TRƯỜNG ĐẠI HỌC
SƯ PHẠM KỸ THUẬT TP. HỒ CHÍ MINH
KHOA ĐÀO TẠO QUỐC TẾ
fie.hcmute.edu.vn

UNDERGRADUATE CURRICULUM MANUAL

ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

2021

ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

I. CURRICULUM

1st Semester:

No.	Course ID	Course Title	Credits	Prerequisite
1.	MATH132401E	Calculus I	3	
2.	LLCT130105E	Philosophy of Marxism and Leninism	3	
3.	PHYS130402E	Physics 1	3	
4.	GCHE130603E	General chemistry	3	
5.	PHED110613E	Physical Education 2	0(1)	
6.	IEET130145E	Introduction to Electrical & Electronics Engineering Technology	3	
7.	EHQT130137E	Academic English 1	3	
8.	EHQT230237E	Academic English 2	3	
Total			**21**	

2nd Semester

No.	Course ID	Course Title	Credits	Prerequisite
1.	PHYS110602E	Physics - Laboratory 1	1	
2.	MATH132501E	Calculus II	3	
3.	LLCT120214E	Political economics of Marxism and Leninism	2	
4.	LLCT120405E	Scientific socialism	2	
5.	CPRL130064E	C programming language	3	
6.	ELCI140144E	Electrical Circuits	4	
7.		Elective Social Science 1	2	
8.	EHQT330337E	Academic English 3	3	
9.	TEEN120146E	Technical English 1	2	
Total			**22**	

3rd Semester

No.	Course ID	Course Title	Credits	Prerequisite
1.	LLCT120314E	Ho Chi Minh's Ideology	2	
2.	MATH142601E	Calculus III	3	
3.	ELPR210644E	Electricity in Practice	1	
4.	MATH132901E	Mathematical Statistics for Engineers	3	

5.	BAEL340662E	Basic Electronics	4	
6.	ELMA230344E	Electric Machines	3	
7.		Elective Fundamental course 1	3	
8.	EHQT430437E	Academic English 4	3	
9.	TEEN230246E	Technical English 2	3	
Total			**25**	

4th Semester

No.	Course ID	Course Title	Credits	Prerequisite
1.	DIGI330163E	Digital System	3	
2.	AMEE142044E	Applied Mathematics for Electrical and Electronics Engineering	4	
3.	POEL330262E	Power Electronics	3	
4.	ELPS246545E	Power Supply System	4	
5.	PREM310744E	Electric Machine in Practice	1	
6.	ELPR320762E	Electronics in Practice	2	
7.		Elective Fundamental course 2	3	
Total			**20**	

5th Semester

No.	Course ID	Course Title	Credits	Prerequisite
1.	LLCT220514E	History of Vietnamese communist party	2	
2.	MICR330363E	Microprocessor	3	
3.	POSY346645E	Power System	4	
4.	ELDR346445E	Automatic Electric Drive	4	
5.	PRES316845E	Project on Power Supply System	1	
6.	POEP320262E	Power Electronics in Practice	2	
7.	PRDI310263E	Digital System in Practice	1	
8.	PRES327145E	Power Supply System in Practice	2	
Total			**19**	

6th Semester

No.	Course ID	Course Title	Credits	Prerequisite
1.	GELA220405E	General Laws	2	
2.	IPSC343045E	Industrial power system control	4	
3.	RENE346745E	Renewable Energy	4	
4.	PRED316945E	Project on Electric Drive	1	

5.	PRMI320463E	Microprocessor in Practice	2	
6.	PELE327245E	Electric Drive in Practice	2	
7.	PTPM329645E	Professional development topics in the direction of power system - ME	0(2)	
8.		Elective Social Science 2	2	
Total			**17**	

7th Semester

No.	Code	Course name	Credits	Prerequisite
1.	PISC414545E	Project on Industrial power system control	1	
2.		Elective Advanced course 1	3	
3.		Elective Advanced course 2	3	
4.		Elective Advanced course 3	3	
5.	PREN427045E	Practice on Renewable Energy	2	
6.	IPSP425245E	Industrial power system control in practice	2	
7.	PTEA429745E	Professional development topics in the direction of Electric Drive - Automation	0(2)	
8.	PTRE429845E	Professional development topics in the direction of Renewable Energy	0(2)	
Total			**14**	

8th Semester

No.	Course ID	Course Title	Credits	Prerequisite
1.	ININ422745E	Industry Internship	3	
2.	SPSE329145E	Extracurricular activities + seminars specialized	2	
3.	FIPR479245E	Graduation Thesis	7	
Total			**12**	

II. COURSE DESCRIPTION

Introduction to Electrical & Electronics Engineering Technology **Credits: 3**

Prerequisites: None

Course Description: This course provides the learner with the expected learning outcomes for the Electrical and Electronics Engineering Technology education program and framework, as well as the roles, positions and missions of an engineer in the electrical and electronics engineering field. Training fields and technology will be used whilst studying at the Electrical & Electronics Engineering Technology programme.

Textbooks:

1) Horowitz, Paul, and W. Hill. *Art of Electronics*. 3rd ed., Cambridge University Press, 2015.

Reference books:

1) Harris, David M., and Sarah L. Harris. *Digital Design and Computer Architecture*. Morgan Kaufmann Publishers, 2007.
2) Moura, Louis, and Izzat Darwazeh. *Introduction to Linear Circuit Analysis and Modelling: From DC to RF*. Newnes, 2005.
3) Patterson, David A., and John L. Hennessy. *Computer Organization and Design: The Hardware/Software Interface*. 4th ed., Morgan Kaufmann, 2008.
4) Storey, Neil. *Electronics: A Systems Approach*. 4th ed., Prentice Hall, 2009.

C programming language **Credits: 3**

Prerequisites: None

Course Description: This course provides an introduction to computing and program development in the C programming language. This includes a brief introduction to basic computer concepts, 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, and applying the theory in practice by creating several programs in C.

Textbook:

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

Electrical Circuits **Credits: 4**

Prerequisites: Advanced Mathematics & General Physics

Course Description: This course provides the learner with an understanding of the following concepts: the basics of 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:

1) Svoboda, James A., and Richard C. Dorf. *Introduction to Electrical Circuits*. 8th ed., 2010.

Electronic and Electrical Materials **Credits: 3**

Prerequisites: Chemistry, Physics and Mathematics Foundation
Course Description: This course equips students with an understanding of the foundations of material science in the field of electrical and electronic engineering. The topics and concepts covered in this course include the manufacture of electrical materials, electronic materials in the electricity sector, superconductors, semiconductors, power flow control, etc.
Textbooks:

1) Jones, Ian P. *Materials Science for Electrical and Electronic Engineers*. Oxford University Press, 2001.

Reference books:

1) Callister, W. D. *Materials, Science and Engineering*. Willey, 2000.
2) Morgan, D. V., and K. Board. *An Introduction to Semiconductor Micro Technology*. Wiley, 2002.
3) Ohring, M. *Engineering Materials Science*. Academic Press, 2001.
4) Shackelford, J. L. *Introduction to Materials Science and Engineering*. Prentice Hall, 2003.
5) Smith, W. F., and J. Hashemi. *Foundations of Materials Science and Engineering*. 3rd ed., McGraw-Hill, 2003.

Basic Electronics **Credits: 4**

Prerequisites: Advanced Mathematics 3 & General Physics
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 principle 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, and analyse and design the simple DC sources provide electronic circuits.
Textbooks:

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

Practice of Electricity **Credits: 1**

Prerequisites: Electrical Safety, Electrical Circuit
Course Description: In this course, learners will be introduced to contents related to basic electrical installation technology, such as calculation method for constructing and installing, quality inspection, electrical machine installation technology, and operating common electrical machines.
Textbook:

1) Jackson, Herbert W., Dale Temple, and Brian E. Kelly. *Introduction to Electric Circuits Lab Manual*. 9th ed., Oxford University Press, 2013.

Digital Systems **Credits: 3**

Prerequisites: Basic Electronics

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.

Textbooks:

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.

Automatic Control Systems **Credits: 3**

Prerequisites:

Course Description: This course provides the learner with knowledge of the components of an automatic control system and the method of building mathematical models of the automatic control system including the transfer function, signal graph and equation of state, the problem of control and observation, the stable survey methods of automatic control systems, survey methods of control system quality (accuracy, time domain, frequency domain), and the design methods of automatic control system.

Textbooks:

1) Golnaraghi, Farid, and Benjamin C. Kuo. *Automatic Control Systems*. 9th ed., John Wiley & Sons Inc., 2009.
2) Nise, Norman S. *Control Systems Engineering*. 6th ed., John Wiley & Sons Inc., 2010.

Electrical Machines **Credits: 3**

Prerequisites: Electrical Circuits

Course Description: This course provides the learner with knowledge of basic structure, working principle, the meaning of the electromagnetic relations of DC machine, transformers, asynchronous machines, synchronous machines, special machines, and electrical instruments. Students will be introduced to methods for calculating variables, technical parameters of electrical machines and electrical instruments, work characteristics (rule) of electrical machines and

electrical instruments, the method of implementation, and control modes of electrical machines and electrical instruments.

Textbooks:

1) Sen, P. C. *Principles of Electrical Machinery and Power Electronics.* 2nd ed., John Wiley & Sons, 1997.

Reference books:

1) Fitzgerald, A. E., C. Jr. Kingsley, and S. D. Umans. *Electrical Machinery*. 6th ed., McGraw-Hill, New York, 2003.
2) Kelemen, J. A. *ECE 3300 Laboratory Manual*. 2nd ed., WMU IEEE Student Branch, 2003.
3) Say, M. G. *Alternating Current Machines*. 5th ed., Halstead Press, John Wiley & Sons Inc., 1983.

Electrical Measurement and Instruments **Credits: 3**

Prerequisites: Electrical Circuits

Course Description: This course provides the learner with knowledge of concepts of measurement and electrical measure, principles of structure and operations of the directive devices, measurement of electrical quantities structure, and the method of measuring the electrical quantities such as current, voltage, resistance, capacitance, inductance, frequency, phase angle, and power. The students will analyse and estimate measurement errors, as well as understand the principles and operations of the electrical measurement system in the industry.

Textbook:

1) Purkait, P., et al. *Electrical and Electronics Measurements and Instrumentation.* McGraw - Hill, 2013.

Power Supply System **Credits: 4**

Prerequisites: none

Course Description: This course equips learners with knowledge about the method for determining the load calculation and the ability to calculate voltage loss, power loss, and short circuit calculations, as well as select the number and transformer capacity. The students are also introduced to the concepts of diagrams distribution substations and redundant power, function and operating principle of the switchgear, medium and low voltage protection, the method selected conductors, cables, switchgear protect-sectioning measurement, distribution cabinet low and medium voltage, offset low voltage network power plant, and industrial lighting calculations.

Textbooks:

1) Sivanagaraju, S. *Electric Power Transmission and Distribution*. Pearson Education, 2008.

Reference books:

1) Gonen, Turan. *Electric Power Distribution Engineering*. 3rd ed., CRC Press, 2008.
2) McDonald, John D. *Electric Power Substations Engineering*. 3rd ed., CRC Press, 2012.

3) Miller, R., and James Malinowski. *Power System Operation*. 3rd ed., McGraw Hill, 1994.
4) Pansini, Anthony J. *Electrical Distribution Engineering*. Taylor and Francis, 2006.
5) Short, T. A. *Electric Power Distribution Equipment and Systems*. Taylor and Francis, 2004.

Practice of Basic Electronics **Credit: 2**

Prerequisites: Basic Electronics
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 reality, analysis of circuit operation, and analysis of operation of basic electronic circuit.
Textbook:
1) Kybett, Harry, and Earl Boysen. *All New Electronics Self-Teaching Guide*. 3rd ed., Wiley Publishing, Inc., 2008.

Microprocessor **Credits: 3**

Prerequisites: Digital Systems
Course Description: This course provides the learner with knowledge of the role and functions of the processor and the processor system; historical development of processor generations and the basic parameters to assess the ability of the processor; the structure and the role of the components in the block diagram of 8-bit microprocessors and principles of operation of 8-bit microprocessors; historical development of microcontrollers; advantages and disadvantages of using microcontrollers; internal and external structure of 8-bit microcontroller; the function of peripheral devices: timer/counter, interrupts, data transfer of microcontroller, Assembly language, and C language to program the microcontroller.
Textbooks:
1) Barnett, Richard H., Sarah Cox, and Larry O'Cull. *Embedded C Programming and the Microchip PIC*. Delmar Publishers Inc., 2003.
2) Bates, Martin P. *PIC Microcontrollers. An Introduction to Microelectronics*. 3rd ed., Newnes, 2011.

Power Electronics **Credits: 3**

Prerequisites: None
Course Description: This course provides learners with specialized knowledge of basic power electronic accessories. The students will be introduced to the following topics: the structure, operating principles, waveform and parameters, the uncontrolled and controller rectifier circuits, modified circuit, switching voltage AC, transforming DC voltage, inversing and selecting the DC power supply.

Textbook:

1) Mohan, N., T. M. Underland, and W. P. Robbins. *Power Electronics: Converters, Application and Design*. 3rd ed., John Wiley, 2003.

Automatic Electric Drive **Credits: 4**

Prerequisites:

Course Description: This course introduces students to the content related to the characteristics of the electric drive system, methods of adjusting the motor speed, direct current and alternating current, the calculation method features, engines in the different working state, characteristic construction methods, and instructs students on how to choose equipment for power transmission and working principles of the new powertrain.

Textbooks:

1) El-Sharkawi, Mohamed A. *Fundamentals of Electric Drives*. Brooks/Cole, 2000.
2) Nisit, K. D., and Prasanta K. Sen. *Electric Drives*. India, Prentice-Hall, 1999.
3) Veltman, Andre, Duco W. J. Pulle, and R. W. de Doncker. *Fundamentals of Electrical Drives.* Springer International Publishing, 2016.

Power System **Credits: 4**

Prerequisites:

Course Description: This course introduces learners to the contents related to the load forecasting method, the method of calculating voltage loss, power loss, short circuit calculations on a high-voltage network, methods for selecting the number and capacity of transformers, substations diagram of voltage from 110 kV or more. The students will gain an understanding of the function and operating principle of the switchgear, high-voltage protection, methods to select conductors, cables, switchgear, equipment limits of the short circuit current to high-voltage network, and power control methods including pressure and reducing energy loss in power system.

Textbook:

1) Miller, Robert, and James Malinowski. *Power System Operation.* 3rd ed., McGraw-Hill, 1994.

Power Supply System Project **Credits: 1**

Prerequisites: Power Supply

Course Description: This course presents methods of electricity distribution and network design workshop, including the content regarding workshop features, data load, load grouping, and bar wiring diagram. The students will have the opportunity to determine the load calculation at each level, choose the number and capacity MBA, choose backup power generators, power offset selected and offset schemes, choose the wire/cable, select switchgear / protect / measurement,

select power distribution cabinet, calculate lightning, and make grounding calculations and estimates.

Textbooks:

1) Sivanagaraju, S. *Electric Power Transmission and Distribution*. Pearson Education, 2008.

Reference books:

1) Gonen, Turan. *Electric Power Distribution Engineering*. 3rd ed., CRC Press, 2008.
2) McDonald, John D. *Electric Power Substations Engineering*. 3rd ed., CRC Press, 2012.
3) Miller, R., and James Malinowski. *Power System Operation*. 3rd ed., McGraw Hill, 1994.
4) Pansini, Anthony J. *Electrical Distribution Engineering*. Taylor and Francis, 2006.
5) Short, T. A. *Electric Power Distribution Equipment and Systems*. Taylor and Francis, 2004.

Practice of Electrical Machine **Credits: 1**

Prerequisites: Electrical Machine

Course Description: In this course, the students will have the opportunity to take part in practical work in the following areas related to electrical machines: installation technology of basic electricity, calculation method for constructing and installing; quality inspection, repairing, installing technology of electrical machine, manufacturing technology of winding in detail, assembling and operating common electrical machines.

Textbooks:

1) Chaturvedi, D. K. *Electrical Machines Lab Manual with MATLAB Programs*. I K International Publishing House, 2015.
2) Kothari, D. P., and B. S. Umre. *Laboratory Manual for Electrical Machines*. I K International Publishing House, 2014.

Programmable Logic Controller **Credits: 3**

Prerequisites: None

Course Description: This course provides students with contents regarding the method for determining the output of the sensors, how to calculate the value of output as required, the type of sensor connection and actuators with PLC controllers, functional and operational principles of PLC, and application scripts.

Textbooks:

1) Bryan, L. A., and E. A. Bryan. *Programmable Controllers: Theory and Implementation*. 2nd ed., American Technical Publishers, 2002.
2) Jack, Hugh. *Automation Manufacturing Systems with PLCs*. April 14, 2005.

Practice of Digital Systems **Credits: 1**

Prerequisites: Electricity Practice and Electronics Practice.

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.

Textbooks:

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 Power Electronics **Credits: 2**

Prerequisites: Basic Electronics, Electronic and Electrical Materials,

Course Description: This course provides learners with knowledge about the installation of circuits, operating of circuits, waveforms of circuits, DC-DC converter, DC-AC converter, AC-DC converter, and IGBT. The learners will be able to recognise and repair faults in the power electronics system, and design PWM circuits.

Textbook:

1) Arora, O. P. *Power Electronics Laboratory: Theory, Practice, and Organization*. Alpha Science International Ltd., 2006.

Practice of Power Supply System **Credits: 2**

Prerequisites: none

Course Description: This course enables the learner to work with the power supply system such as power transmission line model, power substation model, capacitor control system model, power plant model, and power relay protection model. Learners will have the opportunity to recognize supply power system drawings and investigate low and medium voltage distribution systems.

Textbooks:

1) DeLorenzo. *Electrical Power Engineering, User Manual*.
2) *Electrical Power Supply Laboratory Manual*
3) Gerrish, Howard H., and William E. Jr. Dugger. *Electricity and Electronics: Lab Manual.* Goodheart-Willcox Pub, 1989.
4) Lab-Volt. *Electrical Power Engineering, User Manual.*

Project on Electric Drive **Credits: 1**

Prerequisites: none

Course Description: This course focuses on practical problem-solving in the field of automatic electric drives involving DC motors and AC motors. The knowledge applied in the project will relate to characteristics of speed, mechanical properties, natural and artificial mechanical characteristics, parameters affecting the mechanical properties form, drawing the mechanical

properties, the method boot, and motor control in different working modes as lifting load requirements and the state of the electric motor brake.

Textbooks:

1) El-Sharkawi, Mohamed A. *Fundamentals of Electric Drives*. Brooks/Cole, 2000.
2) Nisit, K. D., and Prasanta K. Sen. *Electric Drives*. India, Prentice-Hall, 1999.
3) Veltman, Andre, Duco W. J. Pulle, and R. W. de Doncker. *Fundamentals of Electrical Drives.* Springer International Publishing, 2016.

Supervisory Control and Data Acquisition **Credits: 3**

Prerequisites: none

Course Description: The course content provides knowledge of the following concepts: components of SCADA in automatic system; actuator system; input/output remote terminal units (RTU) or Programmable Logic Controllers, center monitor and control station; communication system; Human-Machine Interface (HMI); hardware and software integrated method, in order to build a SCADA system in practice.

Textbooks:

1) Maurizio, Di Paolo Emilio. *Data Acquisition Systems: From Fundamentals to Applied Design*. Springer, 2013.
2) Radvanovsky, Robert, and Jacob Brodsky. *Handbook of SCADA/Control Systems Security.* 2nd ed., CRC Press, 2013.

Relay Protection and Automation **Credits: 3**

Prerequisites: Advanced Mathematics 1-3, General Physics 1-3

Course Description: This course equips learners with contents related to function, principles of operation, the specifications, the technical specifications of the installed equipment and automatic protection, operation of automated systems in electrical systems, and industrial power network.

Textbooks:

1) Blackburn, J. Lewis, and Thomas J. Domin. *Protective Relaying: Principles and Applications*. 4th ed., CRC Press, 2015.
2) Sleva, Anthony M. *Protective Relay Principles*. CRC Press, 2009.
3) Werstiuk, Chris. *The Relay Testing Handbook: Principles and Practice*. Valence Electrical Training Services, 2012.

Practice of Electric Drive **Credits: 2**

Prerequisites: none

Course Description: This course provides the learner with the opportunity for practical work with drawings and mechanic characteristics of AC and DC of asynchronous machines and speed adjusting of asynchronous machines.

Textbooks:

1) El-Sharkawi, Mohamed A. *Fundamentals of Electric Drives*. Brooks/Cole, 2000.
2) Nisit, K. D., and Prasanta K. Sen. *Electric Drives*. India, Prentice-Hall, 1999.
3) Veltman, Andre, Duco W. J. Pulle, and R. W. de Doncker. *Fundamentals of Electrical Drives.* Springer International Publishing, 2016.

Project on Programmable Logic Controller **Credits: 1**

Prerequisites: Programmable Logic Controller

Course Description: This course provides the opportunity for solving some practical problems in the field of automation, including designing PLC and the process as automated packaging systems, traffic light systems, conveyor systems, heat oven system, conveyor control systems, drive systems, and systems related to temperature, pressure, flow, level, and volume.

Textbooks:

1) Bryan, L. A., and E. A. Bryan. *Programmable Controllers: Theory and Implementation*. 2nd ed., American Technical Publishers, 2002.
2) Jack, Hugh. *Automation Manufacturing Systems with PLCs*. April 14, 2005.
3) Johnson, Curtis D. *Process Control Instrumentation Technology*. 8th ed., Pearson New International Edition, 2014.

Practice of Microprocessor **Credits: 2**

Prerequisites: Electricity Practice and Electronics Practice.

Course Description: This course gives students hands-on experience programming the microcontroller used to control objects to display information such as LED, LED 7-segment, LCD, GLCD, and matrix LED. The students will also get the opportunity for practical work related to the input objects such as buttons, keyboard matrix, temperature sensors, distance measurement sensor, motion sensor, and communication devices such as standard I2C real-time clock, serial EEPROM memory, ADC/DAC, as well as counting pulses and counter, timing control and timer, step motor and DC motors control, and PWM modulation.

Textbooks:

1) Barnett, Richard H., Sarah Cox, and Larry O' Cull. *Embedded C Programming and the Microchip PIC*. Delmar Publishers Inc., 2003.
2) Bates, Martin P. *PIC Microcontrollers. An Introduction to Microelectronics*. 3rd ed., Newnes, 2011.

Practice of Industrial Power System Control **Credits: 2**

Prerequisites: none

Course Description: This course provides learners with knowledge about sensors connecting to controllers. The learners will get the opportunity to design and choose programmable equipment and program for demanding industrial systems.

Textbooks:

1) Anderson, Gary D. *PLC Programming Using RSLogix 500: Ladder Logic Diagnostics & Troubleshooting*. CreateSpace Independent Publishing Platform, 2015.
2) Pawla, Andrzej M. *Sensors and Actuators in Mechatronics: Design and Applications*. CRC Press, 2006.

MATLAB/SIMULINK for Power System **Credits: 3**

Prerequisites: Circuit 1 & 2, Power Supply, Electrical System

Course Description: This course provides students with the fundamentals of the software Matlab, Matlab programming language and the basic toolbox related to electrical engineering. It is designed for senior undergraduate or graduate electrical engineering students studying power system analysis and design. The course offers learners a thorough understanding of the fundamental concepts of power system analysis and their applications to real-world problems. MATLAB and SIMULINK, both ideal for power system analysis, are integrated into the course, which enables students to confidently apply the analysis to the solution of large practical power systems with ease.

Textbook:

1) Kalechma, Misza. *Practical MATLAB Applications for Engineers*. CRC Press, 2008.

Residential and Industrial Lighting Techniques **Credits: 3**

Prerequisites:

Course Description: This course provides the contents related to light types, lighting methods, application standards, specifications, requirements, procedures for design and evaluation of indoor/outdoor lighting system, square, street, industrial, and sports facilities lighting.

Textbooks:

1) Gordon, Gary. *Interior Lighting for Designers*. 4th ed., Wiley, 2003.
2) Karlen, Mark, James R. Benya, and Christina Spangler. *Lighting Design Basics*. 2nd ed., Wiley, 2012.

Building Access Control and Security System **Credits: 3**

Prerequisites: Electrical Measurement and Instrument; Power Supply System, Power System

Course Description: This course provides students with the contents related to the fire alert system, automatic fire fighting system, CCTV system, security system, computer network system, communication system, Inbuilding system, and Intercom system.

Textbooks:

1) Norman, Thomas L. *Integrated Security Systems Design*: *A Complete Reference for Building Enterprise-Wide Digital Security Systems.* 2nd ed., Butterworth-Heinemann, 2014.
2) Wheeler, Evan. *Security Risk Management: Building an Information Security Risk Management Program from the Ground Up*. Syngress, 2011.

Electrical Machine Calculation **Credits: 3**

Prerequisites: Electrical Circuit; Electrical Machine 1 and Electrical Machine 2
Course Description: This course provides learners with contents related to calculation methods for rewinding common electrical machines such as single-phase transformer, three-phase transformer, and single-phase and three-phase induction motors.
Textbook:
1) Gonen, Turan. *Electrical Machines*. Power Intl Pr, 1998.

Special Electrical Machine **Credits: 3**

Prerequisites: Electrical Machine Instrument
Course Description: This course introduces learners to key concepts and understanding of the synchronous machine, DC brushless motor, stepper motor, servo motor, self-syn machine, enCourse IDr: constitution, operating principle, electromagnetic relationship, and their applications in the industry.
Textbooks:
1) Gonen, Turan. *Electrical Machines*. Power Intl Pr, 1998.
2) Janardanan, E. G. *Special Electrical Machines*. India, Prentice-Hall, 2014.

Power Station and Power Plant **Credit: 3**

Prerequisites: none
Course Description: This course provides students with key concepts and knowledge about the constitution, specification, operating principle of types of power plant; distributed diagram of transformer stations, selection and rating of transformers, protection and measurement diagram of a transformer station, and economic operation of a power station.
Textbooks:
1) Kehlhofer, Rolf, et al. *Combined-Cycle Gas & Steam Turbine Power Plants*. 3rd ed., PennWell Corp., 2009.
2) Woodruff, E. B., Herbert B. Lammers, and Thomas F. Lammers. *Steam Plant Operation*. 9th ed., McGraw-Hill, 2011.

Energy Audit and Efficiency **Credits: 3**

Prerequisites: Power System, Power Supply System

Course Description: This course equips learners with an understanding of the meaning and purpose of electric audit and efficiency, procedures of electric audit and efficiency, technologies to save energy, and the problems that need to be researched and solved in the future.

Textbook:

1) Abbi, Y. P., and Shashank Jain. *Handbook on Energy Audit and Environment Management*. The Energy and Resources Institute, 2006.

Power Quality in Power System **Credits: 3**

Prerequisites: none

Course Description: This course introduces the power quality problems under consideration of the power supply system, as well as residential or industrial loads. During the course, the following concepts will be discussed: general power quality; electromagnetic interference; harmonics of the power grid; harmonic limits for loads.

Textbooks:

1) McGranaghan, Mark F., Surya Santoso, and H. Wayne Beaty. *Electrical Power Systems Quality*. 3rd ed., McGraw-Hill, 2012.
2) Santoso, Surya. *Fundamentals of Electric Power Quality*. CreateSpace Independent Publishing Platform, 2009.

Building Management System **Credits: 3**

Prerequisites: Electrical Circuit, Electrical Measurement and Instrument

Course Description: The world is becoming smarter and greener with the implementation of high-end automation systems. Building Management Systems leads to more optimized control of resources, high-end security, and ease of access. The internet of things initiated by big technology ventures will create a smart world that can be controlled with just a click. The lack of educated BMS experts leads to improper design and implementation. The industry is looking for skilled technicians who can meet all the requirements in BMS sector. This course is a golden opportunity to enhance students' employability in home automation and BMS sector.

Textbooks:

1) Levermore, Geoff. *Building Energy Management Systems: An Application to Heating, Natural Ventilation, Lighting and Occupant Satisfaction*. 2nd ed., Routledge, 2000.
2) Rocha-Lona, Luis, Jose Arturo Garza-Reyes, and Vikas Kumar. *Building Quality Management Systems: Selecting the Right Methods and Tools.*Productivity Press, 2013.
3) Wang, Shengwei. *Intelligent Buildings and Building Automation*. Routledge, 2009.

ATS and Power Backup System **Credits: 3**

Prerequisites:

Course Description: This course provides contents related to the constitution, operating principle, functions, and specifications of power backup system; selection of configuration and power rating of the backup system; constitution, operating principle, functions, and specifications of ATS; and selection of ATS.

Textbook:

1) Dugan, Roger C., et al. *Electrical Power Systems Quality*. 2nd ed., McGraw-Hill, 2002.

Industrial Management **Credits: 3**

Prerequisites: none

Course Description: This course equips learners with skills in risk management, logistics management, long-term and mid-term planning skills, planning and strategic management of a company's production from earlier supply-demand and revenues.

Textbooks:

1) Fayol, Henri, and Constance Storrs. *General and Industrial Management.* Martino Fine Books, 2013.
2) Kumar, Anuj. *Industrial Management: An Introduction*. Alpha Science, 2015.

Industrial Management & Project Management **Credit: 3**

Prerequisites: Advanced Mathematics, Basic Informatics, General Economics

Course Description: This course provides students with an understanding of industrial and project management topics and concepts such as the types of project investments, project management, project capitals, value of money over time, financial performance indicators of a project; contents of pre-feasibility and feasibility projects; selection of items for a project, specific and technical analysis of a project, project management and organization, financial analysis, economic, social, and environmental analysis; procedures of planning a project; legal fundamentals, techniques, and methods of project evaluation.

Textbook:

1) Kogon, Kory, Suzette Blakemore, and James Wood. *Project Management for the Unofficial Project Manager*. FranklinCovey, 2015.

Industrial Power System Control **Credits: 4**

Prerequisites: Power Supply System, Electric Machines, Digital Systems

Course Description: This course provides the learner with knowledge of automatic control, including an understanding of the power supply system, electric drive system in production, and civil machines.

Textbooks:

1) Curriculum "Power Supply System" for University, Technology Sector, Assoc. Dr. Quyen Huy Anh, HCMC University of Technology and Education, 2010.
2) Electrical installation guide According to IEC international standards, Phan Thi Thanh Binh and other authors_Hanoi: Technical Science, 2009.

3) Curriculum "CAD in electrical engineering", Assoc. Dr. Quyen Huy Anh, National University publisher, Ho Chi Minh City, 2008.
4) Cuttle, Christopher. *Lighting by Design.* 2nd ed., Architectural Press, 2008.
5) El-Sharkawi, Mohamed A. *Fundamentals of Electric Drives*. Brooks/Cole, 2000
6) King, A., and W. Knight. *Uninterruptible Power Supplies*. McGraw-Hill, 2004.
7) Ong, Chee-Mun. *Dynamic Simulation of Electric Machinery Using Matlab/Simulink*. Prentice-Hall, 1997.
8) Pansini, Anthony J. *Electrical Distribution Engineering*. CRC Press, 2007.
9) Phan Xuan Minh. *Automated Control Theory*. Education Publisher, 2008.
10) Short, T. A. *Electric Power Distribution Equipment and Systems*. CRC Press, 2006.
11) Trzynadlowski, Andrzej M. *The Field Orientation Principle in Control of Induction Motors*, Springer US, 1994.
12) Veltman, Andre, Duco W. J. Pulle, and R. W. de Doncker. *Fundamentals of Electrical Drives.* Springer International Publishing, 2016.
13) Watkins, A. J. *Electrical Installation Calculations*. Newnes, 2006.
14) Werner, Leonhard. *Control of Electrical Drives*. Springer-Verlag Berlin Heidelberg, 2001.
15) Nguyen Thi Phuong Ha, Huynh Thai Hoang. *Automatic Control*. National University publisher, Ho Chi Minh City.
16) Tran Quang Tho, Lecture on electric drive facilities, Faculty of Electrical and Electronics Engineering, HCMC University of Technology and Education.
17) Bui Quoc Khanh, Nguyen Van Lien, Nguyen Thi Hien. *Electric Drive*. Science and Technology Publisher.
18) Phan Quoc Dung, To Huu Phuc. *Electric Drive*. University of Technology - Ho Chi Minh City National University.
19) Nguyen Van Nho. *Electric Drive Facilities*. University of Technology - Ho Chi Minh City National University.

Renewable Energy **Credits: 4**

Prerequisites: Electrical Power System

Course Description: This course provides the learners with necessary knowledge about the various forms of renewable energy resources, and adopts a hands-on approach to the subject by helping the learners understand the transformation of sustainable energy into electricity, and how to set up renewable energy system and explore the different roles of engineers working in renewable energy fields to create a sustainable environment that contributes to greater health and safety.

Textbooks:

1) Vo Viet Cuong. *Renewable Energy*. HCMC University of Technology and Education Publisher, 2014.

References:

1) Boyle, Godfrey. *Renewable Energy – Power for a Sustainable Future*. Oxford. 2005.
2) Sorensen, Bent. *Renewable Energy*. Elsevier Academic Press. 2004.

Project on Industrial Power Systems Control **Credits: 1**

Prerequisites: Industrial Power Systems Control

Course Description: This course enables learners to apply specialized skills and knowledge in the field of electrical-electronics engineering technology by implementing a specific project to solve specialized problems in practice. Through this project, students will have an opportunity to improve their scientific research skills, synthesize documents, work on program simulation, and control, design and build an automatic electrical system in practice, write reports and present research results.

Textbook:

Relay Protection and Automation in Industrial Power System **Credit: 3**

Prerequisites: Power Supply System, Electric Machines

Course Description: This course provides the learner with the basic principles and skills in the protection of industrial electrical systems, short circuit calculation, and the design of protection principles for elements in industrial systems. The students will also participate in the calculation and setting of relay value for industrial protection system, and analyse and calculate protection diagrams for industrial electrical systems

Textbooks:

1) Tran Dinh Long. *Relay Protection in Power System*. Publisher of Science and Technology, 2011.
2) Nguyen, Hoang Viet. *Relay Protection and Automation in Power Systems*. Vietnam National University Publisher, 2011.

References:

1) Alstom Grid. *Network Protection and Automation Guide*. Alstom Grid Worldwide Contact Centre, 2011.
2) Elmore, Walter A. *Protective Relaying Theory and Applications*. CRC Press, 2003.
3) Nguyen, Hoang Viet. *Exercises for Relay Protection and Short Circuit Calculation*. Vietnam National University Publisher, 2011.
4) Software of GE, Alstom, Siemens and user manual.

Practice of Renewable Energy **Credits: 2**

Prerequisites: Renewable Energy

Course Description: This course provides the learner with basic concepts and practical skills regarding renewable energy, including exploiting renewable energy sources such as sun, wind, thermal, fuel cell, etc.

Textbooks:

1) Vo Viet Cuong. *Renewable Energy in Practice*. HCMC University of Technology and Education Publisher, 2019.

Reference books:

1) *Manual for using the test kits of DELORENZO.*

Industry Internship **Credits: 3**

Prerequisites: Senior students

Course Description: This course provides the learner with an opportunity to apply the knowledge gained throughout the programme into real-life business, and to gain professional experience in the business.

Textbooks:

1) *Technical manual*

Graduation Thesis **Credits: 7**

Prerequisites: All subjects

Course Description: This course helps learners to apply the accumulated knowledge by designing and constructing the control system to meet the set out requirements. It shows the ability to find documents, write reports, plan, work in groups, as well as the ability to present. In addition, it helps students improve their ability to detect and solve problems.

Textbooks:

Professional Development *in Power System - ME orientation* **Credits: 2**

Prerequisites:

Course Description: This course provides learners with necessary knowledge about the various forms of renewable energy resources, and gives a hands-on approach to the subject by helping the learners understand the transformation of sustainable energy into electricity, know how to set up renewable energy system, and explore the different roles of engineers working in renewable energy fields to create a sustainable environment that contributes to greater health and safety.

Textbooks:

1) Vo Viet Cuong. *Renewable Energy*. HCMC University of Technology and Education Publisher, 2014.

References:

1) Boyle, Godfrey. *Renewable Energy – Power for a Sustainable Future*. Oxford, 2005.
2) Sorensen, Bent. *Renewable Energy*. Elsevier Academic Press, 2004.

Professional Development Topics *in Electric Drive – Automation orientation* **Credits: 2**

Prerequisites:

Course Description: This course provides practical knowledge for learners in the form of thematic reports (on electrical-electronics engineering technology, the power system of utility, and the design of electrical systems in buildings) from public works and business submissions. Learners harvest reports in order to be evaluated.

Textbooks:

1) Curriculum for Power System Design
2) Electrical Installation Guide according to IEC international standards

3) Standard Electrical Design Handbook.
4) Electrical Safety curriculum.

References:

1) Standard of electric equipment and materials.
2) Attached catalogues from the business.
3) Standards for designing power supply systems.
4) Related technical documents and books.

Professional Development Topics *in Renewable Energy orientation* **Credits: 2**

Prerequisites:

Course Description: This course provides learners with practical knowledge in the form of specialized reports on the electrical-electronics engineering technology, the electric drive systems, and the design of electric drive systems, automation in buildings, and the workshop. Learners harvest reports to be evaluated.

Textbooks:

1) Curriculum for Electric Drive
2) Curriculum for Programmable Logic Controller

References:

1) Attached catalogues from the business.
2) Standards for designing electric drive systems - automation.
3) Related technical documents and books.