-Network and Machine Learning.

Reference(s)

[1] Artificial Intelligence: A Modern Approach., 3rd Edition., Stuart Russell, Peter Norvig., 2010.
[2] An Introduction to Genetic Algorithms., Melanie Mitchell., 1996
[3] Support Vector Machine for Classification and Regression., Steve R Gunn., 10 May 1998.
[4] Support vector Machines and kernels methods., AI Magazine Vol 23 Number 3., 2002., Nello Cristianini and Bernhard Scholkopf
[5] Neural Network Learning and expert systems, Gallant, Stephen I., the MIT press, London, 1993

Prerequisite(s)

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COURSE (MK)	Name	: e-Commerce
	Code	: EE185661
	Credit(s)	: 2 Credit
	Semester	:

Description of Course

Learning Outcomes

Course Learning Outcomes

Main Subjects

Reference(s)

Prerequisite(s)

COURSE		
	Name	: e-Health
	Code	: EE185662
	Credit(s)	: 2
	Semester	:

Description of Course
This course is preparing student to understand the basic principle of e-Health system or telemedicine. This course consists of : history of e-health system, basic system of e-health, design of e-health, e-health system for stroke patient, Diabetic e-health monitoring, Tele-imaging technique, introduction to wireless technology, e-Health based on wireless system, Data management in e-Health system, e-Health monitoring system, data warehouse for e-health and data security.

Learning Outcomes

Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently

(S12) Working together to be able to make the most of his/her potential

Course Learning Outcomes

Knowledge

Students understand the scope and parts of the e-Health system, the basic principles of e-Health implementation, implementation of wireless technology in e-Health applications, Embedded System technology bases, Data warehousing techniques and medical data security.

Specific Skill

Students are able to implement simple e-Health applications such as ECG data monitoring and data analysis and storage techniques.

General Skill

Able to explain the history, scope and basic principles of implementing e-Health systems, important aspects of the e-Health system, Technique for implementing wireless technology for e-Health applications and medical data security techniques

Attitude

Demonstrate honesty in developing research themes, open to suggestions and input and responsible for avoiding plagiarism.

Main Subjects

1. History and scope of e-Health system
2. Basic principles and parts of the e-Health system
3. Design of e-Health system
4. Wireless technology in e-Health applications
5. Embedded system technology in e-Health
6. Data warehousing system for e-Health
7. Data security techniques in e-Health implementation

Reference(s)
[1] Bernard Fong, A.C.M. Fong, C.K.Li., Telemedicine Technology: Information Technologies in Medicine and Telehealth., Wiley, 2011 [2] Data Ware House, Tutorial Point., Simply East Learning., Tutorial Point, 2014 [3] Data Communication and Networking., 4th Edition., Behrouz A Forouzan., 2007 [4] ADVANCES IN TELEMEDICINE: APPLICATIONS IN VARIOUS MEDICAL DISCIPLINES AND GEOGRAPHICAL REGIONS Edited by Georgi Graschew and Theo A. Roelofs., Croatia, 2011

Prerequisite(s)
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