MINISTRY OF EDUCATION & TRAINING

**HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION**

 **UNDERGRADUATE PROGRAM**

***Major of***

**AUTOMATION AND CONTROL ENGINEERING TECHNOLOGY**

**MAY 2017**

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| THE MINISTRY OF EDUCATION & TRAINING**HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION** | SOCIALIST REPUBLIC OF VIETNAMIndependence – Liberty - Happiness |

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**UNDERGRADUATE PROGRAM**

**Education Program:** Automation and Control Engineering Technology

 **Level:** Undergraduate

**Major**: Automation and Control Engineering Technology

 **Type of Program**: Full time

(Decision No……date….on………)

**1. Duration of Study:** 4 years

**2. Student Enrollment:** High-school Graduates

**3. Grading System, Curriculum and Graduation Requirements**

**Grading System:** 10

**Curriculum:** Based on regulations of Decision No 43/2007/BGDDT

**Graduation Requirements:**

*General condition***:** Based on regulations of Decision No 43/2007/BGDDT

*Condition of specialty***:** None

**4. The objectives and Expected Learning Outcomes**

**Goals**

Training human resources, improving intellectual standards of the people, fostering talents; researching science and technology for new knowledge and product creation to meet the requirements of development of economics and society, to ensure national defense, security and international integration.

Training learners have political quality, morality, knowledge, professional practice skills, research capacity, development of scientific applications and technologies that are commensurate with the level of training. They have a healthy body, creative capability and professional responsibility, adaptability to the work environment; spirit of serving the people.

Training Engineers of Automation and Control Engineering Technology (ACET) major have basic scientific knowledge, fundamental knowledge, specialized knowledge of automation and control major, analysis capability, solve problem skills and solutions assessment, ability contribution, design, operation of automation and control systems, communication skills and work in a team, professional attitudes, meet the development requirements of major and society. After graduation, the graduates are able to work in companies, factories, industrial manufactories or operation of automatic control systems and ACET education organizations.

**Objectives**

PO1: Form a stable foundation of general knowledge, foundation and core knowledge and specialized/ major knowledge of Automation and Control Engineering Technology.

PO2: Use proficiently self-studying skills major, problem solving skills and professional skills in the major of Automation and Control Engineering Technology.

PO3: Communicate effectively, organize, lead and conduct teamwork.

PO4: Apply well competences of brainstorming, designing, deploying, and operating the Automation Control System, Robotic systems, PLC System, Electric Drive, to improvement or creation of electrical and electronic products.

PO5: Be able to grasp society’s needs, carry out social responsibilities, respect work ethics and be aware of life-long learning

**Program outcomes**

1. **General knowledge, fundamental and specialized knowledge of Automation and Control** **major:**

ELO 1. Apply fundamental knowledge of mathematics, natural science and social science; achieve more specialized knowledge and study further at higher levels.

ELO 2. Construct the basis of core technological knowledge about Automation and Control.

ELO 3. Create the combination of advanced specialized knowledge in the fields Automation and Control systems.

1. **Specialized and professional skills in electrical and electronics major:**

ELO 4. Analyze and argue for technical matters; brainstorm systematically, and solve automatic control system matters.

ELO 5. Examine and experiment electrical and electronic matters.

ELO 6. Implement proficiently professional skills in the electrical and electronics field.

1. **Communication skills and ability to work in multidiscipline areas:**

ELO 7. Work independently; lead and work in a team.

ELO 8. Communicate effectively in various methods: written communication, electronics communication, graphics and presentation.

ELO 9. Use English in communication.

ELO 10. Realize the roles and responsibility of engineers and social circumstance which has impacts on the technical activities of electrical and electronic industry.

ELO 11. Comprehend business culture, work ethics principles, and working style of industrial organizations.

ELO 12. Be aware of life-long learning.

1. **Skills to take shape of ideas, design, deploying and operate industrial electrical system**

ELO 13. Take shapes of ideas, set up requirements, determine functions and elements of the Automatic Control System, Robotics, Electric Machines, and Automatic Electric Drive.

ELO 14. Design required elements of the Automatic Control System, Robotics, Electric Machines, and Automatic Electric Drive.

ELO 15. Deploy hardware and software for elements of small Automatic Control System and/or Robotics integrated to the manufacturing process.

ELO 16. Operate Automatic Control System in factories and manage the operation of Automatic Control Systems.

**5. Blocks of knowledge in the whole program:130** credits (without Physical Education, Military Education, and Supplementary Courses)

**6. Allocation of credits**

|  |  |
| --- | --- |
| **Groups of Courses** | **Credits** |
| **Total** | **Compulsion** | **Elective** |
| Foundation science courses | **43** | **39** | **4** |
| Political Education + General Laws | 12 | 12 | 0 |
| Social Science | 4 | 0 | 4 |
| Mathematics and Natural Sciences | 21 | 21 | 0 |
| Informatics | 3 | 3 | 0 |
| Introduction to Automation and Control Engineering Technology | 3 | 3 | 0 |
| **Automation and Control Engineering Courses** | **77** |  |  |
| Fundamental courses | 35 | 35 | 0 |
| Advanced courses | 23 | 17 | 6 |
| Practice and laboratory | 17 | 17 | 0 |
| Industry Internship | 2 | 2 | 0 |
| **Graduation Thesis** | **10** | **10** | **0** |
| Proposal | 3 | 3 | 0 |
| Capstone project | 7 | 7 | 0 |

**7. Program content**

**A – Compulsory courses**

***7.1. Foundation science courses:* 43 credits**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Course’s ID** | **Course name** | **Credits** | **Note** |
|  |  | **Political Education and General Laws** | **12** |  |
|  | LLCT150105E | Principles of Marxist-Leninism | 5 |  |
|  | LLCT120314E | Ho Chi Minh’s Ideology | 2 |  |
|  | LLCT230214E | Vietnamese Communist Party Policy of Revolution | 3 |  |
|  | GELA220405E | General Laws | 2 |  |
|  |  | **Introduction to Automation and Control Engineering Technology** | **3** |  |
|  | IACT130046E | Introduction to Automation and Control Engineering Technology | 2+1 | 1 Practice |
|  |  | **Informatics** | **3** |  |
|  | CPGRL130064E | C programming language | 3 |  |
| **V.** |  | **Mathematics and Natural Sciences**  | **21** |  |
|  | MATH141601E | Calculus I | 4 |  |
|  | MATH141701E | Calculus II | 4 |
|  | MATH141801E | Calculus III | 4 |
|  | PHYS130402E | Principles of Physics 1 | 3+1 | 1 lab |
|  | AMEE331944E | Applied Mathematics for Electrical and Electronics Engineering | 3 |  |
|  | MATH122101E | Probability and Application | 2 |  |
| **VI.** |  | **Social Science** | **4** |  |
|  | GEEC220105E | General Economics | 2 |  |
|  |  | Creativity Methodologies | 2 |  |
|  | PLSK320605E | Planning Skill | 2 |  |
|  | INMA220305E | Introduction to Management | 2 |  |
|  | INSO321005E | Introduction to Sociology | 2 |  |
|  | IQMA220205E | Introduction to Quality Management | 2 |  |
|  | INLO220405E | Introduction to Logics | 2 |  |
|  | PRSK320705E | Presentation Skills | 2 |  |
|  | SYTH220505E | Systems Thinking | 2 |  |
|  | ULTE121105E | University Learning Methods | 2 |  |
|  | IVNC320905E | Vietnamese Culture |  2 |  |
|  | TDTS320805E | Writing Scientific and Technical Documents | 2 |  |
| **VII.** |  | **Supplementary Courses** | **26** |  |
| 7.1 | EHQT130137E | Academic English 1 | 3 |  |
| 7.2 | EHQT230237E | Academic English 2 | 3 |  |
| 7.3 | EHQT330337E | Academic English 3 | 3 |  |
| 7.4 | EHQT430437E | Academic English 4 | 3 |  |
| 7.5 | EHQT530537E | Academic English 5 | 3 |  |
| 7.6 | TEEN120146E | Technical English 1 | 2 |  |
| 7.7 | TEEN230246E | Technical English 2 | 3 |  |
| 7.8 | TEEN330346E | Technical English 3 | 3 |  |
| 7.9 | TEEN430446E | Technical English 4 | 3 |  |
| **VIII.** |  | **Physical Education** | **3** |  |
| 8.1 | PHED110513E | 1. Physical Education 1 | 1 |  |
| 8.2 | PHED110613E | 2. Physical Education 2 | 1 |  |
| 8.3 | PHED130715E | 3. Physical Education 3 (compulsory) | 1 |  |
| **IX.** |  | **National Defense Education** | **165** credit hours |  |

**7*.*2.Automation and Control Engineering Courses**

**7.2.1. Fundamental courses: 35 credits**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Course’s ID** | **Course name** | **Credits** | **Note** |
| **I** |  | **EEE related courses** | **20** |  |
|  | ELCI140144E | Electrical Circuits | 4 |  |
|  | BAEL340662E | Basic Electronics | 4 |  |
|  | DIGI330163E | Digital Systems | 3 |  |
|  | POEL330262E | Power Electronics | 3 |  |
|  | ACSY330346E | Automatic Control Systems | 3 |  |
|  | MICR330363E | Microprocessor | 3 |  |
| **II** |  | **Basic Automation and Control courses** | **15** |  |
|  | ELMA240344E | Electric Machines | 4 |  |
|  | ELDR330545E | Automatic Electric Drive | 3 |  |
|  | IDIN330546E | Industrial Instrumentations | 2 |  |
|  | CADA430546E | CAD for Automation and Control Engineering | 3 |  |
|  | SCDA 430946E | SCADA Systems | 3 |  |

**7.2.2.a Advanced courses: 23 (theory courses)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Course’s ID** | **Course name** | **Credits** | **Note** |
| **I** |  | **Compulsory** | **17** |  |
|  | PLCS 330846E | Programmable Logic Controller | 3 |  |
|  | ROBO 330446E | Robotics | 3 |  |
|  | ICNW 431046E | Industrial Communication Networks | 3 |  |
|  | AACS 421246E | Advanced Automatic Control Systems | 3 |  |
|  | EEPN 320746E | Electrical Equipment and Pneumatic | 2 |  |
|  | PRMP410946E | Project on Micro Processor | 1 |  |
|  | PRAR411046E | Project on Automation and Robotics | 1 |  |
|  | PPLC311146E | Project on Programmable Logic Controller | 1 |  |
| **II** |  | **Elective** | **6** |  |
|  | ***Automatic Control***  | ***6*** |  |
|  | INCO 331546E | Intelligent Control | 3 |  |
|  | IMPR 432446E | Image Processing in Industrial | 3 |  |
|  | EMSY437764E | Embedded Systems | 3 |  |
|  | MACC332546E | Measure and Control Using Computer | 3 |  |
|  | MASC 330146E | Modeling and Simulation using Computer | 3 |  |
|  | ***Automation***  | ***6*** |  |
|  | PRCO 431846E | Process Control | 3 |  |
|  | FMCI 431746E | FMS and CIM | 3 |  |
|  | ACAD431546E | Advanced CAD for Automation and Control Engineering | 3 |  |
|  | AICN 431546E | Advanced Industrial Communication Networks | 3 |  |
| 10. | ELPS330345E | Power Supply System | 3 |  |
|  |  | ***Others courses***  |  |  |

**7.2.2.b. Advanced courses: 17 (courses in workshop, industrial internship)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Course’s ID** | **Course name** | **Credits** | **Note** |
|  |  | **Practice and experiment** | **17** |  |
|  | ELPR320762E | Electronics in Practice | 2 |  |
|  | ELPR210644E | Electricity in Practice | 1 |  |
|  | PMEM320845E | Electrical Equipment and Pneumatic in Practice | 2 |   |
|  | PRDI320263E | Digital Systems in Practice | 2 |   |
|  | PRMI 320463E | Microprocessor in Practice | 2 |  |
|  | PREM211244E | Electric Machine in Practice | 1 |   |
|  | POEP320262E | Power Electronics in Practice | 2 |  |
|  | PPLC321346E | Programmable Logic Controller in Practice | 2 |  |
|  | PROB 311446E | Robotics in Practice | 1 |  |
|  | PACS 320246E | Automatic Control System in Practice | 2 |  |
|  |  | **Internship** | **2** |  |
|  | ININ422746E | Industry Internship | 2 |  |

**7.2.3. Graduation Thesis (*or graduation examination):* 10**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Course’s ID** | **Course name** | **Credits** | **Note** |
|  |  | **Graduation Thesis** | **10** |  |
| 1. | THPR402746E | Thesis Proposal | 3 |  |
| 2. | FIPR 402846E | Graduation Thesis | 7 |  |

**8. Curriculum Distribution** (*Expectation, and only main semesters: 1, 2, …, 8)*

**Semester 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | IACT130046E | Introduction to Automation and Control Engineering Technology | 2+1 |  |
|  | MATH141601E | Calculus I | 4 |  |
|  | CPGR130064E | C Programming Language  | 2+1 |  |
|  | MATH122101E | Probability and Application | 2 |  |
|  | PHED110513E | Physical Education 1 | 0 |  |
|  | GDQP008031E | Military Education  | 0 |  |
|  | LLCT150105E | Principles of Marxism-Leninism | 5 |  |
|  | EHQT130137E | Academic English 1 | 3 |  |
|  | EHQT230237E | Academic English 2 | 3 |  |
|  |  | **Total** | **23** |  |

**Semester 2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | MATH141701E | Calculus II | 4 |  |
|  | AMEE331944E | Applied Mathematical in Electrical Engineering | 3 |  |
|  | PHYS130402E | Principles of Physics 1 | 3 |  |
|  | PHED110613E | Physical Education 2 | 0 |  |
|  | ELCI140144E | Electrical Circuits | 4 |  |
|  | LLCT120314E | Ho Chi Minh’s Ideology | 2 |  |
|  | TEEN120146E | Technical English 1 | 2 |  |
|  | EHQT330337E | Academic English 3 | 3 |  |
|  |  | **Total** | **21** |  |

**Semester 3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | ACSY330346E | Automatic Control Systems | 3 |  |
|  | MATH141801E | Calculus III | 4 |  |
|  | LLCT230214E | Vietnamese Communist Party Policy of Revolution | 3 |  |
|  | PHYS110602E | Principles of Physics - Laboratory 1 | 1 |  |
|  | BAEL340662E | Basic Electronics | 4 |  |
|  | DIGI330163E | Digital Systems | 3 |  |
|  | ELPR210644E | Electricity in Practice | 1 |  |
|  | PHED130715E | Physical Education 3 | 0 |  |
|  | TEEN230246E | Technical English 2 | 3 |  |
|  |  | **Total** | **22** |  |

**Semester 4**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | POEL330262E | Power Electronics | 3 |  |
|  | MICR330363E | Microprocessor | 3 |  |
|  | ELMA240344E | Electrical Machines | 4 |  |
|  | INSE330546E | Instrumentation and Sensors | 2 |  |
|  | PACS 320246E | Automatic Control System in Practice | 2 |  |
|  | ELPR320762E | Electronics in Practice | 2 |  |
|  | PRDI320263E | Digital Systems in Practice | 2 |  |
|  | EHQT430437E | Academic English 4 | 3 |  |
|  |  | **Total** | **21** |  |

**Semester 5**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | PLCS330846E | Programmable Logic Controller | 3 |  |
|  | ROBO330446E | Robotics | 3 |  |
|  | ELDR320545E | Automatic Electric Drive | 3 |  |
|  | ICNW 431046E | Industrial Communication Networks | 3 |  |
|  | PRMI 320463E | Microprocessor in Practice | 2 |  |
|  | PREM211244E | Electric Machine in Practice | 1 |  |
|  | POEP320262E | Power Electronics in Practice | 2 |  |
|  | PRMP410946E | Project on Micro Processor | 1 |  |
|  | TEEN330346E | Technical English 3 | 3 |  |
|  |  | **Total** | **21** |  |

**Semester 6**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | CADA430546E | CAD for Automation and Control Engineering | 3 |  |
|  | EEPN 320746E | Electrical Equipment and Pneumatic | 2 |  |
|  | PROB 311446E | Robotics in Practice | 1 |  |
|  | PPLC321346E | Programmable Logic Controller in Practice | 2 |  |
|  | GELA220405E | General Laws | 2 |  |
|  | PPLC311146E | Project on Programmable Logic Controller | 1 |  |
|  | EHQT530537E | Academic English 5 | 3 |  |
|  |  | **Choose 02 among the elective courses - management** | **4** |  |
|  | INMA220305E | Introduction to Management | 2 |  |
|  | INSO321005E | Introduction to Sociology | 2 |  |
|  | IQMA220205E | Introduction to Quality Management | 2 |  |
|  | GEEC220105E | General Economics | 2 |  |
|  |  | Creativity Methodologies | 2 |  |
|  | PLSK320605E | Planning Skill | 2 |  |
|  | INLO220405E | Introduction to Logics | 2 |  |
|  | IVNC320905E | Vietnamese culture | 2 |  |
|  | PRSK320705E | Presentation skills | 2 |  |
|  | SYTH220505E | Systems Thinking | 2 |  |
|  | TDTS320805E | Writing Scientific and Technical Documents | 2 |  |
|  | ULTE121105E | University learning methods | 2 |  |
|  |  | **Total** | **18** |  |

**Semester 7**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | AACS 421246E | Advanced Automatic Control Systems | 3 |  |
|  | SCDA 430946E | SCADA Systems | 3 |  |
|  | PMEM320846E | Electrical Equipment and Pneumatic in Practice | 2 |  |
|  | TEEN430446E | Technical English 4 | 3 |  |
|  | PRAR411046E | Project on Automation and Robotics | 1 |  |
|  | THPR402746E | Thesis Proposal | 3 |  |
|  |  | **Choose 02 among the courses** | **6** |  |
|  | ***Automatic Control*** |  |  |
|  | INCO 331546E | Intelligent Control | 3 |  |
|  | IMPR 432446E | Image Processing in Industrial | 3 |  |
|  | EMSY437764E | Embedded Systems | 3 |  |
|  | MACC332546E | Measure and Control Using Computer | 3 |  |
|  | MASC330146E | Modeling and Simulation using Computer | 3 |  |
|  | ***Automation*** |  |  |
|  | PRCO 431846E | Process Control | 3 |  |
|  | FMCI 431746E | FMS and CIM | 3 |  |
|  | ACAD431546E | Advanced CAD for Automation and Control Engineering | 3 |  |
|  | AICN 431546E | Advanced Industrial Communication Networks | 3 |  |
|  | ELPS330345E | Power Supply System | 3 |  |
|  |  | **Total** | **21** |  |

**Semester 8**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Code** | **Course name** | **Credits** | **Prerequisite** **(if any)** |
|  | ININ422746E | Industrial Internship | 2 |  |
|  | FIPR 402846E | Graduation Thesis | 7 |  |
|  |  | **Total** | **9** |  |

1. **Brief description of course contents**
2. **Introduction to Automation and Control Engineering Technology Credits: 3**

*Distribution of learning time:* ***2/1/6***

*Prerequisites: None*

*Course Description:* This course provides to the learner with knowledge of expected learning outcomes for Automation and Control Engineering Technology, framework program and education program of Automation and Control Engineering Technology, roles, positions and missions of engineer in Automation and Control Engineering Technology and training fields and technology have been and will be applied Automation and Control Engineering Technology.

*Textbooks:*

1. Horowitz and Hill, Art of Electronics, third Edition, Cambridge University Press, 2015.

*Reference books:*

1. Luis Moura and IzzatDarwazeh, Introduction to Linear Circuit Analysis and Modelling: From DC to RF Newnes, 2005
2. David Money Harris, Sarah L. Harris, Digital design and computer architecture, Morgan Kaufmann Publishers, 2007.
3. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fourth Edition, Morgan Kaufmann, 2008.
4. Neil Storey, Electronics: A Systems Approach (4th edition), Prentice Hall, 2009.
5. **Calculus I Credits: 3**

*Distribution of learning time:* ***3 (*3/0/6)**

*Prerequisites: None*

*Former subjects of condition: None*

*Course Description*: This course helps students review the general and advanced mathematical knowledge: Cardinality of a set: rational numbers, real numbers, complex numbers. Limit: function, limit of a function, continuous function. Differential calculus: derivative, differential, Taylor-Maclaurin expansion, the survey on function, curve in polar coordinates. Calculus of single variable: volume fraction uncertainty, definite integrals, generalized integrals. Chain: Chain number, string functions, power series, Taylor-Maclaurin sequence, Fourier series, Fourier expansion, trigonometric series.

*Textbook*:

*1*. K. Smith, M. Strauss and M. Toda, Calculus6th National Edition–Kendall Hunt.

1. **Introduction to C programming language Credits: 3**

*Distribution of learning time:* ***3 (*2/1/6)**

*Prerequisites: None*

*Former subjects of condition:* 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 lastly, practice in these through creating several programs in C.

*Textbook:*

1. Paul Deitel and Harvey Deitel, *C: How to Program,* 7th Edition, Pearson, 2012
2. **Probability with applications Credits: 2**

*Distribution of learning time:* ***2 (*2/0/4)**

*Prerequisites: None*

*Former subjects of condition:* None

*Course Description*:

This course will expose students to the basic concepts of probability and applied statistics. This course will relate this material to real-world examples from current events and other fields may be brought in as well. Upon successfully completing the course students will be familiar with the fundamentals of probability and statistics, including unpredictable events, probability and its formula, random variables, discrete and continuous distributions, sample theory, hypothesis testing, recurrence, and linear correlation.

*Textbook:*

1. Robert P. Dobrow. Probability: With Applications and R, Willey, 2013.

1. **Calculus II Credit: 3**

*Distribution of learning time:* ***3 (*3/0/6)**

*Prerequisites: None*

*Former subjects of condition:* **Calculus I**

*Course Description*: This course provides the learnerwith contents: Matrix-determinant: the matrix, the form of matrix, inverse matrix, determinants, matrix classes. System of Linear Equations: linear systems, Cramer rule, Gauss method, homogeneous system. Space Vector: Space Vector, subspace, linear independence, linear dependence, basis, dimension, Euclidean space. Diagonal matrix-quadratic form: eigenvalues, eigenvectors, private space, diagonal matrix, quadratic form, canonical form, the surface level 2. Differential calculus of function of several variables: function of several variables, derivative, differential, extreme of function of several variables, calculus applications in geometry in space.

*Textbook*:

*1*. K. Smith, M. Strauss and M. Toda, ***Calculus*** 6th National Edition–Kendall Hunt.

1. **Mathematical Statistics for Engineers**

*Distribution of learning time:* ***3 (*3/0/6)**

*Prerequisites: None*

*Former subjects of condition:* **Calculus I**

*Course Description*:

This module consists of descriptive statistics, fundamental probability, random variables and probability distribution laws, characteristics of random variables, parameter estimation, hypothesis testing, regression and analysis of variance.

*Textbook:*

1. Probability and Statistics for Engineering and Science by Devore, 8th Edition (published by Cengage Learning), 8th edition with Enhanced Web Assign, regular edition ISBN 1111655499
2. **Principles of Physics 1 Credit: 3**

*Distribution of learning time:* ***3(*2/1/4)**

*Prerequisites: None*

*Former subjects of condition: None*

*Course Description:* This course provides the learner with contents: the mechanics: point dynamics, the law of conservation, solid motion. Thermodynamics: kinetic molecular theory, principles of Thermodynamics I, principles of Thermodynamics II. Electricity and magnetism: electric field, magnetic, variability of electrical magnetic field.

*Textbooks:*

1. R.A. Serway & J.W. Jewett; *Physics for Scientists and Engineers with Modern Physics*, 9th Edition; ISBN for bundle 9781285143811
2. Hallyday, R. Resnick, J. Walker, **Fundamentals of Physics**, John Willey & Sons,1999.
3. **Electrical Circuits Credit: 4**

*Distribution of learning time:* 4/0/8

*Prerequisites: None*

*Former subjects of condition: Advanced Mathematics & General Physics*

*Course Description:* This course provides the learnerwith 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, draw the frequency characteristics of the transfer function.

*Textbook:*

1. Introduction to Electrical Circuits, R. Dorf and J Svoboda, 8th Edition
2. **Electronic and Electrical Materials Credit: 2**

*Distribution of learning time: 2*/0/4

*Prerequisites:* None

*Former subjects of condition:*Chemistry, Physics and Mathematics Foundation executive

*Course Description:* This course equips students to structure the content, technology type manufacturing electrical materials, electronic materials feature electrical com in the electricity sector, electronic; The nature electrical, mechanical, chemical, electronics of material: conductive, insulating, superconductors, semiconductors, power flow control.

*Textbooks:*

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

*Other supplemental materials:*

1. W. D. Callister. Materials, Science and Engineering. Willey, 2000.
2. W.F. Smith and J. Hashemi. Foundations of Materials Science and Engineering.3rd ed. McGraw-Hill, 2003.
3. M. Ohring. Engineering Materials Science. Academic Press2, 2001.
4. J.L.Shackelford. Introduction to Materials Science and Engineering. Prentice Hall, 2003.
5. D.V. Morgan and K. Board. An Introduction to Semiconductor Micro technology. 2002.
6. **Calculus III Credit: 3**

*Distribution of learning time:* ***3 (*3/0/6)**

*Prerequisites: None*

*Former subjects of condition:* **Calculus II**

*Course Description*: This course provides the learner with contents: multiple integral: double integral, application for calculated area of flat domain, calculate the surface area, object volume, triple integrals, and applications for the object volume. Line integral: lineintegral type one and applications,line integral type one and applications, Green formula, condition of line integral does not depend on integrating line. Surface integral: Integral surface type one, type two, the Ostrogratskiformula, vector field, flux and divergence, vector format of Ostrogratski formula, Stokes formula, circulation and vortex vector, vector format of Stokes formula.

*Textbook*:

*1*. K. Smith, M. Strauss and M. Toda, ***Calculus*** 6th National Edition–Kendall Hunt.

1. **Basic Electronics Credit: 4**

*Distribution of learning time:* 4/0/8

*Prerequisites: Advanced Mathematics 3 & General Physics*

*Former subjects of condition:* Electrical Circuits& General Physics

*Course Description:* This course provides the learner with knowledge of electronic components, present the structure and principles of operation of the electronic components, analyze, and explain the principle of operation of simple electronic circuits. Analyze the frequency response of the amplifier circuit, analyze and design the audio power amplifier circuits, distinguish the type of feedback, analyze and design application circuits used op\_amp, analyze the principle of operation of the oscillator circuits, analyze and design the simple DC sources provide electronic circuits.

*Textbooks:*

1. Thomas L.Floyd - Electronic Devices – Prentice Hall, 2012.
2. Albert Malvino - Electronic Principle- Mc Graw Hill, 2015
3. **Electricity in practice Credit: 1**

*Distribution of learning time: 0*/1/0.6

*Prerequisites:*electrical safety, electrical circuit

*Former subjects of condition:* electrical circuit, electrical and electronic materials, basic electronics, electrical measurement, and instrument in practice, electrical safety.

*Course Description:* learners perform contents in basic electrical installation technology, calculation method for constructing and installing; quality inspection, electrical machine installation technology and operating common electrical machines.

*Textbook*:

1. Herbert W. Jackson, Dale Temple, and Brian E. Kelly, Introduction to Electric Circuits Lab Manual, 9th Edition, ISBN: 9780195438147
2. **Digital Systems Credit: 3**

*Distribution of learning time:* 3/0/6

*Prerequisites:* Basic Electronics

*Former subjects of condition:* Electrical Circuits & General Physics

*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, sequential circuit, of the basics of digital integrated circuits TTL and CMOS, characteristic parameters of digital integrated circuits, classify integrated circuits, the principle of changing between analog and digital signals, operational structure and application of the memory, the principles of the digital oscillator circuit.

*Textbooks:*

1. Ronald J. Tocci, Neal S. Widmer, *Digital Systems*: Principles and Applications, 12th Ed. Prentice Hall, 2015
2. Anil K. Maini, *Digital Electronics*, John Wily & Sons, 2007
3. **Automatic Control Systems Credit: 3**

*Distribution of learning time:* 3/0/6

*Prerequisites:* None

*Former subjects of condition:* Electrical Circuits, Electrical Measurement and Instruments, Complex Functions and Laplace Transforms, Basic Electronics

*Course Description:* This course provides the learner with knowledge of the components of an automatic control system, the method of building mathematical models of the automatic control system including: 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 quality of control system: accuracy, time domain, frequency domain and the design methods of automatic control system so that the stable system and achieve quality targets.

*Textbooks:*

1. Norman S. Nise, *Control Systems Engineering*, Sixth Edition, John Wiley & Sons, Inc.
2. Farid Golnaraghi And Benjamin C. Kuo, *Automatic Control Systems*, Ninth Edition, John Wiley & Sons, Inc.
3. **Electrical Machines Credit: 4**

*Distribution of learning time: 4*/0/8

*Prerequisites:* Electrical Circuits

*Former subjects of condition:*Advanced Mathematics 3, General Physics, Electronic and Electrical Materials, Electrical Circuits, Electrical Measurement and Instruments.

*Course Description:* This course provides the learner with knowledge of basic structure,working principle, meaning of the electromagnetic relations of DC machine, transformers, asynchronous machines, synchronous machines, special machines and electrical instruments. 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, control modes of electrical machines and electrical instruments.

*Textbooks:*

1. P. C. Sen, Principles of Electrical Machinery and Power Electronics, John Wiley & Sons, Inc. 2nd edition, Inc., 1997 (Required)

*Reference books:*

1. Kelemen, J. A., 2003. ECE 3300 Laboratory Manual, 2nd ed., WMU IEEE Student Branch. (Required)
2. Fitzgerald, Kingsley and Umans, Electrical Machinery, 6th ed., McGraw-Hill, New York, 2003. (Reference)
3. Alternating Current Machines, 5th ed., Halstead Press, John Wiley & Sons, Inc., 1983. (Reference)
4. **Instrumentation and Sensors Credit: 3**

*Distribution of learning time:* 3/0/6

*Prerequisites:* Electrical Circuits

*Former subjects of condition:*Electrical Circuits, Basic Electronics

*Course Description:* This course provides the learner with knowledge of concept of measurement, electrical measurement and sensors. The learners known about measurement of electrical quantities structure, the method of measuring the electrical quantities such as current, voltage, resistance, capacitance, inductance, frequency, phase angle, power, analyse and estimate measurement errors, and understand the principles and operation of the electrical measurement system, the measure instrumentations as well as the principle of the sensors and its applications in industry.

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*Textbook:*

1. PrithwirajPurkait, Budhaditya Biswas, Santanu Das, ChiranjibKoley, *Electrical and Electronics Measurements and Instrumentation, McGraw* - Hill, 2013.
2. C. Loughlin, *Sensors For Industrial Inspection*, Springer
3. **Power Supply System Credit: 3**

*Distribution of learning time: 3*/0/6

*Prerequisites:* None

*Former subjects of condition:*Circuits, electric-electronic instruments; Electronic measurement and instrumentation; electrical safety.

*Course Description:* This course equips learner’s contents of the method for determining the load calculation, calculate voltage loss, power loss, and short circuit calculations, select the number and transformer capacity, 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. Electric Power Transmission and Distribution, [S. Sivanagaraju](https://www.google.com.vn/search?tbo=p&tbm=bks&q=inauthor:%22S.+Sivanagaraju%22), 2008.

*Reference books:*

1. Electric Power Distribution Engineering, Third Edition, Turan Gonen, 2008.
2. Electrical Distribution Engineering; Anthony J. Pansini, 2006.
3. Electric Power Distribution Equipment and Systems; T. A. Short, 2004.
4. Electric Power Substations Engineering; John D. McDonald, 2012.
5. Power System Operation, 3rd Edition by [Robert Miller](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&text=Robert+Miller&search-alias=books&field-author=Robert+Miller&sort=relevancerank), [James Malinowski](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&text=James+Malinowski&search-alias=books&field-author=James+Malinowski&sort=relevancerank), 1994.
6. **Electronics in Practice Credit: 2**

*Distribution of learning time: 0*/2/4

*Prerequisites:* Basic electronics

*Former subjects of condition:* electrical circuit, electrical and electronic materials, basic electronics, and electricity in practice, electrical measurement and instrument in practice, electrical safety.

*Course Description:* in this course, learners perform contents in usage of instruments in electronics; to recognize the basic electronic components such as R, L, C, diode, BJT, FET, OP-AMP; verification of basic application circuits of the electronic components between theory and reality, from which analysis of circuit operation in practice; Applying the practical application circuits, analyzing of operation of basic electronic circuit in practice.

*Textbook:*

1. Harry Kybett and Earl Boysen, All New Electronics Self-Teaching Guide, Third Edition, Wiley Publishing, Inc. 2008
2. **Microprocessor Credit: 3**

*Distribution of learning time:* 3/0/6

*Prerequisites:* Digital System

*Former subjects of condition:*Digital System, Basic Electronics.

*Course Description:* This course provides the learnerwith knowledge of the role and functions of the processor, the processor system; historical development of processor generations, the basic parameters to assess the ability of the processor; the structure and role of the components in the block diagram of 8-bit microprocessors, principles of operation of 8-bit microprocessors; historical development of microcontrollers, advantages and disadvantages when using microcontrollers, internal and external structure of 8-bit microcontroller; function of peripheral devices: timer/counter, interrupts, data transfer of microcontroller, Assembly language, C language to program the microcontroller.

*Textbooks:*

1. Martin P. Bates, *PIC Microcontrollers, Third Edition: An Introduction to Microelectronics*, Newnes; 3 Edition, 2011.
2. Richard H. Barnett, Sarah Cox, Larry O'Cull, *Embedded C Programming and the Microchip PIC*, Delmar Publishers Inc, 1 edition, 2003.
3. **Power Electronics Credit: 3**

*Distribution of learning time:* 3/0/6

*Prerequisites:* None

*Former subjects of condition:* Electrical Circuits; Basic Electronics; Electric Machines, Electricity Instrument; Electrical Measurement and Instruments.

*Course Description:*This course provides the learnerwith knowledge of basic power electronic accessories, specialized. The structure, operating principles, waveform and parameters: the uncontrolled and controller rectifiercircuits; modified circuit, switching voltage AC, transform DC voltage, inverse and select the DC power supply.

*Textbook:*

1. N. Mohan, T. M. Undeland and W. P. Robbins, “Power Electronics: Converters, Application and Design,” John Wiley, 3rdEdition.
2. **Automatic Electric Drive Credit: 3**

*Distribution of learning time: 3*/0/6

*Prerequisites:* Advanced Mathematics, Computer Science Basic, Electric, Electric tools, basic electronics, power electronics

*Former subjects of condition:*Electric - Electric tools, power electronics

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

*Textbook:*

1. Electric drives, N. K. DW, P. K. SEN, 1999.
2. Fundamentals of electric drives, Mohamed E.L, Sharkawi, 2000.
3. Fundamentals of Electrical Drives-, Andre Veltman, Duco, W.J., Pulle-Rik-W, Springer-International-Publishing-2016.
4. **Electrical machine in practice Credit: 2**

*Distribution of learning time: 0*/2/4

*Prerequisites:*electrical machine

*Former subjects of condition:* electrical circuit, electrical and electronic materials, basic electronics, electricity in practice, electrical measurement and instrument in practice, electrical safety.

*Course Description:* learners perform contents in installation technology of basic electricity, calculation method for constructing and installing; quality inspection, repairing, installing technology of electrical machine; manufacturing technology of winding in details, assembling and operating common electrical machines.

*Textbooks:*

1. [D. P. Kothari](http://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=D.+P.+Kothari&search-alias=stripbooks), [B. S. Umr](http://www.amazon.in/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=B.+S.+Umre&search-alias=stripbooks)e, Laboratory Manual for Electrical Machines, I K International Publishing House Pvt. Ltd, 2014
2. D.K. Chaturvedi, Electrical Machines Lab Manual with MATLAB Programs, I K International Publishing House Pvt. Ltd, 2015
3. **Programmable Logic Controller Credit: 3**

*Distribution of learning time: 3*/0/6

*Prerequisites:* None

*Former subjects of condition:*Introduction to Computer, Digital, automatic control systems, Electric-electronic instruments, automatic control system, automatic Drive Technologies

*Course Description:* This course equips learner’s contents of 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 controllers PLC, functional and operational principles of PLC and application scripts.

*Textbooks:*

1. L. A. Bryan and E. A. Bryan, Programmable *Controllers: Theory and implementation*, Second Edition, An Industrial Text Company Publication Atlanta, Georgia, USA.
2. Hugh Jack, *Automation Manufacturing Systems with PLCs*, April 14 2005.
3. **Digital Systems in Practice Credit: 2**

*Distribution of learning time: 0*/2/4

*Prerequisites: None*.

*Former subjects of condition:* Electricity in practice and Electronics in practice.

*Course Description:* This course instructs students to practice 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. Ronald J. Tocci, Neal S. Widmer, *Digital Systems*: Principles and Applications, 12th Ed. Prentice Hall, 2015
2. Anil K. Maini, *Digital Electronics*, John Wily & Sons, 2007
3. **Power electronics in Practice Credit: 2**

*Distribution of learning time: 0*/2/1.3

*Prerequisites:*Basic Electronics, Electronic and Electrical Materials,

*Former subjects of condition:* Electrical Circuits, Electrical Circuits, Electrical Measurement in Practice, Electronics in Practice, Electrical Safety.

*Course Description:* This course provides learners knowledgeaboutinstallation of circuits, operatiion of circuits, waveforms of circuits, DC-DC converter, DC-AC converter, AC-DC converter, IGBT. The learners are able to regconise and to repair faults in power electronics system, and to design PWM circuits.

*Textbook:*

1. [O.P. Arora](http://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=O.P.+Arora&search-alias=stripbooks), Power Electronics Laboratory: Theory, Practice, and Organization, Alpha Science International Ltd, 2006
2. **Supervisory Control and Data Acquisition Credit: 3**

*Distribution of learning time: 3*/0/6

*Prerequisites:* None

*Former subjects of condition:* electrical circuit, electrical machine-instrument; electrical measurement and instrument; Programmable Logic Controller.

*Course Description:* The course content provides knowledge of: components of SCADA in automatic system; actuator system; input/output remote terminal units RTU or Programmale Logic Controllers, center monitor and control station; communication system; Human - Machine Interface HMI; hardware and software integrated method tobuild a SCADA system in practice.

*Textbooks:*

1. [Maurizio Di Paolo Emilio](https://www.amazon.com/Maurizio-Di-Paolo-Emilio/e/B00J6DKLVU/ref%3Ddp_byline_cont_book_1), *Data Acquisition Systems: From Fundamentals to Applied Design*, 2013th Edition, Springer.
2. [Robert Radvanovsky](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&text=Robert+Radvanovsky&search-alias=books&field-author=Robert+Radvanovsky&sort=relevancerank) and [Jacob Brodsky](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&text=Jacob+Brodsky&search-alias=books&field-author=Jacob+Brodsky&sort=relevancerank), *Handbook of SCADA/Control Systems Security,* 2nd Edition, CRC Press.
3. **Project on Programmable Logic Controller Credit: 1**

*Distribution of learning time: 1*/0/2

*Prerequisites:*  Programmable Logic Controller

*Former subjects of condition:*circuit, power-electronic instruments; Electronic measurement and instrumentation; power supplies, power systems, and Programmable Logic Controller.

*Course Description:* This course content for solving some practical problems in the field of automation including design, 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, volume.

*Textbooks:*

1. Curtis D. Johnson, *Process Control Instrumentation Technology*, Eighth Edition, Pearson New International Edition, 2014.
2. L. A. Bryan and E. A. Bryan, Programmable *Controllers: Theory and Implementation*, Second Edition, An Industrial Text Company Publication Atlanta, Georgia, USA.
3. Hugh Jack, *Automation Manufacturing Systems with PLCs*, April 14 2005.
4. **Microprocessor in Practice Credit: 2**

*Distribution of learning time: 0*/2/4

*Prerequisites: None*.

*Former subjects of condition:* Electricity in practice and Electronics in practice.

*Course Description:* students are instructed to practice programming for microcontroller. In particular, students will study how to write programs to interface LEDs, 7-segment LEDs, LCD, LED matrix, keyboard, real-time, data transfer, timing timer, counter, ADC temperature change, practical applications.

*Textbooks:*

1. Martin P. Bates, *PIC Microcontrollers, Third Edition: An Introduction to Microelectronics*, Newnes; 3 Edition, 2011.
2. Richard H. Barnett, Sarah Cox, Larry O'Cull, *Embedded C Programming and the Microchip PIC*, Delmar Publishers Inc, 1 edition, 2003.
3. **Programmable Logic Controller in Practice Credit: 2**

*Distribution of learning time: 0*/2/4

*Prerequisites:* Programmable Logic Controller

*Former subjects of condition:* Basic computer, DigitalSystem, AutomaticControlSystems, ProgrammableLogicController.

*Course Description:* This course provides learnerswide knowlegde about sensors conecting to controllers; the learners are able to design, choose programmable equiment and program for demanding industrial systems.

*Textbooks:*

# Andrzej M Pawla, *Sensors and Actuators in Mechatronics: Design and Applications*, CRC Press, Jul 28, 2006

# [Gary D. Anderson](https://www.amazon.com/Gary-D.-Anderson/e/B01B70WO00/ref%3Ddp_byline_cont_book_1), *PLC Programming Using RSLogix 500: Ladder Logic Diagnostics & Troubleshooting*, (Volume 3) Paperback – September 29, 2015.

1. **CAD for Automation and Control Engineering Credit: 3**

*Distribution of learning time: 3*/0/6

*Prerequisites:* None

*Former subjects of condition:* Circuits, Electrical Machines

*Course Description:* This course equips learner’s contents of the basic principles of design and simulation, CAD applications, the method of solving problems of specialized techniques in design as well as drawing Electrical Technical drawings, symbols and principles of drawing power.

*Textbooks:*

1. Eplan user guide, 2017.

2. Visio 2010.

1. **Project management Credit: 3**

*Distribution of learning time: 3*/0/6

*Prerequisites:* Advanced mathematics, basic informatics, general economics

*Former subjects of condition:*general economics, power supply system, power system.

*Course Description:* this course equips learners for contents intypes of project investment, project management, capitals for project, value of money over time, financial performance indicators of project; contents of pre-feasibility and feasibility projects; selection of iterms for project, specific and technical analysis of 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:*

# Project Management for the Unofficial Project Manager: A FranklinCovey Title Paperback, [Kory Kogon](https://www.amazon.com/Kory-Kogon/e/B00MRHTYDS/ref%3Ddp_byline_cont_book_1), [Suzette Blakemore](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&text=Suzette+Blakemore&search-alias=books&field-author=Suzette+Blakemore&sort=relevancerank), 2015.

1. **Automatic Control System in Practice Credit: 2**

*Learning time duration:* ***2 (0/2/4)***

*Prerequisite subjects:* None

*Previous subjects:* Automatic Control System, Microprocessor.

*Summary of the subject:*In this subject, learners perform the content of the survey and control some reality control system including temperature control, pressure control, flow control, control position and velocity, ... the knowledge of process control, the effect of the additional stage of the automatic control system, the method of communication in automation control system is also mentioned in the technical implementation this episode

1. **Embedded Systems Credit: 3**

*Learning time duration:* ***3 (3/0/6)***

*Prerequisite subjects:* None

*Previous subjects:* Microprocessor, Programmable Logic Controller.

*Summary of the subject:*This subject equips students knowledge of embedded systems architecture, principles of embedded operating systems, real-time operating system.

1. **Electrical Equipment and Pneumatic Credit: 3**

*Learning time duration:* ***3 (3/0/6)***

*Prerequisite subjects:* None

*Previous subjects:* Electrical Machines - electrical equipment.

*Summary of the subject:*This subject provides basic knowledge about the elements of electrical equipment, electronic, pneumatic, inverter. The control circuit terminals, control inverter, control of machine tools

1. **Measurement and control by computer Credit: 3**

*Learning time duration:* ***3 (3/0/6)***

*Prerequisite subjects:* None

*Previous subjects:* Microprocessor, Automatic Control System.

*Summary of the subject:*This subject aims to provide students with the basic knowledge about the structure, system, method of communication between computers with peripherals used in the field of measurement , monitoring and automatic control.

1. **FMS and CIM Credit: 3**

*Learning time duration:* ***3 (3/0/6)***

*Prerequisite subjects:* None

*Previous subjects:* Electrical Circuit, Electrical measurement and measurement equipment, Automatic transmission power, Programmable Logic Controller, Measurement and control by computer.

*Summary of the subject:*This subject provides basic knowledge about FMS and CIM in automation as automatic feeders, automatic processing, automatic assembly and automatic storage.

1. **Intelligent Control Credit: 3**

*Learning time duration:* ***3 (3/0/6)***

*Prerequisite subjects:* None

*Previous subjects:* Automatic Control System.

*Summary of the subject:*This subject provides the knowledge initial intelligent control system. First introduced on fuzzy logic synthesis and application of control systems. Next to the owner of the structure and neural network training algorithm with applications in the synthesis of automatic control systems. The last section is to introduce some control scheme combined with fuzzy logic trends, neural networks and genetic algorithms in intelligent control systems

1. **Image Processing In Industry Credit: 3**

*Learning time duration:* ***3 (3/0/6)***

*Prerequisite subjects:* None

*Previous subjects:* Modelling and computer simulations, Automatic Control System, Microprocessor, Robot Technology.

*Summary of the subject:*This subject provides basic knowledge about the system, software for industrial image processing and applications.

1. **Robotics in Practicing Credit: 1**

*Learning time duration:* ***1 (0/1/2)***

*Prerequisite subjects:* None

*Previous subjects:* Robot Technology.

*Summary of the subject:*In this subject, students perform the content of the survey and the type of suture joints in the robot, the robot sensors and robot programming

1. **Campus Infrastructure**

Follow the Ministry of Education and Training’s regulations.

1. **PROGRAM GUIDE**

- Credit hour is calculated as:

 1 credit = 15 lecture hours

 = 30 laboratory hours

= 45 hours of practice

 = 45 hours of self -study

 = 90 workshop hours.

 = 45 hours for project, thesis.

* Graduation thesis: conduct a research project to solve specific problems related to the major.

 **RECTOR DEAN OF FACULTY**