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TRƯỜNG ĐẠI HỌC

**SƯ PHẠM KỸ THUẬT TP. HỒ CHÍ MINH**

**KHOA ĐÀO TẠO QUỐC TẾ**

## **UNDERGRADUATE CURRICULUM MANUAL**

### **MECHATRONIC ENGINEERING TECHNOLOGY**

**Program Chair: Vu Quang Huy**

**2021**

## MECHATRONIC ENGINEERING TECHNOLOGY

### I. CURRICULUM

#### 1<sup>st</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	LLCT130105E	Philosophy of Marxism and Leninism	3	
2	MATH132401E	Calculus 1	3	
3	INME130129E	Introduction to Mechatronic Engineering	3	
4	GCHE130603E	General Chemistry for Engineers	3	
5	PHED110513E	Physical Education 1	0	
6	GDQP008031E	Military Education	0	
7	EHQT130137E	Academic English 1	3	
8	EHQT230237E	Academic English 2	3	
9	PHYS 130402E	Physics 1	3	
10	MEIF134529E	Information Technology for Mechatronics	3(2+1)	
Total (excluding Physical Education and Military courses)			24	

#### 2<sup>nd</sup> Semester

No.	Course ID	Course Name	Credits	Prerequisite
1	LLCT120205E	Political economics of Marxism and Leninism	2	
2	LLCT120405E	Scientific Socialism	2	
3	MATH132501E	Calculus 2	3	
4	PHED110613E	Physical Education 2	0	
5	MEDR141123E	Mechanical Engineering Drawing	4(3+1)	
6	PHYS131002E	Physics 2	3	
7	ENME130620E	Engineering Mechanics	3	
8	MATH132901E	Mathematical Statistics for Engineers	3	
9	TOMT220225E	Tolerances and Measuring Technology	2	
10	PHYS111202E	Principles of Physics - Laboratory 1	1	
Total (excluding Physical Education and Military courses)			23	

#### 3<sup>rd</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1		Social Science Course 1	2	
2	MATH132601E	Calculus 3	3	
3	PHED130715E	Physical Education 3	0	
4	APEN222329E	Applied Programming in Engineering	3(2+1)	
5	EEEN230129E	Electrical and Electronics Engineering	3	
6	MEMA230720E	Mechanics of Materials	3	
7	TEEN123725E	Technical English 1	2	
8	AMME131529E	Applied Mathematics in Mechanical Engineering	3	
9	GELA220405E	General Laws	2	
Total (excluding Physical Education and Military courses)			21	

#### 4<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	AUCO330329E	Automatic Control	3	
2	MMCD230323E	Mechanisms and Machine Components Design	3	
3	DITE226829E	Digital Techniques	2	
4	EHQT230337E	Academic English 3	3	
5	LLCT120314E	Ho Chi Minh's Ideology	2	
6	PNHY230529E	Pneumatic & Hydraulic Technology	3	
7	PEEE210229E	Practice of Electronic Circuit Design	1	
8	MATE230430E	Manufacturing Technology	3	
9	SEAC225959E	Sensors and Actuators	2	
10	MEPR220227E	Basic Mechanical Practice	2	
Total			24	

#### 5<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	PRMD310523E	Project of Mechanical Design	1	
2	SERV334029E	Drive Servo Systems	3	
3	LLCT220514E	History of Vietnamese Communist Party	2	
4		Social Science Course 2	2	

5	ROBO331129E	Robotics	3	
6	MPAU220729E	Manufacturing Process Automation	2	
7	MICO236929E	Microprocessors	3	
8	PACT310429E	Practice of Automatic Control	1	
9	EHQT230437E	Academic English 4	3	
10	TEEN233825E	Technical English 2	3	
Total			23	

### 6<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	PSEA315929E	Practice of Industrial Robots and Sensors	1	
2	PMPA326629E	Practice of Manufacturing Process Automation	2	
3	PMIP326929E	Practice of Microprocessors	2	
4		Advanced Mechatronic Engineering course 1	3	
5	ARIN337629E	Artificial Intelligence	3(2+1)	
6	MALE337029E	Machine Learning	3	
Total			14	

### 7<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1		Advanced Mechatronic Engineering course 2	3(2+1)	
2		Advanced Mechatronic Engineering course 3	3(2+1)	
3	FAIN442029E	Industry Internship	4	
4	PESD314129E	Practice of Drive Servo Systems	1	
5	PRME315129E	Project of Mechatronic System	1	
6	SEMI325929E	Business Seminar (Mechatronics)	2	
Total			14	

### 8<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	UGRA475529E	Graduation Thesis (Mechatronics Engineering)	7	
Total			7	

## ELECTIVE COURSES

### Social science courses (4 Credits)

No.	Course ID	Course Title	Credits	Notes
1	GEEC220105E	General Economics	2	Select 2 course
2	INMA220305E	Introduction to Management	2	
3	INLO220405E	Introduction to Logics	2	
4	ULTE121105E	Learning Methods in University	2	
5	SYTH220505E	Systematic Thinking	2	
6	PLSK320605E	Planning Skill	2	
7	IVNC320905E	Introduction to Vietnamese Culture	2	
8	INSO321005E	Introduction to Sociology	2	
9	BPLA121808E	Business Plan	2	
10	SYTH220491E	System Thinking	2	
11	WOPS120390E	Workplace Skill in Technology	2	
12	REME320690E	Research Methods	2	

### Advanced Mechatronics Engineering courses (9 Credits)

No.	Course ID	Course Title	Credits	Notes
1	MAVI332529E	Machine Vision	3(2+1)	
2	SCDA331629E	Industrial Communication Networks	3(2+1)	
3	DIPR337529E	Digital Signal Processing	3(2+1)	

4	PCTR431929E	Process control	3(2+1)	
5	BDES333877E	Big Data Essentials	3(2+1)	
6	IOTM337629E	Internet of Things in Mechatronics	3(2+1)	
7	EMSY337329E	Embedded system	3(2+1)	
8	CAED321024E	CAE in Mechanics	3(2+1)	
9	CCCT331725E	CAD/CAM-CNC	3(2+1)	
10	WEPR330479E	WEB Programing	3(2+1)	

### Supplementary Courses

No.	Course ID	Course Title	Credits	Notes
1	EHQT130137E	Academic English 1	3	
2	EHQT230237E	Academic English 2	3	
3	EHQT230337E	Academic English 3	3	
4	EHQT230437E	Academic English 4	3	
5	TEEN123725E	Technical English 1	2	
6	TEEN233825E	Technical English 2	3	

## II. COURSE DESCRIPTION

### Introduction to Mechatronic Engineering

**Credits: 03 (2+1)**

*Prerequisite:*

*Course description:* The goal of this course is to provide first-year students a broad outline of engineering, the skills needed to explore different disciplines of engineering and help them decide on a career in engineering.

*Textbook:*

1) Saeed Moaveni, Engineering Fundamentals: An Introduction to Engineering, CL-Engineering, 2011, ISBN 1439062080

1) Philip Kosky; George Wise; Robert Balmer; William Keat, Exploring Engineering, An Introduction to Engineering and Design, Academic Press, 2010

**Information Technology for Mechatronics****Credits: 03(2+1)***Prerequisite: None*

*Course description:* This course provides fundamentals of computer programming and C++ language, basic knowledge and skills for computer programming: define the problem, create algorithm, build program.

*Textbook:*

1) Ivor Horton, Beginning C, Apress, Fifth Edition, 2008.

**Applied Mathematics in Mechanical Engineering****Credits: 3***Prerequisite: None**Former subjects of condition: Calculus 1, 2*

*Course description:* This course provides basic knowledge of partial differential equation, Laplace transform, numerical methods including approximate solution for differential equation, interpolation, numerical integration, optimization and applications in Mechanical and mechatronics engineering

*Textbook:*

1) Erwin Kreyszig, Advanced Mathematical Methods, Wiley, 2011.

2) PETER V. O'NEIL , Advanced Engineering Mathematics, Thomson, 7th edition, 2012

3) Richard L. Burden and J. Douglas Faires, Numerical Analysis, Brooks/Cole, 9th edition, 2011.

4) Steven C. Chapra, Numerical Methods for Engineers, McGraw Hill, 6rd Edition, 2010.

**FUNDAMENTAL MECHATRONICS ENGINEERING COURSES****Mechanical Engineering Drawing****Credits: 04(3+1)***Prerequisite: None*

*Course description:* This course provides students fundamental theory of engineering drawing, including: engineering drawing standards, basic drawing skills and drawing principles, methods of representation, orthographic projection; and cultivates the abilities of writing and reading engineering drawing.

*Textbook:*

1) David A. Madsen, David P. Madsen, Engineering Drawing and Design, 6rd edition, Cengage Learning, 2016

2) K.L. Narayana, P. Kannaiah, K. Venkata Reddy, Machine drawing, 3rd edition, New Age International Publishers

**Applied Programming in Engineering****Credits: 03 (2+1)***Prerequisite: None*

*Course description:* This course provides advanced computer programming and C#, professional skills for computer programming: define the problem, create algorithm, build program. This course equips students with knowledge and skills so that they can understand, use programming software in building control system software.

*Textbook:*

- 1) Daniels Solis, Illustrated C#, Apress, 2008.

## **Engineering Mechanics**

**Credits: 03**

*Prerequisite: None*

*Course description:* This course provides fundamental knowledge of mechanical engineering. In this course, following topics will be covered: **Statics**: statics axioms, force, connection, reaction, system analysis; **Kinematics**: study the motion of points, objects, translation and rotation, kinematic analysis; **Dynamics**: physical laws, theorems of dynamics, D’Alambert principles, Lagrange equations.

*Textbook:*

- 1) J. L. Meriam, L. G. Kraige. Engineering Mechanics, Seventh Edition. John Wiley & Sons, Inc, 2006.
- 2) R. C. HIBBELER. Engineering Mechanics, Twelfth Edition. PRENTICE HALL, 2010.

## **Mechatronics of Materials**

**Credits: 03 (3)**

*Prerequisite: None*

*Course description:* This course introduces students to fundamental knowledge of strength of materials; methods of calculating the stress, strain in mechanical components, structural members under loading, its load capacity and deformations.

*Textbook:*

- 1) Mechanics of materials, Ferdinand P. Beer, E. Russelll Johnston, JR., McFraw-Hill, 1992.

## **Mechanisms and Machine Components Design**

**Credits: 03**

*Prerequisite: None*

*Course description:* This course study structures, working principles and calculating methods of kinematic, dynamic designs of machine and mechanism, standard mechanical joints and components. At the end of the course, students can independently solve calculating problems and machine design problems.

*Textbook:*

- 1) Hamrock, Jacobson, and Schmid; Fundamentals of Machine Elements, Third Edition



- 2) Shigley and Mischke, Mechanical Engineering Design, Tenth Edition
- 3) Robert L. Norton, Design of Machinery with Student Resource DVD (McGraw-Hill Series in Mechanical Engineering, 5th Edition.
- 4) R.S. Khurmi, J.K. Gupta, Textbook of Machine Design, 2005

### **Project of Mechanical Design**

**Credits: 01**

*Prerequisite:*

*Course description:* This course is help students reinforce the contents of machine design course: structures, working principles and calculating methods of kinematic, dynamic designs of machine and mechanism, standard mechanical joints and components.

*Textbook:*

- 1) Hamrock, Jacobson, and Schmid, Fundamentals of Machine Elements, Third Edition
- 2) Shigley and Mischke , Mechanical Engineering Design, Tenth Edition
- 3 Robert L. Norton, Design of Machinery with Student Resource DVD (McGraw-Hill Series in Mechanical Engineering, 5th Edition.
- 4) R.S. Khurmi, J.K. Gupta, Textbook of Machine Design, 2005

### **Tolerance and Measurement Technology**

**Credits: 03 (2+1)**

*Prerequisite: None*

*Course description:* This course provides a foundation for (1) Interchangeability in machine manufacturing engineering Tolerance and common fits in machine manufacturing engineering such as smooth cylindrical fits, keys and spline fits, thread fits, method of solving the dimension chain exercises and basic principles to draw dimension on detail drawings, some measuring equipment and methods to measure the basic parameters of mechanical parts (2) *Experiments on Mechanical Measurement Techniques* mentions methods to measure basic parameters of mechanical parts; introduces tools, equipment, precision and manipulation; calculates and processes measuring results.

*Textbook:*

- 1) Geometrical Dimensioning and Tolerancing for Design, Manufacturing And Inspection, 2nd edition
- 2) K.L. Narayana, P. Kannaiah, K. Venkata Reddy, Machine drawing, 3rd edition, New Age International Publishers

### **Electrical and Electronics Engineering**

**Credits: 3**

*Prerequisite: None*

*Course description:* This course provides students with knowledge of electrical circuit, circuit design, 1-phase and 3-phase AC circuits. Working principles and calculation methods of current regulator, synchronous motor, asynchronous motor, DC motor. Working principles and calculation

methods of basic electrical and electronics components such as diode, transistor BJT, MOSFET, SCR, TRIAC, OpAmp.

*Textbook:*

- 1) A Textbook of Electrical Technology-Vol 1-Basic Electrical Engineering - B.L. Theraja et al.
- 2) A Textbook of Electrical Technology-Vol 4-Electronic Devices and Circuits - B.L. Theraja et al.

### **Manufacturing Technology**

**Credits: 03**

*Prerequisite: none*

*Course description:* The subject provides students with knowledge of mechanical engineering of process manufacturing mechanical parts. It also provides the steps for calculating, design manufacturing technology to meet needs of economics and engineering.

*Textbook:*

- 1) Mikell-p-groove, *fundamentals of modern manufacturing, 4th edition, JOHN WILEY & SONS, 2010.*
- 2) Serope Kalpakjian and Steven R. Schmid, *Manufacturing Engineering and Technology*, Pearson, 2014

### **Automatic Control**

**Credits: 03**

*Prerequisite: none*

*Course description:* This course provides students with specialized knowledge in Automatic Control such as control theory of continuous systems. This course also provides the knowledges of physical modelling, mathematic approaches to analyze the characteristics of the dynamic systems, and evaluate performance of the control systems and design an automatic control systems.

*Textbook:*

- 1) Benjamin C. Kuto, *Automatic Control Systems*, New York, 2010
- 2) Katsuhiko Ogata, *Modern Control Engineering*, 4th Edition, Prentice Hall, 2002.
- 3) Richard C. Doft& Robert H. Bishop. *Modern Control Systems*, 11th Edition Pearson Prentice Hall, 2008.

### **Artificial Intelligence**

**Credits: 03**

*Prerequisite: none*

*Course description:* This course provides basic knowledge of AI to apply AI for mechatronic system. It also provides modern intelligent algorithms such as gene, neural network, expert systems

*Textbook:*

1) Russell, S. J. and Norvig, P. (2010). Artificial intelligence: A modern approach (3rd edition). Upper Saddle River, NJ: Prentice-Hall. (ISBN 0-13-604295-7)

**Machine Learning**

**Credits: 03**

*Prerequisite: None*

*Course description:* This course aims to teach students the fundamentals of machine learning. It will cover the most common forms of model architectures and primarily the algorithms. Students have knowledges in machine learning such as classification, clustering, neuron networks, algorithms and applications. The learners are able to apply the algorithms to solve technical and practical problems.

*Textbook:*

1) Benjam Christopher Bishop, Pattern Recognition and Machine Learning. Springer, 2006.  
Kevin P. Murphy Machine Learning: A Probabilistic Perspective, MIT Press, 2012

**Sensors and Actuators**

**Credits: 02**

*Prerequisite: None*

*Course description:* This course provides students with specialized knowledge in sensors and actuators. This course also provides the knowledges of principles of color sensors, capacitor, magnetic, temperature, pressure, encoder sensors. Besides, It also provides principle of actuators as DC, AC electric motors, hydraulic, pneumatic motor, step, linear, servo motors

*Textbook:*

1) Benjam Clarence W. de Silva; Sensors and Actuators: Engineering System Instrumentation, 2015  
2) Fraden, Jacob, Handbook of Modern Sensors: Physics, Designs, and Applications, 2016

**ADVANCED MECHATRONICS ENGINEERING COURSES**

**Pneumatic – Hydraulic Technology**

**Credits: 3**

*Prerequisite: None*

*Course description:* This course provides basic knowledge of operating principles of a pneumatic control system, electro pneumatics, hydraulics, electro hydraulics; advantages and disadvantages of a pneumatic/hydraulic control system compared to electrical control system ; introduces components, basic principles in design pneumatic/hydraulic control system, fault detection and maintenance for pneumatic/hydraulic system.

*Textbook:*

1) Jagadeesha T, Hydraulics and Pneumatics, I K International Publishing House (November 16, 2015)

**Manufacturing Process Automation**

**Credits: 2**

*Prerequisite: none*

*Course description:* This course provides knowledge of structure of an automatic control system, shows student how to use sensors, actuators, PLC in building an automated manufacturing process. This course also introduces students to PLC programming and application of PLC in manufacturing process automation.

*Textbook:*

Serope Kalpakjian, Steven Schmid, Manufacturing Engineering and Technology, SI Edition 7 Ed., PEARSON, 2013.

## **Digital Techniques**

**Credits: 02**

*Prerequisite: none*

*Course description:* This course provides fundamentals of digital system, operating principles, design and structure of digital systems, design and structure of microcontrollers, basic peripheral devices and its applications in a digital system.

*Textbook:*

1) Ronald J Tocci, Neal S. Widmer, Digital Systems: Principles and Applications, 11th edition

## **Microprocessors**

**Credits: 03**

*Prerequisite: none*

*Course description:* This course provides fundamentals of microcontroller, design and structure of microcontrollers, basic peripheral devices and its applications in a microcontroller system.

*Textbook:*

MykePredko, Programming and Customizing the PIC Microcontroller, 3rd Ed, McGraw Hill, 2008.

## **Drive Servo Systems**

**Credits: 03**

*Prerequisite: None*

*Course description:* This course provides students with fundamentals of servo system in industry, topics covered: block diagram, design and control common servo systems, from electrical servo systems with step motor, DC motor, AC motor to hydraulic servo systems. This course also provides knowledge of trajectory generation, especially interpolation algorithm for multi-axis servo systems.

*Textbook:*

1) Masatosi Nakamura, Satoru Goto, Nobuhiro Kyura, "Mechatronic Servo System Control", Springer, Germany 2004

2) Suk-Hwan Suh, Seong-Kyoon Kang, Dae-Huyk Chung, Ian Stroud, "Theory and Design of CNC Systems", Springer, London, 2008

**Robotics****Credits: 03***Prerequisite: None*

*Course description:* This course provides knowledge of robots and its applications in automated manufacturing, services, and daily life. Based on this knowledge, students can quickly approach and efficiently exploit the advantages of robot in different areas.

*Textbook:*

1) Saeed B. Niku, Introduction to Robotics: Analysis, Systems, Applications, Wiley; 3th edition (September 22, 2011)

**Project of Mechatronic System****Credits: 01***Prerequisite: None*

*Course description:* This course helps student to reinforce their knowledge of automatic control, manufacturing process automation, selecting mechatronic system control equipment, simulation, implement mechanical systems, control systems to serve the automation of mechatronic systems. This course also helps student to improve their presentation skills.

*Textbook:*

1) Klaus Janschek, Mechatronic Systems Design: Methods, Models, Concepts, 2012th edition.

2) Devdas Shetty, Richard A. Kolk, Mechatronics System Design, Second Edition.

**CAD/CAM-CNC Technology****Credits: 03(2+1)***Prerequisite: None*

*Course description:* the subject provides students with (1) Fundamentals of CAD/CAM solution; (2) Basic skills: selection of machining processes order, cutting tool selection and CNC programming (3) Approaching methods for the utilization of CAD/CAM software.

*Textbook:*

1) EMCO WinNC GE Series Fanuc 21 TB

2) EMCO WinNC GE Series Fanuc 21 MB

3) EMCO Win Tutorials - Modular Instructor Guide for Industry and Training-PC Turn/Mill 55 GE Fanuc Series 21

**Process Control****Credits: 03(2+1)***Prerequisite: None*

*Course description:* This course provides basic knowledge of process control, applications of automatic control and automatic devices in controlling process parameters such as: level, flow rate, pressure, temperature. This course also shows students how to use software to simulate, program and monitor mechatronic systems which related to the process parameters.

*Textbook:*

1) Dale E. Seborg, Process Dynamics and Control, Wiley, 4th Edition, 2016

### **Machine Vision**

**Credits: 03(2+1)**

*Prerequisite: none*

*Course description:* This course provides students with fundamentals of image processing, including noise removal, smoothing, edge detection, color recognition, segmentation, motion detection. Besides, students will be introduced to the ideas of applying image processing in real situation.

*Textbook:*

1) R. C. Gonzalez and R. E. Woods, Digital Image Processing.

### **Industrial Communication Networks**

**Credits: 03(2+1)**

*Prerequisite: none*

*Course description:* This course provides students with fundamentals of industrial data transmission. These following topics will be covered: data terminal equipment and communication protocols of common industrial communication network such as: Profibus, Can, DeviceNet, Modbus, Ethernet, AS-i. After the course, students can design a communication network to serve the automation of manufacturing systems in industry.

*Textbook:*

1) Behrouz A. Forouzan, Data Communications and Networking, Fourth Edition, 2007  
John Park, Steve Mackay, Edwin Wright, Practical Data communications for instrumentations and control, 2006

### **Embedded Systems**

**Credits: 03(2+1)**

*Prerequisite: none*

*Course description:* This course provides students with basic knowledge of microcontroller, embedded system, design methods and programming, shows the students how to apply digital system in solving control problems, configure peripheral devices such as: I/O port, ADC, Timer, PWM, UART.

*Textbook*

Richard Barnett, Larry O’Cull, Sarah Cox, Embedded C Programming and the Microchip PIC, 2004

### **Digital Signal Processing**

**Credits: 03(2+1)**

*Prerequisite: None*

*Course description:* This course provides basic knowledge of digital signal processing as analog, digital signal, bandwidth, Z transform and applications, Fourier transform (FT) and discrete Fourier transform (DFT) and fast Fourier transform. It also provides ideal filter and shows the students how to apply digital system in solving control problems, configure and introduces FIR based on Chebyshev and Remez

*Textbook:*

- 1) Alan V. Oppenheim, Ronald W. Schaffer, Discrete-time signal processing (3rd ed.), Prentice-Hall Inc, 2009.
- 2) John G Proakis, Vinay K. Ingle, Digital Signal Processing Using MATLAB (3rd ed.), Cengage Learning, 2011.
- 3) Sen M. Kuo, Bob H. Lee, Wenshun Tian, Real-Time Digital Signal Processing: Implementations and Applications (2nd ed.), John Wiley & Sons, 2006

### **Internet of Things in Mechatronics**

**Credits: 03(2+1)**

*Prerequisite: none*

*Course description:* This course provides basic knowledge Internet of Things (IoT) including structure of IoT system, devices and parts to develop IoT system such as sensors, cloud computing, industrial network, embedded system, and analytics and security.

*Textbook*

- 1) Perry Lea; Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, 2018

## **WORKSHOP**

### **Practice of Manufacturing Process Automation**

**Credits: 02**

*Prerequisite: none*

*Course description:* This course helps students to reinforce their knowledge of manufacturing process automation, the use of sensors, motors, pneumatic/hydraulic valves in control system, working principles of elements of automatic control, install and program PLC, connect PLC with peripheral devices.

*Textbook:*

- 1) Practice of Manufacturing Process Automation manual 2020
- 2) Serope Kalpakjian, Steven Schmid, Manufacturing Engineering and Technology, SI Edition 7 Ed., PEARSON, 2013.

### **Basic Mechanical Practice**

**Credits: 02**

*Prerequisite: none*

*Course description:* This course provides students with basic knowledge and skills in metalworking with hand tools and basic equipment such as punchers, chisels, files, drills, measuring equipment; basic knowledge and skills in turning, grinding and milling.

*Textbook:*

- 1) Practice of Mechanical Engineering manual, 2020
- 2) Practice of turning manual, 2018
- 3) Practice of milling manual, 2018
- 4) Practice of metalworking manual, 2018

### **Practice of Electronic Circuit Design**

**Credits: 01**

*Prerequisite: None*

*Course description:* This course provides students with fundamentals of electrical and electronics, including: electronic devices, diode, resistor, capacitor, transistor, triac-opamp and investigate the principle of operation and characteristics of these devices.

*Textbook:*

- 1) Practice of Electronic Circuit Design Lab manual, 2020
- 2) A Textbook of Electrical Technology-Vol 1-Basic Electrical Engineering - B.L. Theraja et al.
- 3) A Textbook of Electrical Technology-Vol 4-Electronic Devices and Circuits - B.L. Theraja et al.

### **Practice of Automatic Control**

**Credits: 01**

*Prerequisite: None*

*Course description:* This course helps students reinforce their knowledge of Automatic control, shows students how to apply control theory to analyze plant or system, making mathematics model, build and control real automatic control system.

*Textbook:*

- 1) Practice of Automatic Control Lab manual, 2020
- 2) Devendra K. Chaturvedi, Modeling and Simulation of Systems Using MATLAB and Simulink, Taylor Francis , 2010
- 3) Benjamin C. Kuto, Automatic Control Systems, New York, 2010

### **Practice of Microprocessors**

**Credits: 02**

*Prerequisite: None*

*Course description:* This course provides students with basic knowledge of digital system, elements of digital system, design methods and programming, shows the students how to apply digital system in solving control problems, configure peripheral devices such as: I/O port, ADC, Timer, PWM, UART.

*Textbook:*



- 1) Practice of Digital Techniques and Microcontroller Lab manual, 2020
- 2) Ronald J Tocci, Neal S. Widmer, Digital Systems: Principles and Applications, 11th edition
- 3) Myke Predko, Programming and Customizing the PIC Microcontroller, 3rd Ed, Mc Graw Hill, 2008.

### **Practice of Industrial Robots and Sensors**

**Credits: 01**

*Prerequisite: none*

*Course description:* This course helps students reinforce their knowledge of robotic: robot mechanisms, dynamics, and intelligent controls. Topics include planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-rigid-body dynamics, 3D graphic simulation; control design, actuators, and sensors, robot control and robot programming.

*Textbook:*

- 1) Practice of Industrial Robots Lab manual, 2020
- 2) Saeed B. Niku, Introduction to Robotics: Analysis, Systems, Applications, Wiley; 3th edition (September 22, 2011)

### **Practice of Servo Drive Systems**

**Credits: 01**

*Prerequisite: none*

*Course description:* This course equips students with skills in control industrial servo systems, shows students how to apply control theory, electric drive and power electronic, equipment in servo control systems.

*Textbook:*

- 1) Practice of Servo Systems Lab manual, 2020
- 2) Jeffrey Travis, Jim Kring, "LabView for Everyone", Third Edition, Prentice Hall, 2006

### **Industry Internship**

**Credits: 04**

*Prerequisite: None*

*Course description:* The course helps students to strengthen and improve knowledge has equipped in learning time at university. Initially apply specialized knowledge to solve real problems in practice content. Practicing the skills of an engineer, building styles and working methods of mechatronic engineers in professional activities. Train the ability, analysis, synthesis, proposals and solve problems with the soft skills.

*Textbook:*

- 1) Student internship manual 2020

### **Graduation Thesis**

**Credits: 07**

*Prerequisites:* Projects on Theory of Machine and Machine Design, Project of Mechatronic

System, Project of Control and Drive

*Course Description:* The dissertation consists mainly of an industrial or research-based project carried out under the supervision of one or more faculty members. It introduces students to the basic methodology of research in the context of a research topic of current interest.

*Textbook:*

1) Graduation Project Manual, 2020.