MINISTRY OF EDUCATION & TRAINING

HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

UNDERGRADUATE PROGRAM

Major of

MECHATRONIC ENGINEERING TECHNOLOGY

Ho Chi Minh City 2023

THE MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

SOCIALIST REPUBLIC OF VIETNAM
Independence – Liberty - Happiness

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UNDERGRADUATE PROGRAM

Education Program: MECHATRONIC ENGINEERING TECHNOLOGY

Level: Undergraduate

Major: **MECHATRONIC 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 regualtions of Decision No 43/2007/BGDDT

Graduation Requirements:

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

*Condition of speciality***:** None

4. The objectives and Expected Learning Outcomes

Goals

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

Training learner havepolitical 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 **Mechatronic Engineering Technology**major have basic scientific knowledge, fundamental knowledge, specialised knowledge of, mechanical, electricaland electronics major, analysis capability, solve problem skills andsolutions assessment, ability contribution, design, operation of mechanical systems, communication skillsandwork 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.

Objectives

PO1: Form a stable foundation of general knowledge, foundation and core knowledge and specialised/ major knowledge of **Mechatronic Engineering Technology**.

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

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

PO4: Apply well competences of brainstorming, designing, deploying, and operating the **Mechatronic systems**

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

Program outcomes

A. General knowledge, fundamental and specialised knowledge of electrical and electronics 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 **Mechatronic Engineering Technology**.

ELO 3. Create the combination of advanced specialized knowledge in the fields of **Mechatronic Engineering Technology**.

B. Specialised and professional skills in electrical and electronics major:

ELO 4. Analyze and argue for technical matters; brainstorm systematically, and solve mechanical matters.

ELO 5. Examine and experiment mechanical matters.

ELO 6. Implement proficiently professional skills in the mechanical field.

C. 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, mechanicaldrawing 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 industry.

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

ELO 12. Be aware of life-long learning.

D. Skills to take shape of ideas, design, deploying and operate system of Mechatronic Engineering Technology

ELO 13. Take shapes of ideas, set up requirements, determine functions and elements of the Mechanical System, Electrical and Electronic System, Programming for Industrial Systems, Renewable Energy, Mechatronic, and Automatic Control System.

ELO 14. Design required elements of the Mechanical System, Electrical and Electronic System, Programming for Industrial Systems, Renewable Energy, Mechatronic, and Automatic Control System.

5. Blocks of knowledge in the whole program: 150 credits (without Physical Education, Military Education)

6. Allocation of credits

Groups of Courses	Credits		
	Total	**Compulsory**	**Optional**
Foundation science courses	**63**	**59**	**4**
General Politics + Laws	13	13	
Social Sciences and Humanities	4		4
Mathematics and Natural Sciences	25	25	
Technical Computer Sciences	6	6	
Introduction to Engineering Technology	3	3	
Academic English	12	12	
Mechatronics Engineering Courses	**87**	**78**	**9**
Fundamental Mechatronics Engineering courses	29	29	
Advanced Mechatronics Engineering courses	32	23	9
Experiments and Practices	10	10	
Technical English	5	5	
Internship	4	4	
Graduation Thesis	**7**	**7**	
Total Credit	**150**		

7. CONTENTS OF THE PROGRAM

A. COMPULSORY COURSES

7.1 Foundation science courses (63 credits)

Number	Course's ID	Course Name	Credits	Notes
1	LLCT130105E	Philosophy of Marxism and Leninism	3	
2	LLCT120205E	Political economics of Marxism and Leninism	2	
3	LLCT120405E	Scientific socialism	2	
4	LLCT120314E	Ho Chi Minh's ideology	2	
5	LLCT220514E	History of Vietnamese communist party	2	
6	INME130129E	Introduction to Mechatronic Engineering	3	
7	GELA220405E	General Laws	2	
8	MATH132401E	CalculusI	3	
9	MATH132501E	Calculus II	3	
10	MATH132601E	Calculus III	3	
11	MATH132901E	Mathematical Statistics for Engineers	3	
12	AMME331529E	Applied Mathematics in Mechanical Engineering	3	
13	PHYS 130402E	Physics 1	3	
14	PHYS111202E	Physics - Laboratory 1	1	
15	PHYS131002E	Physics 2	3	
16	GCHE130603E	General Chemistry for Engineers	3	

17	APEN222329E	Applied Programming in Engineering	3(2+1)	
18	MEIF134529E	Information Technology for Engineers	3(2+1)	
19	PHED110513E	Physical Education 1	0	
20	PHED110613E	Physical Education 2	0	
21	PHED130715E	Physical Education 3	0	
22	GDQP008031E	Military Education	0	
23		General Knowledge Option Course 1	2	
24		General Knowledge Option Course 2	2	
Total *(excluding Physical Education and Military courses, supplementary courses)*			**51**	

7.2 Mechatronics Engineering Courses (87 Credits)

7.2.1 Fundamental Mechatronics Engineering courses

Number	Course's ID	Course Name	Credits	Notes
1	MEDR141123E	Mechanical Engineering Drawing (3+1)	4	
2	ENME130620E	Engineering Mechanics	3	
3	MEMA230720E	Strength of Materials	3	
4	MMCD230323E	Mechanical Design	3	
5	PRMD310529E	Project of Mechanical Design	1	
6	TOMT220225E	Tolerances And Measuring Technology	2	
7	SEAC225929E	Sensors and Actuators	2	
8	AUCO230329E	Automatic Control	3	
9	EEEN230129E	Electrical and Electronics Engineering	3	
10	MATE230430	Manufacturing Technology	3	
11	DITE226829E	Digital Techniques	2	
Total			**29**	

7.2.2.a Advanced Mechatronics Engineering courses *(Theory and Experiment Courses)*

Number	Course's ID	Course Name	Credits	Notes
1	PNHY230529E	Pneumatic & Hydraulic Technology	3	
2	MPAU220729E	Manufacturing Process Automation	2	
3	MICO236929E	Microprocessors	3	
4	SEMI325929E	Business Seminar	2	
5	SERV334029E	Drive servo systems	3	
6	ROBO331129E	Robotics	3	
7	PRMS415229E	Project of Mechatronic System	1	
8		Advanced Mechatronics Engineering courses 1	3	
9		Advanced Mechatronics Engineering courses 2	3	

10		Advanced Mechatronics Engineering courses 3	3	
11	MALE337029E	Machine Learning	3	
12	ARIN337629E	Artificial Intelligence	3(2+1)	
Total			**32**	

7.2.2.b Advanced Mechatronics Engineering courses *(Practice and Internship Courses)*

Number	Course's ID	Course Name	Credits	Notes
1	BMPR230527E	Basic Mechanical Practice	3	
2	PEEE210229E	Practice of Electronic Circuit Design	1	
3	PMPA326629E	Practice of Manufacturing Process Automation	2	
4	PACT310429E	Practice of Automatic Control	1	
5	PDTM311029E	Practice of Microprocessors	1	
6	PSEA315929E	Practice of Industrial Robots and Sensors	1	
7	PESD314129E	Practice of Drive Servo systems	1	
8	FAIN442029E	Industry Internship	4	
Total			**14**	

7.2.3 Graduation thesis (7 Credits)

Number	Course's ID	Course Name	Credits	Notes
1	UGRA475529E	Graduation Thesis (Mechatronics Engineering)	**7**	

B. OPTIONAL COURSES

Foundation science courses (4 Credits)

Number	Course's ID	Course Name	Credits	Notes
1	GEEC220105E	General Economics	2	
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 Technologt	2	
12	REME320690E	Research Methods	2	

Notes: Student selects 2 courses with 4 credits

Advanced Mechatronics Engineering courses (9 Credits)

Number	Course's ID	Course Name	Credits	Notes
1	MAVI332529E	Machine Vision	3(2+1)	
2	SCDA331629E	Industrial Communication Networks	3(2+1)	SCDA430946E
3	DIPR337529E	Digital Signal Processing	3(2+1)	
4	PCTR431929E	Process control	3(2+1)	PRCO431846E
5	BDES333877E	BigData Essentials	3(2+1)	
6	IOTM337629E	Internet of Things in Mechatronics	3(2+1)	
7	EMSY337329E	Embedded system	3(2+1)	EMSY437764E
8	CAED331024E	CAE in Mechanics	3(2+1)	
9	CCCT331725E	CAD/CAM-CNC Technology	3(2+1)	(td)CADA530546E
10	WEPR330479E	WEB Programing	3(2+1)	

Notes: Faculty selects 3 expertise courses with 3 credits 3x(2+1)

C. SUPPLEMENTARY COURSES

Number	Course's ID	Course Name	Credits	Notes
1	ACEN340535E	Academic English 1	4	
2	ACEN340635E	Academic English 2	4	
3	ACEN440735E	Academic English 3	4	
4	ACEN440835E	Academic English 4	4	
5	ENTW611038E	English for Thesis Writing	1	
6	IEPR550935E	IELTS Preparation	5	Non-accumulation

8. Plan of Courses

Term 1:

Number	Course's ID	Course Name	Credits	Prerequisite
1	LLCT130105E	Philosophy of Marxism and Leninism	3	
2	MATH132401E	Calculus I	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	ACEN340535E	Academic English 1	4	
8	ACEN340635E	Academic English 2	4	
9	PHYS 130402E	Physics 1	3	
10	MEIF134529E	Information Technology for Mechatronics	3	
Total *(excluding Physical Education and Military courses)*			**26**	

Term 2:

Number	Course's ID	Course Name	Credits	Prerequisite
1	LLCT120205E	Political economics of Marxism and Leninism	2	
2	LLCT120405E	Scientific socialism	2	
3	MATH132501E	Calculus II	3	
4	PHED110613E	Physical Education 2	0	
5	MEDR141123E	Mechanical Engineering Drawing (3+1)	4	
6	PHYS131002E	Physics 2	3	
7	ENME130620E	Engineering Mechanics	3	
8	ACEN440735E	Academic English 3	4	
9	ACEN440835E	Academic English 4	4	
10	PHYS111202E	Physics - Laboratory 1	1	
Total *(excluding Physical Education and Military courses)*			**26**	

Term 3:

Number	Course's ID	Course Name	Credits	Prerequisite
1		General Knowledge Option Course 1	2	
2	MATH132601E	Calculus III	3	
3	PHED130715E	Physical Education 3	0	
4	APEN222329E	Applied Programming in Engineering	3(2+1)	CPRL130064E
5	EEEN230129E	Electrical and Electronics Engineering	3	
6	MEMA230720E	Strength of Materials	3	
7	AMME131529E	Applied Mathematics in Mechanical Engineering	3	
8	MATH132901E	Mathematical Statistics for Engineers	3	
9	TOMT220225E	Tolerances And Measuring Technology	2	
10	GELA220405E	General Laws	2	
Total *(excluding Physical Education and Military courses)*			**24**	

Term 4:

Number	Course's ID	Course Name	Credits	Prerequisite
1	AUCO230329E	Automatic control	3	ACSY330346E
2	MMCD230323E	Mechanisms and Machine Components Design	3	
3	DITE226829E	Digital Techniques	2	
4	LLCT120314E	Ho Chi Minh's ideology	2	
5	PNHY230529E	Pneumatic & Hydraulic Technology	3	
6	PEEE210229E	Practice of Electronic Circuit Design	1	
7	MATE230430E	Manufacturing Technology	3	
8	BMPR230527E	Basic Mechanical Practice	3	
Total			**20**	

Term 5:

Number	Course's ID	Course Name	Credits	Prerequisite
1	PRMD310523E	Projects of Mechanical Design	1	
2	SERV334029E	Drive Servo Systems	3	
3	LLCT220514E	History of Vietnamese communist party	2	
4		General Knowledge Option Course 2	2	
5	ROBO331129E	Robotics	3	ROBO330246E
6	MPAU220729E	Manufacturing Process Automation	2	
7	MICO236929E	Microprocessors	3	MICR330363E
8	PACT310429E	Practice of Automatic Control	1	
9	IEPR550935E	IELTS Preparation	5	Non-accumulation
10	SEAC225929E	Sensors and Actuators	2	
Total			**19**	

Term 6:

Number	Course's ID	Course Name	Credits	Prerequisite
1	PSEA315929E	Practice of Industrial Robots and Sensors	1	
2	PMPA326629E	Practice of Manufacturing Process Automation	2	
3	PDTM311029E	Practice of Microprocessors	1	
4		Advanced Mechatronics Engineering course 1	3	
5	MALE337029E	Machine Learning	3	
6	ARIN337629E	Artificial Intelligence	3(2+1)	
7	PESD314129E	Practice of Drive Servo systems	1	
8	ENTW611038E	English for Thesis Writing	1	
Total			**15**	

Term 7:

Number	Course's ID	Course Name	Credits	Prerequisite
1	FAIN442029E	Industry Internship	4	
2	SEMI325929E	Business seminar (Mechatronics)	2	
3		Advanced Mechatronics Engineering course 2	3(2+1)	
4		Advanced Mechatronics Engineering course 3	3(2+1)	
5	PRMS415229E	Project of Mechatronic System	1	
Total			**13**	

Term 8:

Number	Course's ID	Course Name	Credits	Prerequisite
1	UGRA475529E	Graduation Thesis (Mechatronics Engineering)	7	
Total			**7**	

9. Course Description and Workload

9.1 FOUNDATION SCIENCE COURSES

1. Calculus I — Credits: 3

Course workload: ***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 –*Calculus* - 6th National Edition–Kendall Hunt.

2. Calculus II — Credit: 3

Course workload: ***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. 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.

3. Calculus III — Credit: 3

*Course workload: 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, tripleintegrals, 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, vectorformat 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.

4. Physics 1 — Credit: 3

*Course workload:**3(***3/0/6)

Prerequisites: None

Former subjects of condition: None

Course Description: This course provides the learnerwith contents: the mechanics: point dynamics, thelaw of conservation, solidmotion. Thermodynamics: kineticmoleculartheory, principles of ThermodynamicsI, principles of ThermodynamicsII. Electricity and magnetism: electric field, magnetic, variability of electrical magnetic field.

Textbook:

1. D. Hallyday, R. Resnick, J. Walker**,** Fundamentals of Physics**,** John Willey & Sons,1999.

5. Physics 2 — Credit: 3

- *Distribution of learning time: **3(*****3/0/6)**
- *Prerequisites: None*
- *Former subjects of condition: Principles of Physics 1*

Summaries of course: This course provides students with the basic knowledge of physics including electricity, magnetism, light and optics, which is compulsory to access specialized courses in science, engineering and technology branches.

Students will be equipped with the knowledge of phenomena in the natural world, and can apply these knowledge in scientific research, and in technical and technological developments.

The content of the module consists of chapters 23 to 38 of the book "Physics for Scientists and Engineers with Modern Physics", 9th Edition of R.A. Serway and J.W. Jewett.

The goal of this module is to help students become familiar with the scientific method, the fundamental laws of physics, improve their scientific knowledge of physics in general, reasoning skills, as well as strategies to prepare for learning in specialized science classes in programs for engineers. To achieve this goal, the module will provide both understandings of the concepts and skills of solving standard problems (homework) at the end of each chapter.

Besides, this module will help students understand how to build a mathematical model based on experimental results, how to record, display, analyze data and develop a model based on the data which can be used to predict the results of other experiments. At the same time, students will know the limits of the model and can use them in the prediction.

- *Text book*:

  1. R.A. Serway& J.W. Jewett; Physics for Scientists and Engineers with Modern Physics, 9th Edition; ISBN for bundle 9781285143811.
  2. Physics 2 lectures summary, University of Technology and Education, HCMC.

6. General Chemistry for Engineers () — Credits: 03

Course workload: 3(3/0/6)
Prerequisites: None
Course description: This course provides general chemistry necessary for engineering and science. This course covers fundamentals of electronic structures of atoms, relationship of electron and atomic properties, geometric configuration of the molecule, the polarity of the molecules, link of the physical molecules, a preliminary study on the physical and chemical properties of inorganic substances and their structures.
Text book:

1. Lawrence S. Brown, ***Chemistry for Engineering Students***, Brooks/Cole, Cengage Learning, 2nd edition, 2011
2. Steven S. Zumdahl, ***Chemistry***, Brooks/Cole, Cengage Learning, 9th edition, 2014

7. Introduction to Mechatronic Engineering Credits: 03 (2+1)

Course workload: 3 (2, 1, 6)
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
2. Philip Kosky; George Wise; Robert Balmer;WilliamKeat, Exploring Engineering, An Introduction to Engineering and Design, Academic Press, 2010

8. Applied Programming in Engineering Credits: 03 (2+1)

Course workload: 3 (2, 1, 6)
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. This course equips students with knowledge and skills so that they can understand, use programming software in building control system software.
Textbook:

1. Ivor Horton, Beginning C, Apress, Fifth Edition, 2008.
2. Daniels Solis, Illustrated C#, Apress, 2008.

9. Applied Mathematics in Mechanical Engineering Credits: 3

Course workload: 3 (3, 0, 3)
Prerequisite:None
Former subjects of condition: **Calculus I, II**
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.

10. Mathematical Statistics for Engineers **Credits: 03**

*Distribution of learning time: **3 (3/0/6)***
Prerequisites: None
Former subjects of condition: **Calculus I**
Course Description: This module consist 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

9.2 FUNDAMENTAL MECHATRONICS ENGINEERING COURSES

1. Mechanical Engineering Drawing **Credits: 04(3+1)**

Course workload: *4(3, 1, 8)*
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

2. Engineering Mechanics **Credits: 03**

Course workload: *3 (3, 0, 6)*
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.

3. Strength of Materials **Credits: 03 (3)**

Course workload: *3 (3, 0, 6)*
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.

4. Machine Design **Credits: 03**

Course workload: *3 (3, 0, 6)*

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

5. Project of Mechanical Design **Credits: 01**

Course workload: *1 (0, 1, 2)*

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

6. Tolerance and Measurement Technology **Credits: 03 (2+1)**

Course workload: *3 (2, 1, 6)*

Prerequisite:None

Course description: This course provides a foundation for

+ 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.
+ E*xperiments 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

7. Manufacturing Technology **Credits: 03**

Course workload: *2 (2,0, 4)*

Prerequisite: none

Course description: the subject provides students:

- 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

8. Electrical and Electronics Engineering **Credits: 3**

Course workload: *3(3:0:6)*

Prerequisite:None

Course description: This course equips 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, transitor 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.

9. Automatic Control **Credits: 03**

Course workload: *3 (0, 3, 6)*

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 approches 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, Automic 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.

10. Machine Learning **Credits: 03**

Course workload: *3 (3, 0, 6)*

Prerequisite:None

Course description: This course will aim 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.
2. Kevin P. Murphy Machine Learning: A Probabilistic Perspective, MIT Press, 2012

11. Sensors and Actuators **Credits: 02**

Course workload: *2 (0, 2, 4)*
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:

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

9.3 ADVANCED MECHATRONICS ENGINEERING COURSES

1. Pneumatic - HydraulicTechnology **Credits: 3**

Course workload: *3 (3, 0, 6)*
Prerequisite:None
Course description: This course provides basic knowledge of operating principles of a pneumatic control system, electropneumatics, hydraulics, electrohydraulics; 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)

2. Manufacturing Process Automation **Credits: 2**

Course workload: *2 (2, 0, 4)*
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:

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

3. Digital Techniques **Credits: 02**

Course workload: *2(2, 0, 4)*
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

4. Microprocessors **Credits: 03**

Course workload: *3 (3, 0, 6)*
Prerequisite: None

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

Textbook:

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

5. CAD/CAM-CNC Technology **Credits: 03(2+1)**

Course workload: *3(2, 1, 6)*

Prerequisite: None

Course description: the subject provides students

- ✓ Fundamentals of CAD/CAM solution.
- ✓ Basic skills: selection of machining processes order, cutting tool selection and CNC programming.
- ✓ 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

6. Process Control **Credits: 03(2+1)**

Course workload: *2 (2, 0, 4)*

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, Willy, 4th Edition, 2016

7. Drive servo systems **Credits: 03**

Course workload: *3 (3, 0, 6)*

Prerequisite: None

Course description: This course equips 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, NobuhiroKyura, "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

8. Robotics **Credits: 03**

Course workload: *3(3, 0, 6)*

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)

9. Project of Mechatronic System **Credits: 01**

Course workload: *1 (1, 0, 2)*

Prerequisite: None

Course description: This course helps student reinforce their knowledge of automatic control, manufacturing process automation, selecting mechatronic system control equiments, 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.

10. Machine Vision **Credits: 03(2+1)**

Course workload: *3 (2, 1, 6)*

Prerequisite: None

Course description: This course equips 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:

3. R. C. Gonzalez and R. E. Woods, Digital Image Processing.

11. Industrial Communication Networks **Credits: 03(2+1)**

Course workload: *3 (2, 1, 6)*

Prerequisite:

Course description: This course equips students with fundamentals of industrial data transmission. These following topics will be covered: data terminal equiment 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 sytems in inductry.

Textbook:

1. Behrouz A. Forouzan, Data Communications and_Networking, Fourth Edition, 2007
2. John Park, Steve Mackay, Edwin Wright, Practical Datacommunications for instrumentations and control, 2006

12. Embedded System **Credits: 03(2+1)**

Course workload: *3 (2, 1, 6)*

Prerequisite: None

Course description: This course provides 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.

Text book

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

13. Digital Signal Processing **Credits: 03(2+1)**

Course workload: *3 (2, 1, 6)*

Prerequisite: None

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

Text book

1. Alan V. Oppenheim, Ronald W. Schafer, 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

14. Artificial Intelligence **Credits: 03(2+1)**

Course workload: *3 (2, 1, 6)*

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

Text book

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)

15. Internet of Things in Mechatronics **Credits: 03(2+1)**

Course workload: *3 (2, 1, 6)*

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, embeded system,.. and analytics and security

Text book

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

16. Mechanical Experiment **Credits: 1**

Course workload: *1 (0, 1, 2)*

Prerequisite: None

Course description: This course provides learners with contents to verify the theoretical concepts learned in the basic subjects in the fields of mechanical industry applications, such as: The theory, Strength of Materials, Technical oscillator. Besides, the leaners iswill be able to identify, measure the volume of typical modern mechanical materials, the typical contemporary kinetic volume, dynamics of solids experimentally

Textbook:

1. Experiments of Mechanical Measurement Lab manual, 2019

2. Beer, E. Russelll Johnston, JR., Mechanics of materials, Ferdinand P. McFraw-Hill, 1992.
3. J. L. Meriam, L. G. Kraige. Engineering Mechanics, Seventh Edition. John Wiley & Sons, Inc, 2006.

17. Experiments of Pneumatic & Hydraulic Technology **Credits: 1**

Course workload: *1 (0, 1, 2)*

Prerequisite: None

*Course description:*This course reinforce basic knowledge a of operating principles of a pneumatic control system, electropneumatics, hydraulics, electrohydraulics; advantages and disadvantages of a pneumatic/hydraulic control system compared to electrical control system based on experiments and inprove skills of students for building and developing pneumatic and hydraulic systems.

Textbook:

1. Experiments of Pneumatic & Hydraulic Technology Lab manual, 2019
2. Jagadeesha T, Hydraulics and Pneumatics, I K International Publishing House (November 16, 2015)

9.4 WORKSHOP

1. Practice of Manufacturing Process Automation **Credits: 01**

Course workload: *1 (0, 1, 2)*

Prerequisite

Course description: This course helps students 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.

Text book:

1. Practice of Manufacturing Process Automation manual 2019
2. SeropeKalpakjian, Steven Schmid, Manufacturing Engineering and Technology, SI Edition 7 Ed., PEARSON, 2013.

2. Practice of Mechanical Engineering **Credits: 02**

Course workload: *2 (0, 2, 4)*

Prerequisite:

Course description: This course provides basic knowledge and skills in metalworking with hand tools and basic equipments such as punchers, chisels, files, drills, measuring equiments; basic knowledge and skills in turning, grindingand milling

Textbook:

1. Practice of Mechanical Engineering manual, 2019
2. Practice of turning manual, 2019
3. Practice of milling manual, 2019
4. Practice of metalworking manual, 2019

3. Practice of Electronic Circuit Design **Credits: 1**

Course workload: *1 (0, 1, 2)*

Prerequisite: None

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

Textbook:

1. Experiments of Electrical and Electronics Engineering Lab manual, 2019
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.

4.

5. Practice of Automatic Control **Credits: 01**

Course workload: *1 (0, 1, 2)*

Prerequisite: None

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

Textbook:

1. Practice of Automatic Control Lab manual, 2019
2. Devendra K. Chatuvedi, Modeling and Simulation of Systems Using MATLAB and Simulink**,** Taylor Francis , 2010
3. Benjamin C. Kuto, Automic Control Systems, New York, 2010

6. Practice of Microprocessors **Credits: 02**

Course workload: *2(0, 2, 4)*

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, 2019
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.

7. Practice of Industrial Robots and Sensors **Credits: 01**

Course workload: *1 (0, 1, 2)*

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, 2019
2. Saeed B. Niku, Introduction to Robotics: Analysis, Systems, Applications, Wiley; 3th edition (September 22, 2011)

8. Practice of Servo Drive Systems **Credits: 01**

Course workload: *2 (0, 2, 4)*
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, equipments in servo control systems.
Textbook:
1. Practice of Servo Systems Lab manual, 2019
2. Jeffrey Travis, Jim Kring, "LabView for Everyone", Third Edition, Prentice Hall, 2006

9. Industry Internship **Credits: 04**

Course workload: *4 (0, 4, 8)*
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 2019

9.5 GRADUATION PROJECT

Graduation Thesis **Credits: 7**

Course workload: *7*
Prerequisite: Projects on Theory of machine and machine design, project of Mechatronic System, project of Control and Drive
Course description: 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 problem of current research interest.
Textbook:
1. Graduation project manual 2019

10. Campus Infrastructure

Follow the Ministry of education and training's regulations

10.1 Workshops and Laboratories:

- Mechanical Measurement Technology Laboratory
- Mechanical Engineering Workshop
- Gas Welding Workshop
- Electroslag Welding Workshop
- Computer cluster
- Simulation and Automation Laboratory
- PLC Laboratory
- Pneumatic - Hydraulic Laboratory
- Robotics Laboratory
- Process Control Laboratory

10.2 Library, Website

- University's Library
- Faculty's Library
- Faculty's Website

11. PROGRAM GUIDE

- Credit hour is calculated as:

1 credit = 15 lecture hours
= 30 laboratory hours
= 45 hours practice
= 45 hours self -study
= 90 workshop hours.
= 45 hours for project, thesis.

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

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