Course Description

☒ Majors of Semiconductor System Engineering (반도체시스템전공)

Introduction to Semiconductor System			
Yr. : 1	Sem. : 2	Course Code:	EL6001

Course Description

This course is for freshmen in electronics engineering and discusses the present and future of electronics, including semiconductor systems. In addition, it introduces the learning contents and attitudes to grow as an engineer in the rapidly developing semiconductor system field.

Basic Circuit Theory and Lab.			
Yr. : 1	Sem. : 2	Course Code:	EL6002

Course Description

This is the first course in electric and electronic engineering. This lecture includes analysis of resistance circuits and mesh, loop analyses, the characteristics of R, L, C, and sources, circuits analysis including Op-amp, Laplace transform and its application, the transient response of first order circuits.

Introduction to Programming and Practice			
Yr. : 1	Sem. : 2	Course Code:	EL6003

Course Description

This course introduces programming basics for engineering problem solving. Students learn basic principles of programming with a basic programming language and solve various practical problems by programming to develop a computational thinking.

Basic Creative Design			
Yr. : 1	Sem. : 2	Course Code:	EL6004

Course Description

This course helps students to bring up some problems for themselves on the basis of the basic knowledge in the field of electronics, to learn the way to solve them.

Electromagnetics 1			
Yr. : 2	Sem. : 1	Course Code:	EL6005

Course Description

Electromagnetics corresponds to an essential basic science among curriculums of the "Electronic School of Engineering". In this course, electrostatics and magnetostatics are mainly dealt with. In particular, the

vector analysis related with vector differential operator such as the curl, divergence and gradient is studied based on the mathematics as well as the physical viewpoint.

Circuit Theory			
Yr. : 2	Sem. : 1	Course Code:	EL6006

Course Description

This lecture continues basic circuit and theory Lab. and includes the following contents : the transient response of second order circuits, the forced response of R, L, C circuits using phasor theory, the powers of ac signal, transformer circuits, Fourier series and 2-port network.

Electronic Circuits 1			
Yr. : 2	Sem. : 1	Course Code:	EL6007

Course Description

This course helps students to understand theory and operation of diode, transistor, operational amplifier. Also, students understand simple electronic circuits.

Digital Circuits			
Yr. : 2	Sem. : 1	Course Code:	EL6008

Course Description

In this course, basic theories of the binary system, the boolean algebra, the boolean function minimization, logic gates and flip-flops are studied. And design and analysis methodologies of combinational logic circuits, sequential logic circuits and counters using basic theories are studied.

EDA Tool's Practical Use and Electronic Circuit Lab 1			
Yr. : 2	Sem. : 1	Course Code:	EL6009

Course Description

This course helps students to understand various electronic circuits using diodes and transistors through experiment. Also, students can design and operate electronic circuits for specifications.

Electromagnetics 2			
Yr. : 2	Sem. : 2	Course Code:	EL6010

Course Description

The Maxwell's equations are derived through time varying electromagnetics based on electrostatics and magnetostatics studied in the course of "Electromagnetics 1". The propagation theory of electromagnetic plane wave is studied as a source free solution of the Maxwell's equations.

C Programming Application Practice			
Yr. : 2	Sem. : 2	Course Code:	EL6011

Course Description
Students study the principles and techniques of windows programming using MFC. In order to learn MFC programming, students study the basic knowledge of C++ programming language. Students are assigned a project of programming a application using MFC.

Electronic Circuits 2			
Yr. : 2	Sem. : 2	Course Code:	EL6012

Course Description
This course helps students to understand active circuits of diode, transistor, operational amplifier. Also, students can design simple electronic circuits.

HDL Design			
Yr. : 2	Sem. : 2	Course Code:	EL6013

Course Description
Verilog HDL(Hardware Description Language) and VHDL are widely used to design digital systems in industry. This course covers the syntax of Verilog HDL or VHDL and some modeling examples of various digital sub-blocks. Some design projects using EDA softwares and FPGA(Field Programmable Gate Array) devices are included for practical experience in digital system design topics.

EDA Tool's Practical Use and Electronic Circuit Lab 2			
Yr. : 2	Sem. : 2	Course Code:	EL6014

Course Description
In this course, students learn how to use EDA tools for circuit simulation, such as PSPICE, and learn to compare and analyze experimental and simulation results for the operation of differential pair circuits and various operational amplifier application circuits. In addition, students design various electronic circuits themselves according to the given design specifications and verify their operation.

μ-Processor and Practice			
Yr. : 3	Sem. : 1	Course Code:	EL6015

Course Description
Students learn hardware and software design methodology for an advanced microprocessor application system. Students are assigned a project to design and develop of a microcontroller application system.

Semiconductor Physics			
Yr. : 3	Sem. : 1	Course Code:	EL6016

Course Description
This course introduces the physical properties of the semiconductor material and the fundamentals of semiconductor physics for subsequent study of semiconductor devices and explains the operating

principles and electrical characteristics of p-n junctions.			
Digital Integrated Circuit			
Yr. : 3	Sem. : 1	Course Code:	EL6017

Course Description

IC(Integrated Circuit) which is one of the key components in modern IT products is based on CMOS technology, thus electronic engineers need to concretely understand fundamental principles of CMOS IC. This course covers MOS device and process, and basic theory for design and analysis of various CMOS circuits. Some design projects using EDA softwares are included for practical experience in digital IC design topics.

Power Electronic Circuit			
Yr. : 3	Sem. : 1	Course Code:	EL6018

Course Description

Based on the knowledge of electronics engineering, basic principles of switched-mode power supply such as DC-DC converter and DC-AC inverter is discussed. Students would be able to understand the key principle and design methods of power converters that can be found in EV(electric vehicle), renewable energy system, and power supplies.

Signal and System			
Yr. : 3	Sem. : 1	Course Code:	EL6019

Course Description

The aim of this course is to study and analyze characteristics of continuous, discrete signals and systems. The expected course objectives of signals and systems are three fold: understanding the properties and representation of discrete and continuous signals being familiar with sampling process and analysis of discrete systems using z-transforms and recognizing the analysis and synthesis of discrete time systems.

Control Engineering			
Yr. : 3	Sem. : 1	Course Code:	EL6020

Course Description

Basically, this introductory course will provide the fundamental disciplines for frequency-domain and time-domain control systems and their design issues for mechanical and electrical engineering applications, specifically for mechatronics and embedded system engineering. The course will focus on the analysis and design of control systems. Emphasis will be on linear, time-invariant, single-input single output (SISO) continuous time systems. Tentative topics include open and closed-loop state-space representations, analytical solutions, computer simulations, stability, controllability, observability, and controller/observer design. For the better understanding of the control systems, the MATLAB/SIMULINK

computer software package will be used extensively to assist students in the understanding of concepts and fundamentals of system dynamics and control, and also to analyze and design control systems.

Analog and Sensor Circuit Application Design			
Yr. : 3	Sem. : 1	Course Code:	EL6021

Course Description

This course provides the operation, feature and usage of analog circuit devices such as passive components, sensor devices, and IC components. By using these components, undergraduate students design and learn analog amplifiers, power circuits, and data acquisition systems for bio applications and many sensing networks.

Embedded System Design			
Yr. : 3	Sem. : 2	Course Code:	EL6022

Course Description

Students learn hardware and software design methodology for an embedded system. Students are assigned a project to design and development of an embedded system.

Semiconductor Device			
Yr. : 3	Sem. : 2	Course Code:	EL6023

Course Description

This course provides the operating principles and electric characteristics of semiconductor devices, such as metal-semiconductor junctions, bipolar junction transistors, Metal-Oxide-Semiconductor Field Effect Transistors(MOSFETs), junction FETs and optical devices.

Electric Machinery and Control Circuit			
Yr. : 3	Sem. : 2	Course Code:	EL6024

Course Description

Since the commercialization of electric power in the 19th century, electric machinery has played an important role in industrial development in the entire process from production to consumption of electric energy. Thanks to the development of various materials and development of design and production technology, today, it has been diversified into various high-tech machinery such as robots and is constantly evolving according to the needs of various industrial fields. To understand BLDC motors, which are in increasing demand, this course deals with basic magnetic fields, structures and operating principles of DC machines, and driving circuits and controllers using power electronic devices.

Digital Signal Processing			
Yr. : 3	Sem. : 2	Course Code:	EL6025

Course Description

This course will provide the fundamental concepts of discrete-time signals and systems related to the fields of communications, control and digital signal processing, and will help students understand how to analyze in the frequency domain various time-domian signals and systems.

Control System

Yr. : 3	Sem. : 2	Course Code:	EL6026

Course Description

In the aims of effective delivery the contents, control engineering courses are divided into two parts. The first part has been offered in the spring semester and this is the second part of the control engineering. Based on the previous course results, this course will offer the way how to design and estimate the relative stability for the given linear dynamic systems with helps of conventional concepts such as Bode plot, Nyquist, and root locus. To determine the stability for the designed controller, the computer simulations and experimental results on DC motors with Matlab/Simulink will be requested.

Analog Integrated Circuits

Yr. : 3	Sem. : 2	Course Code:	EL6027

Course Description

The demand of the analog integrated circuit is increasing because of the development of Bio and Green fields. The students learn and practice how to design CMOS analog integrated circuits using hand analysis and SPICE simulation. In addition, the layout for a IC is discussed in this class.

SoC Application and Design

Yr. : 3	Sem. : 2	Course Code:	EL6028

Course Description

This course helps students to study microprocessor, bus architecture, hardware for debugging, DSP processor, memory system, various peripherals, and platform-based design in order to understand how to design and use SoC (System-On-a-Chip).

Creative Design Project 1

Yr. : 4	Sem. : 1	Course Code:	EL6029

Course Description

Cultivate the ability of adaptation and ingenuity at the industrial field through the direct experience of the process for the theoretical analysis, design/implementation and results deduction about the items selected by students

Advanced Topics on Semiconductor System

Yr. : 4	Sem. : 1	Course Code:	EL6030

Course Description

In this course, technological trends in semiconductors and semiconductor-based systems are reviewed. Furthermore, this course introduces the latest technological developments through specially invited lectures by industry-university-research experts.

Power System Design			
Yr. : 4	Sem. : 1	Course Code:	EL6031

Course Description

Students learn the basic concepts of transmission and distribution systems, and at the same time acquire power system components and fault analysis methods to understand the characteristics of transmission and distribution facilities, and cultivate design and operation capabilities. This course introduces the basic theories of tidal current calculation and numerical analysis methods of the power system and deals with analysis techniques. Power system analysis and simulation software is used to model the power system and to develop the ability to solve economic dispatch analysis problems.

Full Custom IC Design			
Yr. : 4	Sem. : 1	Course Code:	EL6032

Course Description

In order to develop the ability to design CMOS integrated circuits using CMOS circuit design tools, CMOS device manufacturing technology, CMOS logic gate design and layout, analog block design, and the latest full custom design trends are introduced. In addition, practice projects are performed using design CAD tools (Schematic, Layout, HSPICE simulation, pre-/post-layout simulation, ERD/DRC/LVS).

Digital Back-end Design			
Yr. : 4	Sem. : 1	Course Code:	EL6033

Course Description

This course discusses the back-end design process for implementing digital integrated circuit chips, which includes scan design for DFT (design for testability), test vector generation, test-related verification, layout design by auto P&R (placement & routing), design rule check (DRC) and post-layout timing analysis, etc. In addition, design projects using related EDA tools is provided in the class.

Machine Learning			
Yr. : 4	Sem. : 1	Course Code:	EL6034

Course Description

This course will introduce the concept and principle of machine learning, the multi-layer perceptron, the back-propagation, and basic techniques and deep neural networks. In addition, students will be also trained to use deep neural networks by programming simple multi-layer perceptrons and deep learning networks.

Intelligent Control System and Practice			
Yr. : 4	Sem. : 1	Course Code:	EL6035
Course Description This course introduces the analysis and design of the linear systems using the Python programming language based on the control engineering and control system lecture and then students learn the design of the feedback control system with P controller, PI controller, and PID controller.			
Semiconductor Process			
Yr. : 4	Sem. : 1	Course Code:	EL6036
Course Description This course provides semiconductor process, such as lithography technique, oxidation, diffusion, ion-implantation, etching, deposition and metalization for fabricating semiconductor devices.			
Creative Design Project 2			
Yr. : 4	Sem. : 2	Course Code:	EL6037
Course Description As a continual subject of the Creative Design Project 1, cultivate the design capacity through the completion of the advanced design/implementation and deduce the optimal results by making up for the problems			
Semiconductor Evaluation and Analysis			
Yr. : 4	Sem. : 2	Course Code:	EL6038
Course Description This course covers in-depth study including theory education and practice for electrical analysis of various semiconductor applications such as device, fabrication, analog IC			
Energy Conversion System			
Yr. : 4	Sem. : 2	Course Code:	EL6039
Course Description Energy conversion system technologies used in the emerging industry such as EV(Electric Vehicle), battery Chargers and renewable energy systems are discussed in this course. Students would get the ability to solve engineering problems in electrical energy after they experience the analysis/design/simulation process that uses all the aspect of electronic engineering.			
Display and Drive Circuit			
Yr. : 4	Sem. : 2	Course Code:	EL6040
Course Description This course provides panel structures, operating principles, manufacturing processes, and driving circuits			

of TFT-LCDs and OLED displays.			
Semiconductor Equipment			
Yr. : 4	Sem. : 2	Course Code:	EL6041
Course Description Operation mechanism and structures of equipment for semiconductor processes such as photolithography, etching, deposition and metalization will be learned through this class.			
System Programming			
Yr. : 4	Sem. : 2	Course Code:	EL6042
Course Description This course helps students to understand the structure and working principle of the Linux operating system. Also, this course deals with the techniques of system programming to utilize system resources including files, processes, and networks.			

☒ **Majors of Control and Robot Engineering (제어및로봇전공)**

Logic Circuits			
Yr. : 1	Sem. : 2	Course Code:	EL2001
Course Description In this course, basic theories of the binary system, the boolean algebra, the boolean function minimization, logic gates and flip-flops are studied. And design and analysis methodologies of combinational logic circuits, sequential logic circuits and counters using basic theories are studied.			

Basic Creative Design			
Yr. : 1	Sem. : 2	Course Code:	EL2002
Course Description This course helps students to bing up some problems for themselves on the basis of the basic knowledge in the field of electronics, to learn the way to solve them.			

Basic Circuit and Practice			
Yr. : 1	Sem. : 2	Course Code:	EL2014
Course Description Learning about how to use electrical experiment equipments such as power supply, multimeter, bread board and oscilloscope and how to measure electrical quantities such as currents, voltages, powers, etc. in electrical circuits.			

Electromagnetics 1			
Yr. : 2	Sem. : 1	Course Code:	EL2003
Course Description Electromagnetics corresponds to an essential basic science among curriculums of the "Electronic School of Engineering". In this course, electrostatics and magnetostatics are mainly dealt with. In particular, the vector analysis related with vector differential operator such as the curl, divergence and gradient is studied based on the mathematics as well as the physical viewpoint.			

Circuits Theory 1			
Yr. : 2	Sem. : 1	Course Code:	EL2004
Course Description This is the first course in electric and electronic engineering. This lecture includes analysis of resistance circuits and mesh, loop analyses, the characteristics of R, L, C, and sources, circuits analysis including op-Amp, Laplace transform and its application, the transient response of first circuits.			

Electronic Circuits 1			
Yr. : 2	Sem. : 1	Course Code:	EL2005

Course Description

This course helps students to understand theory and operation of diode, transistor , operational amplifier. Also, students understand simple electronic circuits.

Logic Circuits Practice			
Yr. : 2	Sem. : 1	Course Code:	EL2007

Course Description

In this course, behaviors of various logic gates and flip-flops studied in logic circuits course are analyzed through the experiment. And we design combinational logic circuits, sequential logic circuits and counters with them. Also we analyze behaviors of designed circuits through the experiment.

HDL Design			
Yr. : 2	Sem. : 1	Course Code:	EL2009

Course Description

Verilog HDL(Hardware Description Language) and VHDL are widely used to design digital systems in industry. This course covers the syntax of Verilog HDL or VHDL and some modeling examples of various digital sub-blocks. Some design projects using EDA softwares and FPGA(Field Programmable Gate Array) device are included for practical experience in digital system design topics.

Computer Architecture			
Yr. : 2	Sem. : 1	Course Code:	EL2021

Course Description

In this course, we deal with the hardware and software of a basic computer system. Hardware building blocks for a basic computer and the interaction between those building blocks are dealt with. We also deal with relevant softwares such as an assembly language and an assembler for a basic computer.

μ-Processor 1			
Yr. : 2	Sem. : 2	Course Code:	EL2006

Course Description

Students study hardware architecture of a real microcontroller. Students study the programming skills and interfacing methods for the microcontroller by lectures and laboratory excercise.

Electromagnetics 2			
Yr. : 2	Sem. : 2	Course Code:	EL2010

Course Description

The Maxwell's equations are derived through time varying electromagnetics based on electrostatics and magnetostatics studied in the course of "Electromagnetics 1". The propagation theory of electromagnetic plane wave is studied as a source free solution of the Maxwell's equations.

Circuits Theory 2

Yr. : 2	Sem. : 2	Course Code:	EL2011

Course Description

This lecture continues the circuit theory I and includes the following contents : the transient response of 2nd circuits, the forced response of R, L, C circuits using phasor theory, the powers of ac signal, transformer circuits, Fourier series and transform, 2-port network.

Electronic Circuits 2

Yr. : 2	Sem. : 2	Course Code:	EL2012

Course Description

This course helps students to understand active circuits of diode, transistor , operational amplifier. Also, students can design simple electronic circuits

Electronic Circuits Practice 1

Yr. : 2	Sem. : 2	Course Code:	EL2013

Course Description

This course helps students to understand diode, transistor , operational amplifier and various electronic circuits through experiment. And, students can design and operate electronic circuits for specifications

C Programming Application Design

Yr. : 2	Sem. : 2	Course Code:	EL2030

Course Description

 Students study the principles and techniques of windows programming using MFC. In order to learn MFC programming, students study the basic knowledge of C++ programming language. Students are assigned a project of programming a application using MFC

μ-Processor 2

Yr. : 3	Sem. : 1	Course Code:	EL2015

Course Description

Students learn hardware and software design methodology for an advanced microprocessor application system. Students are assigned a project to design and develop of a microcontroller apllication system

Control Engineering 1			
Yr. : 3	Sem. : 1	Course Code:	EL2017

Course Description

Basically, this introductory course will provide the fundamental disciplines for frequency-domain and time-domain control systems and their design issues for mechanical and electrical engineering applications, specifically for mechatronics and embedded system engineering. The course will focus on the analysis and design of control systems. Emphasis will be on linear, time-invariant, single-input single output (SISO) continuous time systems. Tentative topics include open and closed-loop state-space representations, analytical solutions, computer simulations, stability, controllability, observability, and controller/observer design. For the better understanding of the control systems, the MATLAB/SIMULINK computer software package will be used extensively to assist students in the understanding of concepts and fundamentals of system dynamics and control, and also to analyze and design control systems.

Communication Engineering			
Yr. : 3	Sem. : 1	Course Code:	EL2018

Course Description

An introduction to the core theories about analog communication systems. Topics include Linear Systems & Signals, Fourier Series, Fourier Transform, AM(Amplitude Modulation), FM(Frequency Modulation) and PM(Pulse Modulation)

Sensor and Measurement Engineering			
Yr. : 3	Sem. : 1	Course Code:	EL2048

Course Description

In this course, students learn the fundamental principles of chemistry and physical sensors such as pressure, temperature, force, velocity, electromagnetic and chemistry/bio used in various fields including robotics. They also learn how to make sensors and their applications in engineering systems. Lastly, they understand the measurement process and signal processing methods of sensor signals.

Electronic Circuits Practice 2			
Yr. : 3	Sem. : 1	Course Code:	EL2020

Course Description

This course helps students to understand differential amplifier, various operational amplifier and oscillator circuits through experiment. And, students can understand electronic circuit operations.

Signal and System			
Yr. : 3	Sem. : 1	Course Code:	EL2028

Course Description

The aim of this course is to study and analyze characteristics of continuous, discrete signals and systems. The expected course objectives of signals and systems are three fold: understanding the properties and representation of discrete and continuous signals being familiar with sampling process and analysis of discrete systems using z-transforms and recognizing the analysis and synthesis of discrete time systems.

Windows Programming

Yr. : 3	Sem. : 1	Course Code:	EL2044

Course Description

This course deals with the concepts of Windows programming and object-oriented languages. Students will learn how to develop windows applications and improve their programming skills from the term project.

Renewable Energy

Yr. : 3	Sem. : 1	Course Code:	EL2045

Course Description

This lecture will learn about various materials applied to various energy devices such as fuel cells and secondary cell. we discuss the basic concepts in early lectures on electrochemistry. After that we will see how it applies to energy devices.

Control Engineering 2

Yr. : 3	Sem. : 2	Course Code:	EL2024

Course Description

In the aims of effective delivery the contents, control engineering courses are divided into two parts. The first part has been offered in the spring semester and this is the second part of the control engineering. Based on the previous course results, this course will offer the way how to design and estimate the relative stability for the given linear dynamic systems with helps of conventional concepts such as Bode plot, Nyquist, and root locus. To determine the stability for the designed controller, the computer simulations and experimental results on DC motors with Matlab/Simulink will be requested

Robot Engineering

Yr. : 3	Sem. : 2	Course Code:	EL2026

Course Description

At first, we deal with mathematics that is necessary for studying robotics. Then, we study the basic concepts of robotics such as robot mechanism, forward kinematics, inverse kinematics, and trajectory planning. The system configuration, robot programming, and operation of an industrial robot manipulator is also dealt with.

Control Engineering Practice			
Yr. : 3	Sem. : 2	Course Code:	EL2025

Course Description

This is connected course to Control Engineering 2 in the aims of exposing the students to real control applications of control systems with lots of experiments.

PLC Design			
Yr. : 3	Sem. : 2	Course Code:	EL2016

Course Description

In this course, we learn the concept of the sequence control which is important for the implementation of an automation system. we deal with the hardware, software, and the relevant peripherals of a PLC(Programmable Logic Controller) which is an essential element in an automation system. Students are required to design an automation system with considering realistic constraints.

Power Electronics Experiments			
Yr. : 3	Sem. : 2	Course Code:	EL2050

Course Description

In this course, students learn how to design and manufacture power converters through practical experiments, which is learned in power electronics courses in theoretically. The goal of this course will understand the basic concept of hardware and software designs to implement the power converter, which includes the design of basic PWM generator, power conversion topology, and controller.

Power Electronics			
Yr. : 3	Sem. : 2	Course Code:	EL2029

Course Description

This course deals with power converters essentially employed in Electricity Electronic systems. After we learn power conversion theories of switching made out of semiconductor devices, we analyze high efficiency power supplies for direct current, inverters for alternating current, motor driving device and so on. Based on those analyzing processes, we are able to understand and design power converter by conducting to design circuits, apply control technique and analyze simulation results.

Digital Signal Processing			
Yr. : 3	Sem. : 2	Course Code:	EL2034

Course Description

This course will review the concepts of signals, confirm discrete Fourier transform(DFT) and fast Fourier transform(FFT), introduce the basic design of IIR & FIR filters, and discuss typical applications of digital signal processing. Upon completion of this course, students should be able to: hot to use Z-transform in solving deference equations develop

fundamental discrete algorithms convert discrete time signal(sequence) to frequency domain using FFT design primitive low pass digital filters

Motor Control			
Yr. : 3	Sem. : 2	Course Code:	EL2036

Course Description

 This subject will cover understanding various controllers' structures, operation principles, and its usages used in FA(factory automation) and HA(home automation), and culturing abilities in automation devices and its application fields.

Introduction to Algorithm			
Yr. : 3	Sem. : 2	Course Code:	EL2047

Course Description

In this course, students will learn the concepts of an algorithm and what are the optimal solutions to various problems. In addition, the theoretical solutions are implemented in practice to improve the understanding of the algorithm. This lecture covers various concepts, such as sorting algorithms and data structures, as well as greedy algorithms, dynamic programming methods, graph algorithms, linear programming methods, and approximation algorithms.

Creative Design Project 1			
Yr. : 4	Sem. : 1	Course Code:	EL2032

Course Description

Cultivate the ability of adaptation and ingenuity at the industrial field through the direct experience of the process for the theoretical analysis, design/implementation and results deduction about the items selected by students.

Automatic System			
Yr. : 4	Sem. : 1	Course Code:	EL2031

Course Description

This subject will cover understanding the basic concept of the measuring method and sensors and instruments for instrumental devices, and apply to the instrumental system to learning the design and analysis of the instrumental system.

Digital Control			
Yr. : 4	Sem. : 1	Course Code:	EL2033

Course Description

This subject will cover the fundamental of digital control and theories, discrete-time system, z-transform, discrete state variable conversions, stability, time-domain and frequency-domain characteristics, the

relationship with continuous-time systems, and will learn about control system analysis and design techniques and its application fields using computers and microprocessors.			
Mobile Robot Design			
Yr. : 4	Sem. : 1	Course Code:	EL2035
Course Description In this course, we study basic theories for wheeled mobile robot. We also study several topics for designing wheeled mobile robot such as microcontroller, various sensors and sensor interface methods, communication, and motor control.			
Image Processing			
Yr. : 4	Sem. : 1	Course Code:	EL2040
Course Description This course covers some basic image processing theories such as image representation, transformation, enhancement, restoration, segmentation, filtering, and etc. It also introduces various techniques and applications of image processing in industrial fields.			
Creative Design Project 2			
Yr. : 4	Sem. : 2	Course Code:	EL2037
Course Description As a continual subject of the Creative Design Project 1, cultivate the design capacity through the completion of the advanced design/implementation and deduce the optimal results by making up for the problems.			
Artificial Intelligence			
Yr. : 4	Sem. : 2	Course Code:	EL2049
Course Description This course deals with basic concepts of machine learning, which is a key field of artificial intelligence. The concepts are Perceptron, Kernelized, Neural Network, Logistic Regression, SVM, Decision tree, kNN, PCA, and Clustering. In addition, the machine learning algorithms tackled in this course can be implemented using Python Language.			
Robot Application System			
Yr. : 4	Sem. : 2	Course Code:	EL2046
Course Description This course introduces probabilistic modeling and reasoning theory, which are the core of the field of intelligent robot systems. In addition, students will learn the process of the Kalman filter and the			

extended Kalman filter, and implement robot application systems for various problems using MATLAB.

☒ Majors of Electronic Communication Engineering (전자통신전공)

Circuits Theory 1			
Yr. : 1	Sem. : 2	Course Code:	EL3001
Course Description			
This is the first course in electric and electronic engineering. This lecture includes analysis of resistance circuits and mesh, loop analyses, the characteristics of R, L, C, and sources, circuits analysis including op-Amp and the transient response of first circuits.			
Basic Creative Design			
Yr. : 1	Sem. : 2	Course Code:	EL3002
Course Description			
This course helps students to bring up some problems for themselves on the basis of the basic knowledge in the field of electronics, to learn the way to solve them.			
Circuit theory 2			
Yr. : 2	Sem. : 1	Course Code:	EL3003
Course Description			
This lecture provides: the transient response of 2nd circuits, the forced response of R, L, C circuits using phasor theory, the powers of ac signal, Laplace transform, Fourier series and transform, 2-port network			
Electronic Circuits 1			
Yr. : 2	Sem. : 1	Course Code:	EL3004
Course Description			
This course helps students to understand diode, transistor, operational amplifier and various electronic circuits through experiment. And, students can design and operate electronic circuits for specifications,			
Logic Circuits and Lab.			
Yr. : 2	Sem. : 1	Course Code:	EL3005
Course Description			
In this course, basic theories of the binary system, the boolean algebra, the boolean function minimization, logic gates and flip-flops are studied. We study the design and analysis methodologies of combinational logic circuits, sequential logic circuits and counters using basic theories and VHDL syntax with some basic modeling examples. Also we analyze the behaviors of various logic gates, flip-flops, logic circuits, combinational logic circuits, sequential logic circuits, and counters through the experiment.			
Electromagnetics 1			

Yr. : 2	Sem. : 1	Course Code:	EL3009

Course Description

After learning the physical concepts of vector operators (curl, divergence, gradient) expressing vector fields, we use them to learn about electrostatics and magnetostatics.

Engineering SW Lab.			
Yr. : 2	Sem. : 1	Course Code:	EL3007

Course Description

This lab introduce some key softwares required in our major courses. Through experiment and project for solving the practical problems in real industry, simulation skill and design ability for further study will be enriched.

Electromagnetics 2			
Yr. : 2	Sem. : 2	Course Code:	EL3046

Course Description

This course deals with the integration of electrostatics and electrostatics into time - varying electromagnetics based on electrostatics and magnetostatics, which were handled in "Electromagnetics 1", and basic electromagnetic theory of planar electromagnetic waves.

Electronic Circuits Lab.			
Yr. : 2	Sem. : 2	Course Code:	EL3010

Course Description

This course helps students to understand diode, transistor, operational amplifier and oscillator electronic circuits through experiment. And, students can design and operate electronic circuits for specifications. This course helps students to understand differential amplifier, various operational amplifier and oscillator circuits through experiment. And, students can understand electronic circuit operations.

Electronic Circuits 2			
Yr. : 2	Sem. : 2	Course Code:	EL3011

Course Description

This course helps students to understand active circuits of diode, transistor , operational amplifier. Also, students can design simple electronic circuits.

μ-Processor Lab.			
Yr. : 2	Sem. : 2	Course Code:	EL3012

Course Description

This course integrates hardware and software for microprocessor systems. Lecture and experiments include basic functional blocks of microprocessor, interrupt and input-output control, timer, and serial port. Term

project for creative design works including pre-defined functions is required.

Java Programming			
Yr. : 2	Sem. : 2	Course Code:	EL3013

Course Description

This course introduces the Java syntax and programming paradigm of the object-oriented programming language. Topics include encapsulation, inheritance, polymorphism, abstract classes, packages, collections, generics, event handling, exception handling, GUI components, multi-threading, etc. This course will help students to develop various application programs with Java.

Communication Engineering 1			
Yr. : 3	Sem. : 1	Course Code:	EL3014

Course Description

As this course introduces the core theories about analog communication systems, it studies Linear System & Signals, Fourier Series & Transform, AM (Amplitude Modulation), FM (Frequency Modulation), and PM (Phase Modulation).

Signal and System			
Yr. : 3	Sem. : 1	Course Code:	EL3016

Course Description

This course provides knowledge about the handling and analysis of continuous, discrete signals and systems. The expected course objectives of signals and systems are three fold: understanding the properties and representation of discrete and continuous signals; being familiar with sampling process; and recognizing the analysis and synthesis of discrete time systems.

Digital System Design Lab.			
Yr. : 3	Sem. : 1	Course Code:	EL3017

Course Description

 FPGA and microprocessor are widely used to design digital systems in industry. This course provides system design and implementation about real industrial design topics.

Control System 1			
Yr. : 3	Sem. : 1	Course Code:	EL3018

Course Description

Basically, this introductory course will provide the fundamental disciplines for frequency-domain and time-domain control systems and their design issues for mechanical and electrical engineering applications, specifically for mechatronics and embedded system engineering. The course will focus on the analysis and design of control systems. Emphasis will be on linear, time-invariant, single-input single output (SISO) continuous time systems. Tentative topics

include open and closed-loop state-space representations, analytical solutions, computer simulations, stability, controllability, observability, and controller/observer design. For the better understanding of the control systems, the MATLAB/SIMULINK computer software package will be used extensively to assist students in the understanding of concepts and fundamentals of system dynamics and control, and also to analyze and design control systems.

Semiconductor Engineering 1

Yr. : 3	Sem. : 1	Course Code:	EL3019

Course Description

This course provides undergraduate students an understanding of the physical properties of the semiconductor material and fundamentals of semiconductor physics. It describes the operating principles and electrical characteristics of p-n junctions.

Mobile Programming

Yr. : 3	Sem. : 1	Course Code:	EL3020

Course Description

This course introduces the developing environment of mobile application programs on the Google Android platform and the major Android concepts such as views, activities, intents, broadcast receivers, content providers, etc. This course will help students to develop various application programs for Android devices.

Probability and Random Signal Processing

Yr. : 3	Sem. : 1	Course Code:	EL3021

Course Description

This is a follow-up course of "the principle for probability and statics" which the first year subject and it is intended for the second year under grade students. The objective of this course is to present essential fundamental concepts of discrete-time and continuous-time random processes and their piratical applications to communications, control, and signal processing.

Communication Engineering 2

Yr. : 3	Sem. : 2	Course Code:	EL3022

Course Description

As this course introduces the basic theories about digital communication systems, it studies Pulse Modulation, Probability & Random Process, Digital Transmission, and Digital Modulation.

Communication Engineering Lab.

Yr. : 3	Sem. : 2	Course Code:	EL3045

Course Description

This course performs several experiments including characteristics of Filter and Oscillator, and AM and FM to

understand analog communication systems. and this course performs several experiments including PAM, PCM, ASK, FSK, and PSK to understand the digital communication systems.

Date Communication			
Yr. : 3	Sem. : 2	Course Code:	EL3023

Course Description

As this course introduces the core theories about data and computer communications, it studies data transmission, transmission media, encoding technique, data link control, and multiplexing.

Digital Signal Processing			
Yr. : 3	Sem. : 2	Course Code:	EL3024

Course Description

This course will review the concepts of signals, confirm discrete Fourier transform(DFT) and fast Fourier transform(FFT), introduce the basic design of IIR & FIR filters, and discuss typical applications of digital signal processing. Upon completion of this course, students should be able to: hot to use Z-transform in solving deference equations; develop fundamental discrete algorithms; convert discrete time signal(sequence) to frequency domain using FFT; design primitive low pass digital filters.

Coding Theory			
Yr. : 3	Sem. : 2	Course Code:	EL3025

Course Description

The course provides basic concepts of coding theory and their applications to mobile communication systems, digital communication systems, computer systems, and data networks. This course includes cyclic codes, BCH/RS codes, convolutional codes, Turbo codes, LDPC codes, PN codes, and Walsh codes.

Control System 2			
Yr. : 3	Sem. : 2	Course Code:	EL3026

Course Description

This course will offer the way how to design and estimate the relative stability for the given linear dynamic systems with helps of conventional concepts such as Bode plot, Nyquist, and root locus.

Semiconductor Engineering 2			
Yr. : 3	Sem. : 2	Course Code:	EL3028

Course Description

This course provides an understanding of the operating principles and characteristics of metal-semiconductor junctions, bipolar junction transistors, MOS structures, field effect transistors, and optical devices.

Discrete Signal Systems Design			
Yr. : 3	Sem. : 2	Course Code:	EL3029

Course Description

Discrete systems are pervasive computing systems that consist of discrete real time signal processing with multiple intelligent sensors embedded in the physical world. These systems have many applications including real time control, long-term monitoring of habitats, finding parking spaces in crowded cities, or monitoring the physiology and activity patterns of patients. Practically discrete systems including wireless sensor networks provide the basis for new computing paradigms that challenge many of the classical approaches to developing distributed and networking systems. This course considers the challenges of developing discrete signal processing, real time operating systems, wireless networking protocols, power-management, and middle-ware to support this new type of systems. As part of this course, students will design and implement a primitive discrete filters utilizing finite and infinite impulse responses using Matlab. Suggestive challenging topic will be wireless sensor network system using motes (small devices that integrate a microcontroller and an 802.15.4 radio) or mobile phones.

Convergence Design Project 1			
Yr. : 4	Sem. : 1	Course Code:	EL3030

Course Description

Cultivate the ability of adaptation and ingenuity at the industrial field through the direct experience of the process for the theoretical analysis, design/implementation and results deduction about the items selected by students.

Communication Network Theory			
Yr. : 4	Sem. : 1	Course Code:	EL3031

Course Description

This course studies circuit switched network and Internet as the WAN (Wide Area Network) and Ethernet, Token Ring, and Token Bus as the LAN (Local Area Network). It also introduces the communication protocol architecture and high speed network with wire and/or wireless media for recent trends.

Digital Communication System			
Yr. : 4	Sem. : 1	Course Code:	EL3032

Course Description

In this course, the applications of the source coding, channel coding, modulations and demodulations such as MPSK, MSK, QAM, OFDM are provided. This course also deals with the design and alalysis of digital communications for the better understanding of the current various mobile communication systems.

Machine Learning			
Yr. : 4	Sem. : 1	Course Code:	EL3047

Course Description

This course provide the methods to abstract the knowledge of data and prediction of data using Python program language which is popular computer program language in the field of data science. This course includes various supervised and unsupervised learning algorithms

Intelligent Embedded Systems Theory			
Yr. : 4	Sem. : 1	Course Code:	EL3034

Course Description

This course is a basic introduction to the theory of signals and hybrid linear systems for the 3rd or 4th year undergraduate students in digital communications, signal processing, and control systems, although the main concept of materials is applicable to most areas of engineering. The fundamental purpose of this course is to introduce the design and analysis methods for linear signals and systems theory, with emphasis on intelligent embedded systems in state space. Specifically, time domain analysis of state-space equations will be offered: state equation solution, equivalent transformation, controllability, and observability.

Data Structures			
Yr. : 4	Sem. : 2	Course Code:	EL3008

Course Description

This course introduces the basic data structures such as stacks, queues, linked lists, trees, graphs, hash tables, and etc. It also provides the various algorithms related with the data structures. This course will help students to solve various problems on a computer using them

Convergence Design Project 2			
Yr. : 4	Sem. : 2	Course Code:	EL3036

Course Description

As a continual subject of the Convergence Design Project 1, cultivate the design capacity through the completion of the advanced design/implementation and deduce the optimal results by making up for the problems.

Mobile Communication			
Yr. : 4	Sem. : 2	Course Code:	EL3037

Course Description

The course provides import concepts such as cellular concept and various modern technologies in wireless mobile communication systems. This course also addresses 3G, 4G, and 5G mobile

communication systems to improve the system design capability.			
Wireless Sensor Network			
Yr. : 4	Sem. : 2	Course Code:	EL3039
Course Description			
Mechatronics stems from mechanics, electronics, software engineering. It is merging the principles of electrical, mechanical, computer and industrial engineering. Four interconnected disciplines and applications will be introduced for understanding the possibilities of technologies such as: Argument Reality, MIMO, Fault Tolerant Networks.			
Smart Vehicle Engineering			
Yr. : 4	Sem. : 2	Course Code:	EL3040
Course Description			
The course lecture on IT system of vehicle and vehicle for the future. The student that complete the course can generally understand a electrical vehicle, unmaned vehicle, vehicle sensor system.			
Information Security			
Yr. : 4	Sem. : 2	Course Code:	EL3041
Course Description			
This course provides students with the protection method of information against various security threats and attacks of transferred information through the communication networks. Topics include symmetric key cryptosystems, public key cryptosystems, hash algorithms, digital signature, key exchange protocols, authentication protocols, etc.			

☒ Majors of Electronics and Radio Communication Engineering (전자및전파전공)

Circuits Theory 1			
Yr. : 1	Sem. : 2	Course Code:	EL4001
Course Description			
This is the first course in electric and electronic engineering. This lecture includes analysis of resistance circuits and mesh, loop analyses, the characteristics of R, L, C, and sources, circuits analysis including op-Amp, Laplace transform and its application, the transient response of first circuits.			
Basic Creative Design			
Yr. : 1	Sem. : 2	Course Code:	EL4002
Course Description			
This course helps students to being up some problems for themselves on the basis of the basic knowledge in the field of electronics, to learn the way to solve them.			
Electromagnetics 1			
Yr. : 2	Sem. : 1	Course Code:	EL4003
Course Description			
Electromagnetics corresponds to an essential basic science among curriculums of the "Electronic School of Engineering". In this course, electrostatics and magnetostatics are mainly dealt with. In particular, the vector analysis related with vector differential operator such as the curl, divergence and gradient is studied based on the mathematics as well as the physical viewpoint.			
Circuits Theory 2			
Yr. : 2	Sem. : 1	Course Code:	EL4004
Course Description			
This lecture continues the circuit theory I and includes the following contents: the transient response of 2nd circuits, the forced response of R, L, C circuits using phasor theory, the powers of ac signal, transformer circuits, Fourier series and transform, 2-port network.			
Logic Circuits			
Yr. : 2	Sem. : 1	Course Code:	EL4005
Course Description			
In this course, basic theories of the binary system, the boolean algebra, the boolean function minimization, logic gates and flip-flops are studied. And design and analysis methodologies of combinational logic circuits, sequential logic circuits and counters using basic theories are studied.			

Basic Circuit Lab.			
Yr. : 2	Sem. : 1	Course Code:	EL4006

Course Description

Learning about how to use electrical experiment equipments such as power supply, multimeter, bread board and oscilloscope and how to measure electrical quantities such as currents, voltages, powers, etc. in electrical circuits.

C Programming Application Practice			
Yr. : 2	Sem. : 1	Course Code:	EL4007

Course Description

Students study the principles and techniques of windows programming using MFC. In order to learn MFC programming, students study the basic knowledge of C++ programming language. Students are assigned a project of programming a application using MFC.

Electromagnetics 2			
Yr. : 2	Sem. : 2	Course Code:	EL4008

Course Description

The Maxwell's equations are derived through time varying electromagnetics based on electrostatics and magnetostatics studied in the course of "Electromagnetics 1". The propagation theory of electromagnetic plane wave is studied as a source free solution of the Maxwell's equations.

Electronic Circuits and Lab. 1			
Yr. : 2	Sem. : 2	Course Code:	EL4009

Course Description

This course helps students to understand theory and operation of diode, transistor and operational amplifier. Also, students understand simple electronic circuits. In addition, students can design and operate electronic circuits for specifications.

μ-Processor and Practice			
Yr. : 2	Sem. : 2	Course Code:	EL4011

Course Description

Students study hardware architecture of a real microcontroller. Students study the programming skills and interfacing methods for the microcontroller by lectures and laboratory exercise.

Application Software Lab.			
Yr. : 2	Sem. : 2	Course Code:	EL4044

Course Description

This lab introduce some key software(Matlab, Labview, Pspice) required in our major courses. Through experiment and project for solving the practical problems in real industry, simulation skill and design ability for further study will be enriched.

Transmission line Theory			
Yr. : 3	Sem. : 1	Course Code:	EL4013

Course Description

The transmission line theory and waveguide theory are studied for the design of electronic circuits/components, communication systems and applications of electromagnetic waves in UHF, microwave and millimeter wave band. Smith chart and S-parameter technique are also studied for the analysis of RF/microwave circuits.

Electromagnetics Theory			
Yr. : 3	Sem. : 1	Course Code:	EL4014

Course Description

This course helps students to learn the theory of Maxwell equation and boundary conditions between a pair of media on the course of acquiring the fundamental concept of electromagnetics and some mathematical formulas, to find the general solution of TEM, TE, and TM wave, to analyze electromagnetics within waveguide(parallel plates, rectangular WG, circular WG) and to learn the practical applications of waveguide.

Electronic Circuits and Lab. 2			
Yr. : 3	Sem. : 1	Course Code:	EL4015

Course Description

This course helps students to understand differential amplifier, various operational amplifier, application circuits and oscillator circuits, filter circuits through experiment. And students can design and operate electronic for specifications.

Communication Engineering 1			
Yr. : 3	Sem. : 1	Course Code:	EL4016

Course Description

An introduction to the core theories about analog communication systems. Topics include Linear Systems & Signals, Fourier Series, Fourier Transform, AM(Amplitude Modulation), FM(Frequency Modulation) and PM(Pulse Modulation).

Control Engineering			
Yr. : 3	Sem. : 1	Course Code:	EL4018

Course Description

Basically, this introductory course will provide the fundamental disciplines for frequency-domain and time-domain control systems and their design issues for mechanical and electrical engineering applications, specifically for mechatronics and embedded system engineering. The course will focus on the analysis and design of control systems. Emphasis will be on linear, time-invariant, single-input single output (SISO) continuous time systems. Tentative topics include open and closed-loop state-space representations, analytical solutions, computer simulations, stability, controllability, observability, and controller/observer design. For the better understanding of the control systems, the MATLAB/SIMULINK computer software package will be used extensively to assist students in the understanding of concepts and fundamentals of system dynamics and control, and also to analyze and design control systems.

μ-Processor Application and Design

Yr. : 3	Sem. : 1	Course Code:	EL4019

Course Description

Students learn hardware and software design methodology for an advanced microprocessor application system. Students are assigned a project to design and develop of a microcontroller application system.

Microwave Engineering Lab. 1

Yr. : 3	Sem. : 1	Course Code:	EL4020

Course Description

Learn how to use the Network Analyzer and Spectrum Analyzer based upon the basic theory of Microwave Engineering, and carry out the experiments with the kit and soft-wares.

HDL Design

Yr. : 3	Sem. : 1	Course Code:	EL4012

Course Description

Verilog HDL(Hardware Description Language) and VHDL are widely used to design digital systems in industry. This course covers the syntax of Verilog HDL or VHDL and some modeling examples of various digital sub-blocks. Some design projects using EDA soft-wares and FPGA(Field Programmable Gate Array) device are included for practical experience in digital system design topics.

Microwave Circuit Design

Yr. : 3	Sem. : 2	Course Code:	EL4021

Course Description

Based on the RF/microwave circuit theory and waveguide theory, topics on passive components such as directional coupler, resonator, power divider, filters and so on are studied for recent mobile communication systems and microwave applications such as radar system and RFID system.

Digital Signal Processing

Yr. : 3	Sem. : 2	Course Code:	EL4022

Course Description

This course will review the concepts of signals, confirm discrete Fourier transform(DFT) and fast Fourier transform(FFT), introduce the basic design of IIR & FIR filters, and discuss typical applications of digital signal processing. Upon completion of this course, students should be able to: hot to use Z-transform in solving deference equations develop fundamental discrete algorithms convert discrete time signal(sequence) to frequency domain using FFT design primitive low pass digital filters.

Communication Engineering 2

Yr. : 3	Sem. : 2	Course Code:	EL4023

Course Description

Theoretical basis for digital communication systems. Topics include Probabilities, Random Variables, Digital Transmission & Modulation, Information, etc.

Numerical Analysis and Practice

Yr. : 3	Sem. : 2	Course Code:	EL4024

Course Description

This course helps students to learn the algorithms required to solve a math problem using numerical analysis method. Students learn e simultaneous equation method, eigenvalue equation method, numerical differentiation and integration method, numerical ordinary differential equation method and practice some simple electromagnetic boundary value problems

Semiconductor Engineering

Yr. : 3	Sem. : 2	Course Code:	EL4025

Course Description

This course provides an understanding of the operating principles and characteristics of metal-semiconductor junctions, bipolar junction transistors, MOS structures, field effect transistors, and optical devices.

Communication Engineering Lab.

Yr. : 3	Sem. : 2	Course Code:	EL4026

Course Description

Experiments about analog and digital communication systems. Experimental topics include AM, FM, PAM, PCM, ASK, FSK, PSK, etc.

Microwave Engineering Lab. 2

Yr. : 3	Sem. : 2	Course Code:	EL4027

Course Description

Learn more detail way of using the Network Analyzer and Spectrum Analyzer and carry out the experiments with the kit and soft-wares based upon the Microwave Engineering Lab. 1.

Design and application of Electronic Circuits			
Yr. : 3	Sem. : 2	Course Code:	EL4028

Course Description

This course helps students to understand configuration of feedback amplifier, configuration and efficiency of power amplifier, operational amplifier application circuit and design and analysis of oscillator, signal generation circuit etc. Also, students can design electronic application circuits.

Data Communication			
Yr. : 3	Sem. : 2	Course Code:	EL4045

Course Description

As this course introduces the core theories about data and computer communications, it studies data transmission, transmission media, encoding technique, data link control, and multiplexing.

Convergence Design Project 1			
Yr. : 4	Sem. : 1	Course Code:	EL4029

Course Description

Cultivate the ability of adaptation and ingenuity at the industrial field through the direct experience of the process for the theoretical analysis, design/implementation and results deduction about the items selected by students.

Antenna Engineering			
Yr. : 4	Sem. : 1	Course Code:	EL4030

Course Description

This course helps students to understand the basic principles and theory of antenna and practice some designs of simple array antennas. Students learn the characteristics of several types of wire antenna widely used, antenna performance parameters and propagation characteristics.

Digital Communication System			
Yr. : 4	Sem. : 1	Course Code:	EL4031

Course Description

Overview of theory of digital modulation &demodulation. Develops understanding of error correcting code, information theory and spread spectrum communication.

DSP Application and Design			
Yr. : 4	Sem. : 1	Course Code:	EL4032

Course Description
This course studies DSP(Digital Signal Processor) structure and principle, interfacing with microprocessor, DSP programming, and then deals with the design of real-time application systems using DSP devices.

EMC Engineering

Yr. : 4	Sem. : 1	Course Code:	EL4033

Course Description
According as communication and electronic equipments have drastically became digitalized, high-integrated and have high performance, the amount of undesired electromagnetic waves emitted from these equipments has increased and those are more vulnerable to extraneous electromagnetic waves. In this course, we deal with EMC(electro magnetic compatability) design methods such as suppressing emissions of the undesired electromagnetic waves from those as well as improving the tolerance of the equipment against the extraneous electromagnetic waves. Subject related; Electromagnetic Fields and Communication Engineering 1 & 2

Internet of Things

Yr. : 4	Sem. : 1	Course Code:	EL4034

Course Description
This course explains the techniques for hyper-connectivity IoT(Internet-of-Things), which all things will be connected to Internet. And it includes current issues for implementation and research about that. Through this, we can make new idea for the IoT world.

Convergence Design Project 2

Yr. : 4	Sem. : 2	Course Code:	EL4036

Course Description
As a continual subject of the Convergence Design Project 1, cultivate the design capacity through the completion of the advanced design/implementation and deduce the optimal results by making up for the problems.

Satellite Communication

Yr. : 4	Sem. : 2	Course Code:	EL4038

Course Description
This course helps students to learn the technical elements of satellite communications such as communications network and services, geometry of the geostationary orbit, S/N calculation of the satellite RF link, multiple access techniques(TDMA, FDMA and CDMA) modulation method and understand the functions of satellite transponders and earth station.

CMOS RF Integrated Circuit

Yr. : 4	Sem. : 2	Course Code:	EL4039

Course Description

The size of electronic circuits and systems is more and more reduced. Industry related analog and RF circuit using CMOS integrated circuit is important in the future electronic systems. This course helps students to understand fundamental CMOS circuit and modeling, RF CMOS circuit, LNA and VCO and PLL using CMOS technique

Artificial Intelligence and Practice

Yr. : 4	Sem. : 2	Course Code:	EL4046

Course Description

This course deals with basic concepts of machine learning, which is a key field of artificial intelligence . The concepts are Perceptron, Kernelized, Neural Network, Logistic Regression. SVM, Decision, tree, kNN, PCA and Clustering. In addition, the machine learning algorithms tackled in this course can be implemented using Python Language.

☑ Majors of Electronics and IT Convergence (전자IT융합전공)

Circuits Theory			
Yr. : 2	Sem. : 1	Course Code:	EL5001
Course Description This is the first course in electric and electronic engineering. This lecture includes analysis of resistance circuits and mesh, loop analyses, the characteristics of R, L, C, and sources, circuits analysis including op-Amp, Laplace transform and its application, the transient response of first circuits.			
Creative Thinking and Innovation (Basic Design)			
Yr. : 1	Sem. : 2	Course Code:	EL5002
Course Description This course helps students to bring up some problems for themselves on the basis of the basic knowledge in the field of electronics, to learn the way to solve them.			
Introduction on Electronic IT Convergence			
Yr. : 1	Sem. : 2	Course Code:	EL5003
Course Description This course helps to know the 4th Inductrial Revolotion, Internet-of-things trends, and research on eletronic IT convergence. And this shows the variable and challenging issues.			
Digital Circuits			
Yr. : 2	Sem. : 1	Course Code:	EL5004
Course Description In this course, basic theories of the binary system, the boolean algebra, the boolean function minimization, logic gates and flip-flops are studied. And design and analysis methodologies of combinational logic circuits, sequential logic circuits and counters using basic theories are studied.			
Electronic Circuits			
Yr. : 2	Sem. : 2	Course Code:	EL5005
Course Description This course helps students to understand theory and operation of diode, transistor and operational amplifier. Also, students understand simple electronic circuits..			
C Programming Application Practice			
Yr. : 2	Sem. : 1	Course Code:	EL5007
Course Description			

Students study the principles and techniques of windows programming using MFC. In order to learn MFC programming, students study the basic knowledge of C++ programming language. Students are assigned a project of programming a application using MFC.

μ-Processor and Practice			
Yr. : 2	Sem. : 2	Course Code:	EL5014

Course Description

Students study hardware architecture of a real microcontroller. Students study the programming skills and interfacing methods for the microcontroller by lectures and laboratory exercise.

Data Structures and Algorithms			
Yr. : 2	Sem. : 2	Course Code:	EL5015

Course Description

This course includes important data structures sush as Stack, Queue, and Tree, and explains various algorithm including sorting algorithm and searching algorithms.

Practical TRIZ			
Yr. : 2	Sem. : 2	Course Code:	EL5017

Course Description

Students raise problems on their own based on logical methods and basic knowledge, and deal with ways to solve the problems. Study and apply the theory of creativity, creative thinking, and methods related to TRIZ.

μ-Processor Application and Practice			
Yr. : 3	Sem. : 1	Course Code:	EL5018

Course Description

Students learn hardware and software design methodology for an advanced microprocessor application system. Students are assigned a project to design and develop of a microcontroller application system

Object-oriented Programming Languages			
Yr. : 3	Sem. : 1	Course Code:	EL5019

Course Description

This course explains the concept of object-oriented programming, and then the method and tool for object-oriented programming such as C++ and Java through many projects.

Communication Engineering 1			
Yr. : 3	Sem. : 1	Course Code:	EL5021

Course Description

An introduction to the core theories about analog communication systems. Topics include Linear Systems & Signals, Fourier Series, Fourier Transform, AM(Amplitude Modulation), FM(Frequency Modulation) and PM(Pulse Modulation).

Control Engineering			
Yr. : 3	Sem. : 1	Course Code:	EL5022

Course Description

Basically, this introductory course will provide the fundamental disciplines for frequency-domain and time-domain control systems and their design issues for mechanical and electrical engineering applications, specifically for mechatronics and embedded system engineering. The course will focus on the analysis and design of control systems. Emphasis will be on linear, time-invariant, single-input single output (SISO) continuous time systems. Tentative topics include open and closed-loop state-space representations, analytical solutions, computer simulations, stability, controllability, observability, and controller/observer design. For the better understanding of the control systems, the MATLAB/SIMULINK computer software package will be used extensively to assist students in the understanding of concepts and fundamentals of system dynamics and control, and also to analyze and design control systems.

Design Thinking			
Yr. : 2	Sem. : 1	Course Code:	EL5024

Course Description

Students learn theories for creative problem solving, develop creative problem solving skills, focusing on cases such as the concept of contradiction and elimination, solution evaluation techniques, and latent problem management techniques.

Creative Idea and Patent Application			
Yr. : 3	Sem. : 2	Course Code:	EL5025

Course Description

In this course, based on creative problem solving ability, students will learn practical ideas that can be applied in the major field and how to patent them. The derived ideas are processed for actual patent application, or afterwards, to realize implementation through the creative design project.

Embedded Systems and Practices			
Yr. : 3	Sem. : 2	Course Code:	EL5026

Course Description

To make a final decision on whether to select or reject an idea by identifying a method for discovering new ideas for start-up and identifying information on the possibility of success of a particular start-up idea discovered, business ability, marketability, technicality, economic feasibility, degree of risk, etc. Study the theory of business feasibility analysis..

Data Networks			
Yr. : 3	Sem. : 2	Course Code:	EL5027

Course Description

This course includes many data networks from LAN(Local Area Networks) such as Ethernet, Token Ring, Token Bus to WAN (Wide Area Networks) such as circuit switching networks and packet switching networks. And it shows brand-new issues about next-generation high-speed networks.

Communication Engineering 2			
Yr. : 3	Sem. : 2	Course Code:	EL5028

Course Description

Theoretical basis for digital communication systems. Topics include Probabilities, Random Variables, Digital Transmission & Modulation, Information, etc.

Internet of Things			
Yr. : 4	Sem. : 2	Course Code:	EL5029

Course Description

This course explains the techniques for hyper-connectivity IoT(Internet-of-Things), which all things will be connected to Internet. And it includes current issues for implementation and research about that. Through this, we can make new idea for the IoT world.

Creative Design Project 1			
Yr. : 4	Sem. : 1	Course Code:	EL5030

Course Description

Cultivate the ability of adaptation and ingenuity at the industrial field through the direct experience of the process for the theoretical analysis, design/implementation and results deduction about the items selected by students.

Next-generation Mobile Communication			
Yr. : 4	Sem. : 1	Course Code:	EL5031

Course Description

Based on the characteristics of electromagnetic wave propagation of mobile communication channels and knowledge of channel modeling and transformation, error correction code, coding modulation, the technology of antenna, wireless connection, call transfer, terminal and base station are understood. Understand cell network plan, mobile network structure and learn application to digital cellar, personal mobile communication, mobile data communication and advanced transportation system.

Embedded Linux			

Yr. : 4	Sem. : 1	Course Code:	EL5032

Course Description

Understand how to use the embedded Linux operating system and the development environment and the internal structure of the embedded Linux kernel, and describe the hardware and software element technology that constitutes the embedded Linux system. Also, the processor, bus, peripheral device, and device constituting the embedded Linux system hardware Learn the structure and operation principle of the kernel, learn the kernel structure of the kernel and the device driver, and implement the necessary elements for Linux porting and device driver creation.

Network Programming

Yr. : 4	Sem. : 1	Course Code:	EL5033

Course Description

This course offers basics and essential programming skills for TCP/IP and its application. Specific topics will include the Socket programming, Internet protocols and their tools with basic programming techniques. This course offers design and implementation ability of network programming using winsock. Specific topics will include the advanced programming techniques and implementation of application program. All student have to present their idea and application devices through term projects.

Android Programming

Yr. : 4	Sem. : 1	Course Code:	EL5034

Course Description

This course introduces mobile application development for the Android platform. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Students will learn skills for creating and deploying Android applications, with covering major Android topics such as Views, Activities, Intents, Broadcast Receivers, and Content Providers.

Blockchain and Security

Yr. : 4	Sem. : 1	Course Code:	EL5035

Course Description

In this lecture, basic blockchain technologies such as public key cryptography, hash functions, digital signatures, and zero-knowledge proofs, as well as important concepts of blockchain such as consensus algorithms, data feeds, governance, and determinism are explained. And representative blockchain systems such as Bitcoin and Ethereum are explained.

Creative Design Project 2

Yr. : 4	Sem. : 2	Course Code:	EL5036

Course Description			
As a continual subject of the Creative Design Project 1, cultivate the design capacity through the completion of the advanced design/implementation and deduce the optimal results by making up for the problems.			

Military Real-time Software System			
Yr. : 4	Sem. : 2	Course Code:	EL5037

Course Description

This course helps to know the basics and cases of the real-time software system including distributed object-programming (ex. theads, RPC, Remote Objects), synchronization techniques, and distributed programming models.

Introduction to Machine Learning			
Yr. : 4	Sem. : 2	Course Code:	EL5038

Course Description

Machine learning is a key tool in a variety of fields, including big data, computer vision, natural language processing, and bioinformatics, to create a computer system that can be learned through experience. Implementing these systems requires a learning algorithm that specifies how the system should modify its behavior based on the results of experience. In this course, various learning algorithms and applications for machine learning are studied.

IT Practical Project 1			
Yr. : 2	Sem. : 1	Course Code:	EL5042

Course Description

Existing experiments only follow basic and fixed curriculum. This course aims for doing practical and realistic sub-projects from industry and research projects. So it drives more complete and useful results through continuous project-based courses. And our students can experience gaining intellectual property rights, joining a competitive exhibition, industry-university projects and internship.

This course focuses on existential and practical problems, their variable solution using creative thinking and methods.

IT Practical Project 2			
Yr. : 2	Sem. : 2	Course Code:	EL5043

Course Description

This course opens in the 2nd semester of the 2nd year going after IT Practical Project 1 course. It improves the quality and market possibility of IT Practice Project 1 through discussion and analysis with corporations.

IT Practical Project 3			
Yr. : 3	Sem. : 1	Course Code:	EL5044

Course Description

This course opens in the 1st semester of the 3rd year going after IT Practical Project 2 course. It improves the quality and market possibility of IT Practice Project 2 through discussion and analysis with corporations. As the previous stage of creative design projects, students can apply their works in the field, analyze the performance, and get the patents related on them by comparing existing with patents.

ROS based autonomous flying UAV			
Yr. : 4	Sem. : 1	Course Code:	EL5045

Course Description

The class aims to train developers who can carry out projects and develop prototypes by utilizing the elements technology required to develop ROS-based autonomous flight drones. It will train ROS utilization using reference platform, ROS Node Package development for drone platform control, and applied ROS drone project. It covers the contents of Robot Operating System utilization, Python programming for UAV control, ROS utilization Drone control, Drone SLAM / Navigation, etc.

HDL Design			
Yr. : 3	Sem. : 2	Course Code:	EL5047

Course Description

This course includes the desing and implementation of hardware system using HDL languagle.

XR(Metabus) Programming			
Yr. : 4	Sem. : 2	Course Code:	EL5048

Course Description

This course learns about the XR concept and technology status such as virtual reality and mixed reality, and deals with programming that can implement metaverse services..

Android Programming			
Yr. : 3	Sem. : 1	Course Code:	EL5049

Course Description

The aim of this course is to study and analyze characteristics of continuous, discrete signals and systems. The expected course objectives of signals and systems are three fold: understanding the properties and representation of discrete and continuous signals being familiar with sampling process and analysis of discrete systems using z-transforms and recognizing the analysis and synthesis of discrete time systems.

C++ Programming			
Yr. : 2	Sem. : 2	Course Code:	EL5050
Course Description			
In this lecture, you will learn and learn C++, a representative object-oriented programming language developed to handle various kinds of information handled by computers. Based on the understanding of the basic differences between C and C++ languages, we will learn various syntax elements such as encapsulation, classes, inheritance, etc. that constitute C++..			
Operating System			
Yr. : 3	Sem. : 2	Course Code:	EL5051
Course Description			
Operating system is the most importance software for computers and variable devices. From the late 1960, time-sharing operating system has advanced considerably. Now operating system includes all issue of devices as well as resource management, so it is impossible for engineers to implement and use variable devices without understanding the operation system. This course covers components of the operating system and their functions, and management issues.			