TRƯỜNG ĐẠI HỌC
SƯ PHẠM KỸ THUẬT TP. HỒ CHÍ MINH
KHOA ĐÀO TẠO QUỐC TẾ
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UNDERGRADUATE CURRICULUM MANUAL

COMPUTER ENGINEERING TECHNOLOGY

Program Chair: Pham Van Khoa

2024

COMPUTER ENGINEERING TECHNOLOGY

I. CURRICULUM

1st Semester

No.	Code	Course Title	Credits	Prerequisite
1	ICET335064E	Introduction to CET	3	
2	MATH132401E	Calculus 1	3	
3	PHYS130402E	Physics 1	3	
4	GCHE130603E	General Chemistry for Engineers	3	
5	LLCT130105E	Philosophy of Marxism and Leninism	3	
6	ACEN340535	Academic English 1	4	
7	ACEN340635	Academic English 2	4	
8	PHED110513E	Physical education 1	0(1)	
	Total		**21**	

2nd Semester

No.	Code	Course Title	Credits	Prerequisite
1	MATH132501E	Calculus 2	3	
2	PHYS131002E	Physics 2	3	
3	AMCE245164E	Advanced Mathematics for Computer Engineering	4	
4	ELCI140144E	Electric Circuit	4	
5	**PHYS110602E**	**Physics - Lab 1**	**1**	
6	CPRL130064E	C programming language	3	
7	LLCT120405E	Scientific socialism	2	
8	LLCT120314E	Ho Chi Minh's Ideology	2	
9	PHED110613E	Physical education 2	0(1)	
10	ACEN440735	Academic English 3	4	
11	ACEN440835	Academic English 4	4	
12	LLCT120205E	Political economics of Marxism and Leninism	2	
	Total		**29**	

3rd Semester

No.	Code	Course Title	Credit	Prerequisite
1	MATH142601E	Calculus 3	3	
2	**PHYS111302E**	**Physics - Lab 2**	**1**	
3	BAEL340662E	Basic Electronics	4	
4	DIGI330163E	Digital Systems	3	
5	MATH132901E	Mathematical Statistics for Engineers	3	
6	SISY330164E	Signals and Systems	3	
7	LLCT220514E	History of Vietnamese communist party	2	
8	PHED130715E	Physical education 3	0(3)	
9	EHQT430437E	Academic English 4	3	
10	TEEN230245E	Technical English 2	3	
	Total		**25**	

4th Semester

No.	Code	Course Title	Credits	Prerequisite
1	DSCC235864	Discrete Structures	3	
2	DSPR431264E	Digital Signal Processing	3	
3	ICSD338164E	Integrated Circuits and Systems Design	3	
4	COOA335364E	Computer Organization and Architecture	3	
5	CNIN435464E	Computer Networking and Internet	3	
6	ELPR320762E	Electronics Practice	2	
7	DACO430664E	Data communication	3	
8	**PRDI310263E**	**Digital Systems Lab**	**1**	
9	GELA220405E	General Laws	2	
	Total		**23**	

5th Semester

No.	Code	Course Title	Credits	Prerequisite
1	EMSY435664E	Embedded Systems	3	
2	RTOS345264E	Real Time Operating System	4	
3	ICDV436264E	VLSI Circuits Design	3	
4	ITFA336064E	Internet of Things: Foundations and Applications	3	
5	**CNIL415464E**	**Computer Networking and Internet Lab**	**1**	
6	**COOL325364E**	**Computer Architecture and Organization Lab**	**2**	
7	**ICSL316764E**	**Integrated Circuits and Systems Design Lab**	**1**	
8	**DACL411164E**	**Data Communication Lab**	**1**	
9	**LDSP412564E**	**Digital Signal Processing Lab**	**1**	
10	IEPR550935E	IELTS Preparation	5	Non-accumulation
	Total		**19**	

6th Semester

No.	Code	Course Title	Credits	Prerequisite
1	HSCD446164E	Hardware/Software Co-design	4	
2	**ITFL316064E**	**Internet of Things: Foundations and Applications Lab**	**1**	
3	**ICDL416264E**	**VLSI Circuits Design Lab**	**1**	
4	**EMSL415664E**	**Embedded Systems Lab**	**1**	
5	SEPR415564E	Senior Project 1	1	
	Free Electives (Choose 3 courses of these courses)		**9**	
6	OOPC336964E	Object Oriented Programming Using C++	3	
7	ALDS335764E	Algorithms and Data Structures	3	
8	AICD433164E	Analog IC Design	3	
9	APML436564E	Applied Machine Learning	3	
10	WMNW437464E	Wireless and Mobile Networking	3	

11	MBAD436364E	Mobile Application Development	3	
12	AIFA436864E	AI: Foundations and Applications	3	
13	CLCO436664E	Cloud Computing	3	
14	DASY436464E	Database Systems	3	
15	ESDS437064E	Embedded System Design	3	
16	PYDA437264E	Python for Data Analysis	3	
17	INVR437364E	Introduction to Virtual Reality	3	
	Humanities/Social Science Elective* (Choose 1 course of these courses)		**2**	
18	GEEC220105E	General Economics	2	
19	INMA220305E	Introduction to Management	2	
20	INSO321005E	Introduction to Sociology	2	
21	IQMA220205E	Introduction to Quality Management	2	
22	INLO220405E	Introduction to Logics	2	
23	SYTH220505E	Systems Thinking	2	
24	IVNC320905E	Vietnamese Culture	2	
	Total		**19**	

7th Semester

No.	Code	Course Title	Credits	Prerequisite
1	INTE447464E	Internship Program	4	
2	SEPR415964E	Senior Project 2	1	
3	ENTW611038E	English for Thesis Writing	1	
4	ATCE327164E	Advanced Topics in Computer Engineering	2	
	Total		**7**	

8th Semester

No.	Code	Course Title	Credits	Prerequisite
1	CAPR478964E	Capstone Design Project 2	7	

	Total	**7**	

II. COURSE DESCRIPTION

Introduction to CET **Credits: 3**

Prerequisites: None
Course Description: This course delivers the expected learning outcomes for the Computer Engineering Technology course as stated in the program framework. It provides the learners with roles, positions, and missions of an engineer in a computer engineering field and offers an adequate training field for future computer engineers.
Textbook:

General Economics **Credits: 2**

Prerequisites: None
Course Description: This course provides non-major students with basic knowledge of economics, real phenomena that is happening in the economy from the micro and macro perspective.
Textbook:

Introduction to Management **Credits: 2**

Prerequisites: None
Course Description: This course provides learners with basic knowledge of governance, including the most general environmental factors affecting the business and the basic functions of governance in business organizations, including planning, organizing, leading, and testing. The course activities are designed to improve information searching skills, public speaking, and critical thinking.
Textbook:

Introduction to Sociology **Credits: 2**

Prerequisites: None
Course Description:
Textbook:

Introduction to Quality Management **Credits: 2**

Prerequisites: None

Course Description: This course provides learners with basic knowledge of governance, including the basic functions of management activities, the impact of the most general environmental factors on the business activities of a company, the most basic guidelines on business cost management, recruitment and management of human resources, strategic management and risk management, to help future managers identify and promptly provide solutions to problems.
Textbook:

Introduction to Logic **Credits: 2**

Prerequisites: None
Course Description: This course provides learners with knowledge about the cognitive processes of human cognition and the nature of thinking activity. Learners are provided with knowledge of the basic rules of thinking and forms of thinking in order to train logical thinking, use words and sentences correctly in expressing thoughts, and develop skills to comment, interpret, prove or reject arguments, think critically, consistently, and overcome errors in thinking and in communication.
Textbook:

Systems Thinking **Credits: 2**

Prerequisites: None
Course Description: This course provides students with basic knowledge about systems, systematic methodologies, and creative thinking methods while forming in students the ability to reason and solve problems systematically, logically, and creatively.
Textbook:

Vietnamese Culture **Credits: 2**

Prerequisites: None
Course Description:
Textbook:

C Programming Language **Credits: 3**

Prerequisites: None
Course Description: This course provides an introduction to computing and program development in the C programming language with a brief introduction to basic computer concepts while studying the syntax and semantics of the basic control structures of C, learning C's fundamental data types, structures, and pointer, understanding the design and methodical construction of computer programs, learning how to test and debug programs, etc.

Textbook:
1) Deitel, Paul, and Harvey Deitel. *C: How to Program.* 7th ed., Pearson, 2012.

Advanced Mathematics for Computer Engineering **Credits: 3**

Prerequisites: None
Course Description:
Textbook:

Signals and Systems **Credits: 3**

Prerequisites: None
Course Description: This course covers the fundamentals of signal and system analysis, focusing on representations of continuous-time signals (singularity functions, complex exponentials, and geometrics, Fourier representations, Laplace transforms) and representations of linear, time-invariant systems (difference and differential equations, block diagrams, system functions, poles and zeros, convolution, impulse and step responses, frequency responses). Applications are drawn broadly from engineering and physics, including feedback and control, communications, and signal processing.
Textbook:

Electric Circuits **Credits: 4**

Prerequisites: None
Course Description: This course provides the learner with basic contents about circuit analysis, established circuit under impact sine, circuit analysis methods, circuit theorems, two-port network, circuit analysis in time-domain, circuit analysis in the frequency domain, the frequency characteristics of the transfer function.
Textbook:

Basic Electronics **Credits: 4**

Prerequisites: None
Course Description: This course provides the learner with knowledge of electronic components and the structure and principles of operation of the electronic components. It enables the students to analyse and explain the principles of operation of simple electronic circuits, analyse the frequency response of the amplifier circuit, analyse and design the audio power amplifier circuits, distinguish the type of feedback, analyse and design application circuits using operational amplifier, analyse the principle of operation of the oscillator circuits, analyse and design the simple DC sources, and provide electronic circuits.

Textbook:
1) Floyd, Thomas L. *Electronic Devices*. Prentice Hall, 2012.
2) Malvino, Albert. *Electronic Principle*. Mc Graw Hill, 2015

Digital Systems **Credits: 3**

Prerequisites: None
Course Description: This course provides the learner with knowledge of digital systems, the basic logic gate, the fundamental theorem of Boolean algebra, the combinational circuits, the sequential circuit, the basics of digital integrated circuits TTL and CMOS, the characteristic parameters of digital integrated circuits, the classification of integrated circuits, the principle of changing between analog and digital signals, the operational structure and application of the memory, and the principles of the digital oscillator circuit.
Textbook:
1) Maini, Anil K. *Digital Electronics*. John Wily & Sons, 2007
2) Tocci, Ronald J., and Neal S. Widmer. *Digital Systems: Principles and Applications.* 12th ed., Prentice Hall, 2015

Discrete Structures **Credits: 3**

Prerequisites: None
Course Description: The aim of this course is the study of objects that have discrete as opposed to continuous values, including the foundations of logic, algorithms and their complexity, mathematical reasoning, relations, graphs, trees, and combinatorics.
Textbook:

Computer Organization and Architecture **Credits: 3**

Prerequisites: None
Course Description:
Textbook:

Integrated Circuits and Systems Design **Credits: 3**

Prerequisites: None
Course Description:
Textbook:

Digital Signal Processing **Credits: 3**

Prerequisites: None
Course Description: This course provides the fundamentals of the analysis and representation of discrete-time signal systems, including discrete-time convolution, difference equations, the z-transform, and the discrete-time Fourier transform. Emphasis is placed on the similarities and distinctions between discrete-time. The course proceeds to cover digital network and nonrecursive (finite impulse response) digital filters. It concludes with digital filter design and a discussion of the fast Fourier transform algorithm for computation of the discrete Fourier transform.
Textbook:

Data Communication **Credits: 3**

Prerequisites: None
Course Description: This course will explore the various types of data communication systems, networks, and applications. Concept and terminologies like computer networks, layer architecture (OSI, TCP/IP), network hardware, network software, standardization, network medium, and IP addressing will be explored. The practical aspect will deal with building small to medium level networks including Cabling, Configuring TCP/IP, Peer to Peer networking, and sharing resources.
Textbooks:

1) Forouzan, Behrouz A. *Data Communication and Networking.* 5th ed., McGraw Hill International Edition, 2012.

References:

1) Halsall**,** Fred. *Data Communications, Computer Networks and Open Systems. 4*th ed., Addison-Wesley, 1995.

Stallings, William. *Data and Computer Communications*. 10th ed., Prentice Hall, 2014

Senior Project 1 **Credits: 1**

Prerequisites: None
Course Description: This course serves as an introduction to the principles and practice of product design (specifications, evaluation of design alternatives, technical reports, and oral presentations). Additional topics covered in this course include intellectual property, industry standards and conventions, engineering economics, reliability, safety, engineering ethics, and current topics in the field of electronics engineering.
Textbook:

Senior Project 2 **Credits: 1**

Prerequisites: None
Course Description: This course serves as an introduction to the principles and practice of product design (specifications, evaluation of design alternatives, technical reports, and oral presentations).

Additional topics covered in this course include intellectual property, industry standards and conventions, engineering economics, reliability, safety, engineering ethics and current topics in the field of computer engineering.
Textbook:

Embedded Systems **Credits: 3**

Prerequisites: None
Course Description: This course provides students with basic knowledge of embedded systems, including the basic concepts of embedded systems, the properties of embedded applications; basic components of an embedded system; embedded system design process; ARM microcontroller; ARM instruction set; C programming language for embedded systems; and embedded programming for arm microcontroller.
Textbooks:

1) Crowley, Patrick, and Peter Barry. *Modern Embedded Computing – Designing Connected, Pervasive, Media-Rich Systems*. Morgan Kaufmann Publishers, Inc., 2012.
2) Lee, Edward A., and Sanjit A. Seshia. *Introduction to Embedded Systems – A Cyber-Physical Systems Approach.* MIT Press, 2014.

References:

1) Vahid, Frank, and Tony Givargis. *Embedded System Design: A Unified Hardware/Software Approach*. John Wiley & Sons Inc., 2002.
2) Valvano, Jonathan W. *Embedded Systems: Introduction to Arm®. Cortex(TM)-M Microcontrollers (Volume 1)*. 5th ed., CreateSpace Independent Publishing Platform, 2012.
3) Valvano, Jonathan W. *Embedded Systems: Real-Time Interfacing to Arm®. Cortex™-M Microcontroller.* 2nd ed., CreateSpace Independent Publishing Platform, 2012.

Yiu, Joseph. *The Definitive Guide to the ARM Cortex-M3*. Elsevier Newnes, 2007

Computer Networking and the Internet **Credits: 3**

Prerequisites: Data Communication
Course Description: This course covers the fundamentals of local area networks, Internetworking via the TCP/IP protocols, and the Internet. The OSI reference model and the TCP/IP protocols form the framework. Topics include multi-access network strategies; basic traffic and capacity models; LAN standards and the evolution from shared access to switched and wireless Ethernet; LAN internetworking using bridges and routers; routing strategies and congestion in networks; the IP protocol; transport-layer issues and the TCP and UDP protocols; network security, Internet services and applications such as the Domain Name System, FTP, SMTP mail, and the HTTP protocol for the Web.
Textbook:

Real-Time Operating System **Credits: 4 (3+1)**

Prerequisites: None
Course Description: This course provides an introduction to real-time systems, real-time scheduling, real-time synchronization, real-time operating system kernels, and real-time programming languages. The students are introduced with the design and analysis of real-time resource management algorithms (e.g., scheduling, synchronization), their implementations in production operating system kernels, experimental studies of those implementations, and real-time application development.
Textbook:

Hardware/Software Co-Design **Credits: 4 (3+1)**

Prerequisites: None
Course Description: This course provides an introduction to the design of electronic systems that incorporate both hardware and software components. Techniques for modelling hardware and software components at different levels of abstraction and at their interfaces are investigated. Specific topics include: analysing the control-flow and data-flow of a software program and a cycle-based hardware description; transforming simple software programs into cycle-based hardware descriptions with equivalent behaviour and vice versa; partitioning simple software programs into hardware and software components, and creating appropriate hardware-software interfaces to reflect this partitioning; identifying performance bottlenecks in a given hardware-software architecture and optimizing them by transformations on hardware and software components; using simulation software to co-simulate software programs with cycle-based hardware descriptions.
Textbook:

VLSI Circuits Design **Credits: 3**

Prerequisites: None
Course Description: This is an introductory course that covers basic theories and techniques of digital VLSI design in CMOS technology. In this course, the students will learn about the fundamental concepts and structures of designing digital VLSI systems, including CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, interconnect analysis, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies, and VLSI architecture.
Textbook:

Internet of Things: Foundations and Applications **Credits: 3**

Prerequisites: None
Course Description:
This course provides students with the concepts of IoT which focuses on platforms (hardware platforms and application software platforms that can be applied in IoT), M2M protocols (transfer protocols applied in IoT: Zigbee, Bluetooth, IEEE 802.15.4, IEEE 802.15.6, IEEE 802.15.11), and data and information processing mechanisms.
Textbook:

Advanced Topics in Computer Engineering **Credits: 2**

Prerequisites:
Course Description:
Textbook:

Object-Oriented Programming Using C++ **Credits: 3**

Prerequisites: None
Course Description: This course covers object-oriented programming principles and techniques using C++. Topics include pointers, classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features. This course also covers basic concepts for software design and reuse.
Textbook:

Algorithms and Data Structures **Credits: 3**

Prerequisites: None
Course Description: The aim of the course is to teach students how to design, write, and analyse the performance of C/C++ programs that handle structured data and perform more complex tasks typical of larger software projects. Students will acquire skills in using generic principles for data representation and manipulation with a focus on efficiency, maintainability, and code-reuse.
Textbook:

Analog IC Design **Credits: 3**

Prerequisites: None
Course Description:
Textbook:

Applied Machine Learning **Credits: 3**

Prerequisites: None
Course Description: Applied Machine Learning aims to cover some of the issues that may arise in the practical application of machine learning in real-world problems. In addition, the course will cover some of the mathematics and techniques behind basic data analysis methods for both static and time-series data.
Textbook:

Wireless and Mobile Networking **Credits: 3**

Prerequisites: None
Course Description: This course investigates telecommunication architectures and protocols for wireless sensor networks and wireless embedded systems, Wi-Fi and wireless local area networks, mobile ad-hoc networks, and next-generation cellular systems.
Textbook:

Mobile Application Development **Credits: 3**

Prerequisites: None
Course Description: Mobile computing devices have become ubiquitous in our communities. In this course, the focus is on the creation of mobile solutions for various modern platforms, including major mobile operating systems. Topics include mobile device architecture, programming languages, software engineering, user interface design, and app distribution.
Textbook:

AI: Foundations and Applications **Credits: 3**

Prerequisites: None
Course Description: This course introduces the fundamental problems, theories, and algorithms of the artificial intelligence field, including heuristic search, knowledge representation using predicate calculus, automated deduction and its applications, and planning and machine learning. Additional topics include game playing, uncertain reasoning and expert systems, natural language processing, logics for common-sense reasoning, ontologies, and multiagent systems.
Textbook:

Cloud Computing **Credits: 3**

Prerequisites: None
Course Description: The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming

techniques for cloud computing and large scale distributed systems that form the cloud infrastructure. The topics include: overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.
Textbook:

Database Systems **Credits: 3**

Prerequisites: None
Course Description: This course provides the fundamentals of using and implementing relational and non-relational database management systems. First, from the user perspective (i.e., how to use a database system), the course will discuss conceptual data modeling, physical data modeling, computing on data, designing schemas, querying databases, and manipulating databases. The students will learn about both the relational and "NoSQL" databases such as document and graph databases. Further, from the system perspective (i.e., how to design and implement a database system), the course will provide data representation, data accessing and indexing, query processing and optimization, and transaction processing.
Textbook:

Embedded System Design **Credits: 3**

Prerequisites: None
Course Description: This course covers the theory and practice of system-level design of embedded multi-processor and multi-core systems. Focusing on the necessary modeling foundations to enable design automation, the course will present state-of-the-art methods and techniques for specification, synthesis and performance modeling at the system level.
Textbook:

Practice of Electronics **Credits: 2**

Prerequisites: None
Course Description: In this course, learners will be introduced to instruments in electronics and will engage in the following practical activities: recognition of basic electronic components such as R, L, C, diode, BJT, FET, Opam; verification of basic application circuits of the electronic components in theory and practice, analysis of circuit operation, and analysis of operation of basic electronic circuit.
Textbook:

Practice of Digital Systems **Credits: 2**

Prerequisites: None
Course Description: This course instructs students on how to use digital electronic circuits such as logic gates, Flip-Flops, counters, registers, integrated circuit designs and sequential circuits, memory ICs, ADC, DAC circuits, and applications.
Textbook:
1) Maini, Anil K. *Digital Electronics*. John Wily & Sons, 2007.
2) Tocci, Ronald J., and Neal S. Widmer. *Digital Systems*: *Principles and Applications*. 12th ed., Prentice Hall, 2015.

Practice of Data Communication **Credits: 1**

Prerequisites: None
Course Description: This course equips learners with the basic skills in cable pressing techniques, utilizations of line code simulation software, ability to analyse, install, and test bandpass and baseband data transmission systems through different transmission environments.
Textbook:

Practice of Computer Architecture and Organization **Credits: 2**

Prerequisites: None
Course Description:
Textbook:

Practice of Embedded Systems **Credits: 2**

Prerequisites: None
Course Description: This course equips students with the information needed to understand the embedded system architectures, the principles of embedded operating systems, real-time operating systems, I / O structures, memory, and embedded programming. This course also provides learners with the knowledge and skills to be able to build and develop applications on the embedded kit. In addition, this course helps learners to formulate proper behaviour in the programming process.
Textbook:

Practice of Integrated Circuits and Systems Design **Credits: 2**

Prerequisites:
Course Description:
Textbook:

Practice of Computer Networking and the Internet **Credits: 1**

Prerequisites:
Course Description:
Textbook:

Practice of Digital Signal Processing **Credits: 1**

Prerequisites: None
Course Description: This course provides students with the skills to use Matlab software to simulate continuous-time (CT) signals and discrete-time (DT) signals. Through simulating the types of signals, students can analyse, design and evaluate the CT and DT systems in both the time and frequency domain. In addition, students are also involved in the analysis and evaluation of DT systems on Texas Instruments DSPs dedicated kit such as C6713 DSK, C6416 DSK and C6437 EVM.
Textbook:

Practice of VLSI Circuit Design **Credits: 1**

Prerequisites:
Course Description:
Textbook:

Internet of Things: Foundations and Applications Practice **Credits: 1**

Prerequisites: None
Course Description: This course provides students with the skills to use the operating system platforms used for IoT systems. In addition, students will explore the IoT application system in many different areas based on the basic components of the IoT system including the central processor, communication standard, data communication protocol, and webserver.
Textbook:

Internship Program **Credits: 2**

Prerequisites: Completion of all coursework required for the degree
Course Description: An internship experience provides students with an opportunity to explore career interests while applying knowledge and skills gained in the classroom in a practical work setting. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks.

Textbook:

Capstone Design Project **Credits: 7**

Prerequisites: Completion of all coursework required for the degree
Course Description: The aim of the capstone project in the senior year of Computer Engineering Technology majors is to familiarize the students with the process of designing embedded systems as practiced in the industry. This course requires students to develop a project based on the knowledge and skills acquired in earlier coursework and integrate their technical knowledge through practical design effort.
Textbook: