School of Engineering

Electronic Engineering

Electronic Engineering Concentration/Multiple major

	Concentration major (Major credits minimum 62 credits)	Multiple major (Major credits minimum of 45 credits)
Core (required)	COR1001,COR1007,STS2005,2006 required COR1003,1005 Select 1 HFS2001,2002,2003,2004 Select 1 ETS2001,2002,2003,2004 Select 1 STS2010,CHS2001,2002,2003,2004,2009 Select 1 SHS2001,2002,2 003,2004,2005,2006,2007Select 1	Equivalent to required courses from concentration major track
	24 Credits	
Prerequisites	HSS3014,EEE1002,2103,2104,PHY1001,1002,1101,1102,MAT2110 required CHM1001,BIO1101 Select 1	HSS3014,EEE1002,2103,2104,PHY1001,1002,1101 required PHY1102 selective, highly required
	24 Credits	**17 Credits**
Major required	EEE2032,2051,2052,2101,2111,2112,2120,2135,3131,3181,3182,4185	EEE2051,2052,2101,2111,2112,2120,2135,3131,3181,3182
	32 Credits	**26 Credits**
Major selectives	More than 30 credits from major courses other than required ones	More than 19 credits from major courses other than required ones
		For students who plan on studying in graduate school, EEE4185 (Design project) is recommended

Course roadmap for Electronic Engineering Concentration Major Track

	1st Semester		2nd Semester	
Year 1	HSS3014	1 cr.	COR1003	3 cr.
	COR1001	2 cr.	STS2006	3 cr.
	COR1007	1 cr.	PHY1002	3 cr.
			PHY1102	1 cr
	CHM1001	3 cr		
	BIO1101		EEE1002	3 cr.
	STS2005	3 cr.	EEE2111	3 cr.
	PHY1001	3 cr.		
	PHY1101	1 cr		
	EEE2032	3 cr		16 cr.
		17 cr.		
Year 2	HFS2001	3 cr.	ETS2001	3 cr.
	HFS2002		ETS2002	
	HFS2003		ETS2003	
			ETS2004	
	EEE2103	3 cr		
			MAT2110	3 cr
	EEE2051	2 cr.		
	EEE2101	3 cr.	EEE2104	3 cr.
	EEE2112	3 cr		
	EEE2135	3 cr	EEE2052	2 cr
			EEE2120	3 cr
		17 cr.		14 cr.
Year 3	SHS2001	3 cr.	STS2010	3 cr.
	SHS2002		CHS2001	
	SHS2003		CHS2002	
	SHS2004		CHS2003	
	SHS2005		CHS2004	
	SHS2006		CHS2009	
	SHS2007			
			EEE3182	2 cr
	EEE3131	3 cr		
	EEE3181	2 cr		5 cr.
		8 cr.		

Year 4		EEE4185	3 cr
			3 cr

EEE1002 Basic C Programming Language (Lecture 3 hours : Theory 3) 3 Credits
This course covers basic programming design method necessary to C language text, programming and program development.

EEE2032 Introduction to Engineering Design 3 cr.
(lect.: 3hr, design: 3)
This course focuses on the design process with an understanding of engineering concepts and fundamental theories. Students are expected to apply their theoretical knowledge to bring useful systems to reality. This course helps students become competent engineers though design projects.

EEE2041 Basic Engineering Programming (Lecture 3 hours : Theory 3) 3 Credits
This course covers advanced programming method of C language and algorithm to solve electronic engineering. Students can understand the data structure concept to process data effectively and learn stack, queue, linked list, tree, graph, sorting algorithm and programming. In addition, it introduces MATLAB program used broadly in the engineering.

EEE2042 Creative Engineering Design-Electronics 3 cr.
(lect.: 3hr, design: 3)
Focuses on the design process with an understanding of engineering concepts and fundamental theories. Students are expected to apply their theoretical knowledge to bring useful systems to reality. This course helps students become competent engineers though design projects.

EEE2051 Basic Electronics Laboratory 2 cr.
(lab.: 4hr, experiment 2, exercise 2)
This course is designed for students to learn experimental skills and design techniques for electric circuits. Issues covered in this course include R, RC, RL, and RLC circuits. Also includes oscilloscope operation, resonance circuits, DC/AC bridge networks, two-port networks, magnetically coupled networks, and simple diode circuits.

EEE2052 Digital Logic Circuit Laboratory 2 cr.
(lab.: 4hr, experiment 2, exercise 2)
This course is designed for students to learn experimental skills and design techniques for digital logic circuitry. After understanding the basic functions and characteristics of various digital devices, such as TTL and CMOS gates, flip-flops, counters, encoders/decoders, and memory devices, the implementation of various digital logic circuits using an FPGA will be covered. Students are expected to conduct a design project based on the understanding of basic digital circuits and devices.

EEE2101 Electromagnetics I 3 cr.
(lect.: 3hr, theory 3)
Concepts and basic laws on electrostatic and magnetostatic fields are explained. Based on Coulomb's law and Ampere's law, canonical problems on electric and magnetic fields are solved. Applications on electrical engineering problems are also included.

EEE2102 Electromagnetics II 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: EEE2101)
Time-varying electromagnetic fields are introduced. Based on Maxwell's equations, electromagnetic phenomena such as signal propagations on transmission lines, radiation from antennas and applications on electrical engineering problems are

explained.

EEE2103 Advanced Engineering Mathematics I (lecture 3 hours : theory 3) 3 Credits

This is the course to cover the solution of equation including derived functions and lays the foundation for the study of electronic engineering by covering the definition of related term, various solution of 1st order differential equation, series solution of higher-order linear differential equation, Laplace conversion and its nature, solution with Laplace conversion regarding the initial value issues.

EEE2104 Advanced Engineering Mathematics II (Lecture 3 hours : theory 3) 3 Credits

This course covers vector analysis, differential calculus of vector function, curvilinear integral, surface integral and its application, Fourier series, Fourier conversion, 1st order and 2nd order partial differential equation solution and related mathematical model, solution of heat equation and wave equation.

EEE2108 Engineering Programming 3 cr.

(lect.: 3hr, theory 1, design 2)

This course is designed for students to learn how to apply the basic programming skills to practical engineering problems using C/C++ and MATLAB.

EEE2111 Introduction to Circuit Theory 3 cr.

(lect.: 3hr, theory 2, design 1)

Focuses on loop and node analysis, network theorems, sinusoidal steady states, phasor analysis, and the Bode diagram.

EEE2112 Circuit Theory 3 cr.

(lect.: 3hr, theory 2, design 1)

(Prereq.: EEE2111)

A study focusing on topology of networks, general network analysis methods, state variable, 2-port networks, network functions, fundamental network synthesis, and Laplace & Fourier transforms.

EEE2120 Physical Electronics I 3 cr.

(lect.: 3hr, theory 3)

Focuses on crystal structures, atoms and electrons, atomic energy levels, energy band theory in solid states, the Fermi-Dirac distribution function, energy bands and excess carriers in semiconductors, conduction and diffusion mechanisms in semiconductors, the continuity equation, PN junction diodes, and various junctions.

EEE2129 Foundation for Electronic System Design 2 cr.

(lect.: 2hr, design 2)

Based on fundamentals of electronic engineering, students design simple autonomous systems. Working principles of electronic components are also introduced.

EEE2135 Digital Logic Design 3 cr.

(lect.: 3hr, theory 2, design 1)

A study of the representation of numbers in computer logic circuits, counters, arithmetic logic units, memory devices, input-output devices, control units, and computer hardware.

EEE2153 Signals and Systems 3 cr.

(lect.: 3hr, theory 2, design 1)

Signal properties, sampling, various Fourier transforms and their applications, and properties of linear systems are studied, as well as time and frequency characteristics of signals and systems, and their applications to communications and digital signal processing.

EEE2187 Industry Internship 2 cr.

(lab.: 4hr, experiment 2, exercise 2)

This course is designed to improve students' design and analysis capabilities by having them participate in an internship for at least two weeks at industries in the fields of electronic engineering.

EEE3121 Physical Electronics II 3 cr.

(lect.: 3hr, theory 2, design 1)

(Prereq.: EEE2120)
Focuses on continuity equation, PN junction diodes, bipolar junction transistors, FET, IC, and other electronic devices.

EEE3131 Electronic Circuits I 3 cr.
(lect.: 3hr, theory 2, design 1)
Active circuit elements; diodes, transistors, FET amplifier circuits, rectifiers, biasing in amplifiers, fundamental amplifier circuits, CS, CG, CC, CE, CB, CC, feedback amplifier fundamentals, and basic digital circuits.

EEE3132 Electronic Circuits II 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: EEE3131)
A survey of differential CMOS and BJT amplifiers, multi-stage amplifiers, frequency response, feedback theory, high-performance and operational amplifiers, basic data converters, various analog and digital integrated circuits.

EEE3141 Automatic Control Systems 3 cr.
(lect.: 3hr, theory 2, design 1)
Introductory treatment of automatic control, general concepts and theories of automatic control, transfer function, block diagram, fundamental circuit of control systems, and linear control.

EEE3142 Digital Control Systems 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: EEE3141)
This course focuses on issues related to the analysis and design of digital control systems, such as design techniques employed in z-transformation, state-variable representation, and linear discrete-time optimal control.

EEE3146 Semiconductor Device Engineering I 3 cr.
(lect.: 3hr, theory 1, design 2)
This course examines BJT, MOSFET, junction device theory, IC integration, and IC design concepts.

EEE3148 Communication Systems 3 cr.
(lect.: 3hr, theory 2, design 1)
A study of basic concepts of communication engineering as well as mathematical and computer tools for the design and analysis of communication systems. Topics include Fourier analysis of signals, amplitude modulation, angle modulation, random signals, and noise in analog communications.

EEE3149 Digital Communications 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: EEE3148)
A study of theories and practices in digital communications, including baseband and passband transmission techniques, error correction coding, spreading spectrum systems, digitization, and source coding. Examples such as wired/wireless systems and computer networks are also treated.

EEE3154 Random Processes 3 cr.
(lect.: 3hr, theory 3)
A study of probability, random variables, characteristic function, random processes, correlation and covariance, stochastic signal processing, signal analysis techniques of various noise and signal models, applications, and examples of stochastic signal analysis techniques.

EEE3163 Advanced Digital Circuit Design 3 cr.
(lect.: 3hr, theory 1, design 2)
(Prereq.: EEE2135)
Fundamental and practical techniques for ASIC design and board-level digital circuit design using standard components and PLD (Programmable Logic Device) devices, with a focus on CPLD and FPGA. Students work in teams to develop a PC-based function generator, a simple calculator, and a 4-bit CPU.

EEE3178 Computer Architecture 3 cr.
(lect.: 3hr, theory 2, design 1)
Systems organization, processor and hierarchical memory system design, virtual memory, and instruction set architectures.

EEE3181 Electronic Circuits Laboratory 2 cr.

(lab.: 4hr, experiment 2, exercise 2)
(Prereq.: EEE2051)

This course introduces oscilloscope manipulations and P-Spice simulations and focuses on the fundamentals of OP amplifiers, PN junction diodes, and bipolar junction transistors. Also provides experimentation on OP amplifiers, diodes, BJT, rectifier circuits, four-port networks, and h-parameter measurements, and requires students to complete a team term project that includes a presentation and demonstration.

EEE3182 Advanced Electronic Circuits Laboratory 2 cr.

(lab.: 4hr, experiment 2, exercise 2)
(Prereq.: EEE2051)

A study focusing on the experiments and designs of advanced electronic circuits including FET characteristics and amplifiers, CMOS inverters, class A and B amplifiers, frequency responses of amplifiers, differential amplifiers, active filters, oscillators, multi-vibrators, saw-tooth waveform generators, PLL characteristics, and OP-amp characteristics.

EEE4125 Optical Electronics 3 cr.

(lect.: 3hr, theory 2, design 1)

The course teaches general knowledge on optical components for fiber-optic communications and displays. In regard to fiber-optic communications, optical fibers, signal transfers, receivers, transmitters, wave division multiplexing, and time division multiplexing are covered. A.lso covers topics related to the application of optics to electronics, including LCDs and CCDs and other display components.

EEE4143 Communication Electronic Circuit Design 3 cr.

(lect.: 3hr, theory 2, design 1)

Analysis and design of various transistor and MOSFET digital circuits, logic gates, multivibrators, and OP amps.

EEE4144 Applied Electronic Circuit Design 3 cr.

(lect.: 3hr, theory 2, design 1)

Analysis and design of circuits for communication systems, including AM and FM modulation and demodulation circuits, frequency multiplication circuits, voltage controlled oscillators, and PLL.

EEE4145 RF IC Engineering 3 cr.

(lect.: 3hr, theory 1, design 2)

The design techniques of RF ICs for wireless communication systems are the main topic of the course. Basic concepts of RF systems, RF IC principles, and specifications will be covered so that students learn various RF IC design techniques.

EEE4147 Semiconductor Device Engineering II 3 cr.

(lect.: 3hr, theory 1, design 2)

A survey of IC and semiconductor process, including design and implementation of sensors and actuators based on MEMS and semiconductor technology.

EEE4155 Electronic Materials 3 cr.

(lect.: 3hr, theory 2, design 1)

A survey of electron theory, micro-electronic devices, fabrication processes of semiconductors and metals, and the electrical and thermal conductivity of materials.

EEE4158 Microelectronics 3 cr.

(lect.: 3hr, theory 3)

Covers the transport properties of semiconductors, preparation of semiconductor materials, surface preparation and contacts, semiconductor measurements, high-vacuum technology, and sputtering technology.

EEE4159 Mobile/Wireless Communication Systems 3 cr.

(lect.: 3hr, theory 2, design 1)

This course focuses on issues related to the design and operation of mobile/ wireless communication systems, such as antennas and propagation, wireless multiple access techniques, cellular wireless networks, wireless LAN, and wireless PAN.

EEE4160 Computer Communication 3 cr.
(lect.: 3hr, theory 2, design 1)
A study of basic principles of computer communication design and analysis, including packet networks, circuit switched networks, packet radio, local area networks, Aloha channels, protocols, network design algorithms, routing algorithms, and statistical models of network links.

EEE4161 Internet Communication Networks 3 cr.
(lect.: 3hr, theory 3)
A survey of TCP flow control, congestion control, QoS, network security, and application layer protocols including real time protocols (RTP).

EEE4162 Analysis and Design of Integrated Circuits 3 cr.
(lect.: 3hr, theory 2, design 1)
Device modeling, current mirrors, comparators, analysis and fundamental design techniques for amplifiers, circuit verification based on SPICE simulation, and layout techniques for mixed mode ICs are discussed in regard to their design in high-performance integrated systems.

EEE4165 Introduction to Digital Image Processing 3 cr.
(lect.: 3hr, theory 2, design 1)
Digital image acquisition, image transforms, image enhancement, image restoration and reconstruction, and color image processing.

EEE4166 Applications of Digital Image Processing 3 cr.
(lect.: 3hr, theory 2, design 1)
A study of image segmentation, representation, description, pattern recognition, image understanding and analysis.

EEE4167 Introduction to Microprocessors 3 cr.
(lect.: 3hr, theory 2, design 1)
This course is designed to deal with basic concepts and design techniques necessary for the implementation of a microprocessor-based system. Issues covered are machine instructions of a microprocessor, assembly programming, interfacing memory devices and peripheral devices, and interrupts.

EEE4168 Microprocessor-Based System Design 3 cr.
(lect.: 3hr, theory 2, design 1)
This course focuses on issues related to systematic approaches to design and implementation of microprocessor-based systems, such as computer peripheral devices and their interfaces, as well as the relationship between hardware and system programs. Issues on basic device drivers are also covered in this course.

EEE4169 VLSI Systems Design 3 cr.
(lect.: 3hr, theory 1, design 2)
This course introduces digital system design in MOS technology, including the Sticks diagram, operation of MOS transistors, switch and logic gates, PLA, two-phase dynamic logic, FSM and memory design, floor planning, and layout techniques.

EEE4171 Data Communication Systems 3 cr.
(lect.: 3hr, theory 2, design 1) .
A study of the operations and protocols of layers 1/2/3 in data communication systems, this course focuses on data transmission, multiplexing, packet switching, error detection and correction, automatic repeat request, multiple access, basic queuing analysis, and computer simulation of communication systems.

EEE4172 Antenna Engineering 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: EEE2101)
A study of the roles of antennas in wireless communication systems, including the concept of antenna gain, input impedance, and directivity. Also, practical design techniques are explained.

EEE4173 Microwave Engineering 3 cr.

(lect.: 3hr, theory 2, design 1)

This course explores microwave circuit design techniques for passive microwave devices, including the properties of transmission lines and scattering matrices. Analysis and design of high frequency passive networks such as power dividers, directional couplers, and RF filters are included.

EEE4174 Introduction to Microwave Circuits 3 cr.

(lect.: 3hr, theory 2, design 1)

Microwave circuits containing active devices like diodes and transistors are covered. Noise characteristics and nonlinear properties of active devices are taken into account to design amplifiers, oscillators, and mixers. Design considerations for complete microwave systems are also covered.

EEE4175 Introduction to Digital Signal Processing 3 cr.

(lect.: 3hr, theory 2, design 1)

(Prereq.: EEE2153)

Basic principles and applications of digital signal processing are covered, including definition and analysis of discrete-time signals and systems, basic transforms such as DFT, FFT, and z-transform, sampling theorems and their applications, IIR and FIR filters (basic theory and design methods), and computer-based signal processing techniques. For each subject, students are required to do personal or team projects using MATLAB.

EEE4176 Applications of Digital Signal Processing 3 cr.

(lect.: 3hr, theory 2, design 1)

(Prereq.: EEE4175)

This course deals with the basic theories and applications of Hilbert transform, sampling and reconstruction of bandpass signals, digital filter design and implementation, multirate signal processing and filter bank, modeling and processing of random signals, and spectrum estimation. Students fulfill a series of design projects.

EEE4183 Microprocessor Laboratory 2 cr.

(lab.: 4hr, experiment 2, exercise 2)

This course is designed for students to learn skills and design techniques using a microprocessor. Issues covered in the course include basic principles of microcomputers and microprocessors, understanding microprocessors, assembly programming with instructions, input-output programming, interrupts, and interfacing with peripheral devices. Students are expected to conduct design projects to apply their understanding on the issues.

EEE4184 Applied Electronic Laboratory 2 cr.

(lab.: 4hr, experiment 2, exercise 2)

Five sections offered: microwave (experiments on sold-state oscillators, standing wave and impedance measurements, measurements using network analyzers, and measurements using spectrum analyzers), signal processing (digital signal processor system design and digital signal processor programming), semiconductor, automatic control, and communication.

EEE4185 Electronic System Design Project 3 cr.

(lect.: 3hr, design 3)

(Prereq.: EEE2032)

Comprehensive electronic system design procedures are pursued. Students participate in R&D activities either for commercial or academic purposes.

EEE4199 Special Research 3 cr.

(lect.: 3hr, experiment 2, exercise 3)

A recommended course for seniors, this course is an independent study under the supervision of an instructor in the second semester of the fourth year.

EEEG272 Memory Design and Testing Techniques 3 cr.

(lect.: 3hr, theory 2, design 1)

The course explains semiconductor circuit designs focused on memory

circuits, which I the major domestic semiconductor industry. Based on the basic electronic circuit designs, the requirements and designs of various semiconductor memories such as DRAM, SRAM, and Flash memories are taught. To promote an overall understanding of semiconductor circuits and memories, semiconductor manufacturing techniques are also presented.

EEEG273 Process Practice of Nano Semiconductor(lecture 3 hours : theory 3) 3 Credits

This course helps students learn basic knowledge and applied ability to understand Nano semi-conductor cells and process. This course helps students learn the operation principle of recently developing Nano CMOS cells and memory cells, production process, and circuit design and gives the chance to understand the recent trend of the research being conducted in the field of the industry.

EEEG274 Mobile Phone Design Technology(lecture 3 hours : theory 3) 3 Credits

In this course, students understand the latest technological development of mobile phone and system design specification and learn the technology to design hardware and software. In addition, This course helps students learn the application technology of major parts such as camera, display and sensor consisting of the mobile phone, and design technology of the parts to understand how mobile phone and major parts are designed entirely and learn the role of mobile phone and technological evolution of convergence era of technology and products.

EEEG275 IT Technological Innovation and Future (Lecture 3 hours : theory 3) 3 Credits

This course helps students understand the technological development of latest IT and products commercialization through IT technological innovation and management cases and learn IT technological development such as smart TV, smart phone, Home Appliance, System IC design technology, Mobile Platform and application, convergence, UX technology focusing on the practical technology. In this course, students can learn the technological strategy for performance, quality control process, productivity enhancement until the commercialization of the products and learn the concept of talent and leadership for the students majoring in engineering who companies wish to recruit.

EEEG281 Digital Signal Processing 3 cr. Applications with TI's DSP

(lect.: 3hr, theory 1, design 2)
(Prereq.: EEE4175)

The purpose of this course is to introduce seniors and graduate students to the programming skills of modern digital signal processing systems via labs and lectures based on TI's Digital Signal Processors (DSPs) in the applications of telecommunication, image processing, medical signal processing, and so on. Specifically, this course introduces the architecture of TI's DSPs and deals with some of efficient programming skills of high-level algorithms to achieve desired real-time performance.