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

UNDERGRADUATE PROGRAM

Major of
MECHATRONIC ENGINEERING TECHNOLOGY

November 2016

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,toensure 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: 130credits (without Physical Education, Military Education, and Supplementary Courses)

6. Allocation of credits

Groups of Courses	Credits		
	Total	**Compulsory**	**Optional**
Foundation science courses	**45**	**41**	**4**
General Politics + Laws	10	10	
Social Sciences and Humanities	4		4
Mathematics and Natural Sciences	25	22	
Technical Computer Sciences	3	3	
Introduction to Engineering Technology	3	3	
Mechatronics Engineering Courses	**85**	**79**	**6**
Fundamental Mechatrohics Engineering courses	27	27	
Advanced Mechatrohics Engineering courses	26	22	4
Experiments and Practices	20	18	2
Internship	2	2	
Graduation Thesis	**10**	**10**	

7. CONTENTS OF THE PROGRAM

A. COMPULSORY COURSES

7.1 Foundation science courses (44 credits)

Number	Course's ID	Course Name	Credits	Notes
1	LLCT150105E	Principles of Marxism-Leninism	5	
2	LLCT120314E	Ho Chi Minh's Ideology	2	
3	LLCT230214E	Vietnamese Communist Party Policy of Revolution	3	
4	INME130125E	Introduction to Mechanical Engineering	3	
5	MATH141601E	CalculusI	4	
6	MATH141701E	Calculus II	4	
7	MATH141801E	Calculus III	4	
8	MATH130401E	Mathematical Statistics for Engineers	3	
9	AMME331529E	Applied Mathematics in Mechanical Engineering	3	
10	PHYS 130402E	Principles of Physics 1	3	
11	PHYS110602E	Principles of Physics - Laboratory 1	1	
12	GCHE130603E	General Chemistry for Engineers	3	
13	APEN331329E	Applied Programming in Engineering	3	
14	PHED110513E	Physical Education 1	0	
15	PHED110613E	Physical Education 2	0	
16	PHED130715E	Physical Education 3	0	
17	GDQP008031E	Military Education	0	
18		General Knowledge Option Course 1	2	
19		General Knowledge Option Course 2	2	

Total *(excluding Physical Education and Military courses)*	**45**	

7.2 Mechatronics Engineering Courses (76 Credits)

7.2.1 Fundamental Mechatrohics Engineering courses

Number	Course's ID	Course Name	Credits	Notes
1	EDDG240120E	Descriptive Geometry &Engineering Drawing (3+1)	4	
2	THME230721E	Theoretical Mechanics	3	
3	STMA230521E	Strength of Materials	3	
4	TMMP230220E	Theory of Machine And Machine Design	3	
5	PMMD310423E	Projects on Theory of machine and machine design	1	
6	TOMT220225E	Tolerances And Measuring Technology	2	
7	ENMA220130E	Materials Science	2	
8	AUCO330329E	Automatic Control	3	
9	FMMT330825E	Fundamentals of Machinary Manufacturing Technology	3	
10	EEEN230129E	Electrical and Electronics Engineering	3	
		Total	**27**	

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

Number	Course's ID	Course Name	Credits	Notes
1	PNHY330529E	Pneumatic & Hydraulic Technology	3	
2	MPAU320729E	Manufacturing Process Automation	2	
3	DITE226829E	Digital Techniques	2	
4	MICO226929E	Microcontrollers	2	
5	PCAD315129E	Project of Control and Drive	1	
6	CACC320224E	CAD/CAM-CNC	2	
7	ETDR336429E	Electric Drives	3	
8	PCTR421929E	Process control	2	
9	SERV424029E	Drive servo systems	2	
10	INRO321129E	Industrial Robot	2	
11	PRMS415229E	Project of Mechatronic System	1	
12		Advanced Mechatrohics Engineering courses 1	2	
13		Advanced Mechatrohics Engineering courses 2	2	
		Total	**26**	

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

Number	Course's ID	Course Name	Credits	Notes
1	METE210321E	Mechanical Experiments	1	

2	EXMM210325E	Experimentsof Mechanical Measurement	1	
3	EEEE210229E	Experimentsof Electrical and Electronics Engineering	1	
4	EPHT310629E	Experiments of Pneumatic & Hydraulic Technology	1	
5	ECCC310324E	Experiments of CAD/CAM-CNC	1	
6	EPCT412029E	Experiments of Process Control	1	
7		Experiments ofExpertise course 1	1	
8		Experiments ofExpertise course 2	1	
9	MATE210230E	Experiments of Materials Science	1	
10	EWEP210426E	Electric Welding Practice	1	
11	PMPA316629E	Practice of Manufacturing Process Automation	1	
12	PMEE331027E	Practice of Mechanical Engineering	3	
13	PETD316529E	Practice of Electrical Drive	1	
14	PAUC410429E	Practice of Automatic Control	1	
15	PAPE311429E	Practice ofApplied Programming in Engineering	1	
16	PDTM311029E	Practice of Digital Techniques and Microcontroller	1	
17	PINR411229E	Practice of Industrial Robots	1	
18	PSER414129E	Practice of Drive Servo systems	1	
19	FAIN423025E	Industry Internship	2	
		Total	**22**	

7.2.3 Graduation thesis (10 Credits)

Number	Course's ID	Course Name	Credits	Notes
1	GRAT403125E	Graduation Thesis (Mechatronics Engineering)	**10**	

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	

Notes: Student selects 2 courses with 4 credits

Advanced Mechatrohics Engineering courses (6 Credits)

Number	Course's ID	Course Name	Credits	Notes
1	IIPR422529E	Image processing in industry	2	
2	EIIP412629E	Experiments of Image processing	1	
3	INCN421629E	Industrial Communication Networks	2	
4	EICN411729E	Experiments of Industrial Communication Networks	1	
5	CBMC423629E	Computer – based Measurement and Control	2	
6	ECMC413729E	Experiments of Computer – based Measurement and Control	1	
7	AMCO422929E	Advanced Microcontroller and Embeded System	2	
8	EAMC413029E	Experiments of Advanced Microcontroller and Embeded System	1	

Notes: Faculty selects 2expertise courses +2 experiment courses with 6 credits 2x(2+1)

C. SUPPLEMENTARY COURSES

Number	Course's ID	Course Name	Credits	Notes
1	EHQT 130137E	Academic English 1	(3)	
2	EHQT 230237E	Academic English 2	(3)	
3	EHQT 230337E	Academic English 3	(3)	
4	EHQT 230437E	Academic English 4	(3)	
5	EHQT 330537E	Academic English 5	(3)	
6	TEEN123725E	Technical English 1	(2)	
7	TEEN233825E	Technical English 2	(3)	
8	TEEN333925E	Technical English 3	(3)	
9	TEEN440725E	Technical English 4	(3)	

8. Plan of Courses

Term 1:

Number	Course's ID	Course Name	Credits	Prerequisite
1	LLCT150105E	Principles of Marxism-Leninism	5	
2	MATH141601E	Calculus I	4	
3	INME130125E	Introduction to Mechanical Engineering	3	
4	GCHE130603E	General Chemistry for Engineers	3	
5	PHED110513E	Physical Education 1	0	
6	GDQP008031E	Military Education	0	
7	EHQT 130137E	Academic English 1	(3)	
8	EHQT 230237E	Academic English 2	(3)	
Total *(excluding Physical Education and Military courses)*			**15**	

Term 2:

Number	Course's ID	Course Name	Credits	Prerequisite
1	LLCT120314E	Ho Chi Minh's Ideology	2	
2	MATH141701E	Calculus II	4	
3	MATH130401E	Mathematical Statistics for Engineers	3	
4	PHED110613E	Physical Education 2	0	
5	EDDG240120E	Descriptive Geometry & Engineering Drawing (3+1)	4	
6	PHYS 130402E	Principles of Physics 1	3	
7	ENMA220130E	Materials Science	2	
8		General Knowledge Option Course 1	2	
9	EHQT 230337E	Academic English 3	(3)	
10	TEEN123725E	Technical English 1	(2)	
Total *(excluding Physical Education and Military courses)*			**20**	

Term 3:

Number	Course's ID	Course Name	Credits	Prerequisite
1	LLCT230214E	Vietnamese Communist Party Policy of Revolution	3	
2	MATH141801E	Calculus III	4	
3	PHED130715E	Physical Education 3	0	
4	PHYS110602E	Principles of Physics - Laboratory 1	1	
5	APEN331329E	Applied Programming in Engineering	3	
6	THME230721E	Theoretical Mechanics	3	
7	EEEN230129E	Electrical and Electronics Engineering	3	
8	MATE210230E	Experiments in Materials Science	1	
9		General Knowledge Option Course 2	2	
10	TEEN233825E	Technical English 2	(3)	
Total *(excluding Physical Education and Military courses)*			**20**	

Term 4:

Number	Course's ID	Course Name	Credits	Prerequisite
1	AMME331529E	Applied Mathematics in Mechanical Engineering	3	
2	STMA230521E	Strength of Materials	3	
3	TOMT220225E	Tolerances and Measuring Technology	2	
4	METE210321E	Mechanical Experiments	1	
5	TMMP230220E	Theory of Machine and Machine Design	3	
6	DITE226829E	Digital Techniques	2	
7	FMMT330825E	Fundamentals of Machine Manufacturing Technology	3	

8	EEEE210229E	Experiments in Electrical and Electronics Engineering	1	
9	PAPE311429E	Practice in Applied Programming in Engineering	1	
10	EHQT 230437E	Academic English 4	(3)	
		Total	**19**	

Term 5:

Number	Course's ID	Course Name	Credits	Prerequisite
1	PMMD310423E	Projects on Theory of machine and machine design	1	
2	EXMM210325E	Experiments in Mechanical Measurement	1	
3	AUCO330329E	Automatic control	3	
4	PNHY330529E	Pneumatic & Hydraulic Technology	3	
5	CACC320224E	CAD/CAM-CNC	2	
6	MPAU320729E	Manufacturing Process Automation	2	
7	MICO226929E	Microcontrollers	2	
8	ETDR336429E	Electric Drives	3	
9	EWEP210426E	Electric Welding Practice	1	
10	TEEN333925E	Technical English 3	(3)	
		Total	**18**	

Term 6:

Number	Course's ID	Course Name	Credits	Prerequisite
1	EPHT310629E	Experiments in Pneumatic & Hydraulic Technology	1	
2	PCAD315129E	Project of Control and Drive	1	
3	ECCC310324E	Experiments in CAD/CAM-CNC	1	
4	PCTR421929E	Process control	2	
5	INRO321129E	Industrial Robot	2	
6	PMPA316629E	Practice in Automation of Manufacturing Process	1	
7	PETD316529E	Practice of Electrical Drive	1	
8	PMEE331027E	Practice of Mechanical Engineering	3	
9	PAUC410429E	Practice in Automatic Control	1	
10	PDTM311029E	Practice of Digital Techniques and Microcontroller	1	
11	EHQT330537E	Academic English 5	(3)	
		Total	**14**	

Term 7:

Number	Course's ID	Course Name	Credits	Prerequisite
1	EPCT412029E	Experiments of Process Control	1	
2	SERV424029E	Drive servo systems	2	

3		Advanced Mechatrohics Engineering course 1	2	
4		Experiments in Advanced Mechatrohics Engineering course 1	1	
5		Advanced Mechatrohics Engineering course 2	2	
6		Experiments in Advanced Mechatrohics Engineering course 2	1	
7	PRMS415229E	Project of Mechatronic System	1	
8	PINR411229E	Practice in Industrial Robots	1	
9	PSER414129E	Practice of Drive Servo systems	1	
10	TEEN434025E	Technical English 4	(3)	
		Total	**12**	

Term 8:

Number	Course's ID	Course Name	Credits	Prerequisite
1	FAIN425429E	Industry Internship	2	
2	UGRA4105529E	Graduation Thesis (Mechatronics Engineering)	10	
		Total	**12**	

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. Principles of 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. General Chemistry for Engineers (GCHE130603) 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

6. Introduction to Mechanical 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

7. Applied Programming in Engineering Credits: 03

Course workload: 3 (3, 0, 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.

8. Applied Mathematics in Mechanical Engineering Credits: 3

Course workload: *3 (2, 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.

9. 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. Descriptive Geometry and Engineering Drawing **Credits: 03**

Course workload: *3 (3, 0, 6)*
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. TheoriticalMechanics **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: 04 (3+1)**

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

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. Theory of Machine and 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 on Theory of Machine and Machine Design **Credits: 01**

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

Prerequisite:

Course description: This course is help students reinforce the contents of Ttheory of machine and 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. Materials Science **Credits: 03 (2+1)**

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

Prerequisite: none

Course description: the subject provides students:

+ General knowledge of properties of metal and metallic alloy, metallic materials in manufacturing, general knowledge of heat treating to manipulate mechanical properties of metallic materials.
+ Fundamentals of structure and properties of polymer, composite materials, rubber.

Textbook:

1. Materials Science and Engineering: An Introduction, 8th Edition, Williams D. Callister, Jr., David G. Rethwisch, John Wiley & Sons, Inc.

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 provide 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. Fundamentals of Machinery Manufacturing Technology **Credits: 03**

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

Prerequisite: none

Course description: This course provides the basic knowledge of

+ Metal cutting, fundamentals of machining methods
+ Machining accuracy and quality of machine part surface, effect factors and how to reduce the influence
+ Locations and setup
+ Specification of machining process on machine tool, special machine, etc...

Textbook:

1. Winston A. Knight, Fundamentals of Metal Machining and Machine Tools, Third Edition (CRC Mechanical Engineering),Taylor and Fracis, 2016;
2. B. L. Juneja, Fundamentals of Metal Cutting and Machine Tools, New Age International, 2003;
3. Hassan Abdel-Gawad El-Hofy, Fundamentals of Machining Processes: Conventional and Nonconventional, CRC Press, Aug 6, 2013

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. ManufacturingProcess 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. Microcontroller **Credits: 02**

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

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. Project of Control and Drive **Credits: 01**

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

Prerequisite: None

Textbook:

1. Mohan, Undeland, Robbins, "Power Electronics Converters, Applications, and Design", John Wiley, 3rd Edition.

Course description: This course helps student reinforce their knowledge of selecting electrical actuators, pneumatics, hydraulics, valves, motors, energy source, calculating the mechanism; and enhances students's ability to create technical drawing, design electrical system for controlling mechanical system.

6. CAD/CAM-CNC **Credits: 02**

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

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

7. Electrical Drive **Credits: 3**

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

Prerequisite: None

Course description: This course provides basic knowledge of electrical motors, electrical devices, power electronic components, drives of electrical motor, apply electrical motor in controlling mechatronic system; provides knowledge and skills in classifying DC motor, AC motor, electrical devices; provides fundamentals of motor control, calculate and select motor, power, and suitable devices.

Textbook:

1. Mohan, Undeland, Robbins, "Power Electronics Converters, Applications, and Design", John Wiley, 3rd Edition.

8. Process Control **Credits: 02**

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

9. Drive servosystems **Credits: 02**

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

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

10. Industrial Robot **Credits: 02**

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

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)

11. 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.

12. Image Processing In Industry **Credits: 02**

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

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.

13. Industrial Communication Networks **Credits: 2**

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

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

14. Computer – based Measurement and Control **Credits: 2**

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

Prerequisite: None

*Course description:*This course provides basic knowledge of sensor, instruments, PC I/O port, PCcommunication, communication protocol, building control and measuring system based on PC.

Text book:

1. Jon S. Wilson, Sensor technologies handbook, 2005
2. Mikey Tooley, PC Based Instrumentation and Control, 2005

15. Advanced Microcontroller and Embeded System **Credits: 2**

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

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

10. Principles of Physics 1 Laboratory Credit: 3

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

Prerequisites: None

Former subjects of condition: Principles of Physics 1

Course Description: included a module 9 units of kinetic experiments, fluid dynamics and dynamic point solids. This is additional courses apply knowledge about the nature of the physical phenomena occurring in nature, check all physical theories learned in Principles of Physics 1 and also apply observation skills, conduct experiments, measurements and calculations, analysis, data processing for students.

Textbook:

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

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, 2015
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 Mechanical Measurement **Credits: 1**

Course workload: 1 (0, 1, 2)

Prerequisite: None

Course description: This course provides students with contents function, operation, and application of common mechanical engineering instruments, measurement principles, and statistical analysis. Major elements of measurement systems, including transduction, signal conditioning, and data recording. Function and operation of digital data acquisition systems.

Textbook:

1. Experiments of Mechanical Measurement Lab manual, 2015
2. Geometrical Dimensioning and Tolerancing for Design, Manufacturing And Inspection, 2nd edition
3. K.L. Narayana, P. Kannaiah, K. Venkata Reddy, Machine drawing, 3rd edition, New Age International Publishers

18. Experiments of Electrical and Electronics Engineering **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, 2016
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.

19. 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, 2015
2. Jagadeesha T, Hydraulics and Pneumatics, I K International Publishing House (November 16, 2015)

20. Experiments of CAD/CAM-CNC **Credits: 1**

Course workload: 1 (0, 1, 2)

Prerequisite: None

*Course description:*This course reinforce basic knowledge learned in CAD/CAM-CNC,and also apply for students basic skills: selection of machining processes order, cutting tool selection and CNC programming, using CAD/CAM software.

Text book:

1. Experiments of CAD/CAM-CNC Lab manual, 2015
2. EMCO WinNC GE Series Fanuc 21 TB
3. EMCO WinNC GE Series Fanuc 21 MB
4. EMCO Win Tutorials - Modular Instructor Guide for Industry and Training-PC Turn/Mill 55 GE Fanuc Series 21

21. Experiments of Process Control **Credits: 01**

Course workload: 1 (0, 1, 2)

Prerequisite: None

*Course description:*This course provides basic knowledge and skills in the industrial process control . Applied process control theory, process equipment (including sensors, actuators, control equipment) and specialized software to automate the process parameters: level, flow volume, temperature, pressure in the industry.

Text book:

1. Experiments of Process Control Lab manual, 2015
2. Dale E. Seborg, Process Dynamics and Control, Willy, 4th Edition, 2016

22. Experiments of Image Processing in Industry **Credits: 01**

Course workload: 1 (0, 1, 2)

Prerequisite: None

*Course description:*This course provides for students of mechatronics engineering technology basic knowledge and skills in image processing,programming for image processing, including the basic handling skills (photo and camera manipulation by the program, blur, noise reduction, highlight edges, color space conversion) and advanced (identification color, contour, detection ...). In addition, students are introduced to the idea of processing real image applications in the factory and life.

Text book:

1. Experiments of Image Processing in Industry Lab manual, 2015
2. R. C. Gonzalez and R. E. Woods, Digital Image Processing.

23. Experiments of Industrial Communication Networks **Credits: 01**

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

Prerequisite: None

*Course description:*This course provides for students of mechatronics engineering technology basic knowledge and skills about of industrial data transmission (communication among devices as the computer or PLC in a communications industrial network . How to set up a communications network in the industry, such as Profibus, Can, DeviceNet, Modbus, Ethernet, AS-i ... After finishing, the learner has the ability to design a communications network serving the automation system automated production systems in industry.

Text book:

1. Experiments of Industrial Communication Networks Lab manual, 2015
2. Behrouz A. Forouzan, Data Communications and_Networking, Fourth Edition, 2007
3. John Park, Steve Mackay, Edwin Wright, Practical Data communications for instrumentations and control, 2006.

24. Experiments of Computer – based Measurement and Control **Credits: 01**

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

Prerequisite: None

*Course description:*This course provides for students of mechatronics engineering technology basic knowledge and skills to measure and control the automatic control system based on PC., how to collect and manage data of the system based on sensor system and database system.

Text book:

1. Jon S. Wilson, Sensor technologies handbook, 2005
2. Mikey Tooley, PC Based Instrumentation and Control, 2005
3. Experiments of Advanced Microcontroller and Embeded System manual, 2015

25. Experiments of Advanced Microcontroller and Embeded System **Credits: 01**

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

Prerequisite: None

*Course description:*This course provides for students of mechatronics engineering technology basic knowledge and skills 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, internet connection, data acquisition and analyses.

Text book:

1. None Dogan Ibrahim - PIC Microcontroller Projects in C - Basic to Advanced, 2014
2. Experiments of Computer – based Measurement and Control, Manual 2015

9.4 WORKSHOP

1. Electric Welding Practice **Credits: 01**

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

Prerequisite: None

*Course description:*This course provide students with basic knowledge of electric arc welding such as definition, operating principles of arc welding, welding sticks, operating

principles of TIG, MIG system., the role of welding in the mechanical technology and products of the engineering industry.

1. The James F. Lincoln Arc Welding Foundation , The Procedure Handbook of Arc Welding, 14th Edition Hardcover – 2015
2. Practice of Electric Welding Practice, Manual 2015

2. 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 2015
2. SeropeKalpakjian, Steven Schmid, Manufacturing Engineering and Technology, SI Edition 7 Ed., PEARSON, 2013.

3. Practice of Mechanical Engineering **Credits: 03**

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

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, 2015
2. Practice of turning manual, 2015
3. Practice of milling manual, 2015
4. Practice of metalworking manual, 2015

4. Practice of Electrical Drive **Credits: 01**

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

Prerequisite: None

*Course description:*This course provides basic knowledge and skills of

- Electrical devices: MCB, Contactor, Relay,
- 3-phase motor AC drive, DC drive.
- Install inverters, control ACmotor using inverter

Textbook:

1. Practice of Electrical Drive Lab manual, 2015
2. Mohan, Undeland, Robbins, "Power Electronics Converters, Applications, and Design", John Wiley, 3rd Edition.

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, 2016

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 Applied Programming in Engineering **Credits: 01**

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

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. Practice of Applied Programming in Engineering Lab manual, 2015
2. Ivor Horton, Beginning C, Apress, Fifth Edition, 2008.
3. Daniels Solis, Illustrated C#, Apress, 2008.

7. Practice of Digital Techniques and Microcontroller **Credits: 01**

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

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, 2015
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.

8. Practice of Industrial Robots **Credits: 01**

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

Prerequisite: None

*Course description:*This coursehelps 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, 2015
2. Saeed B. Niku, Introduction to Robotics: Analysis, Systems, Applications, Wiley; 3th edition (September 22, 2011)

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

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

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, 2016
2. Jeffrey Travis, Jim Kring, "LabView for Everyone", Third Edition, Prentice Hall, 2006

11. Industry Internship **Credits: 02**

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

Prerequisite: None

*Course description:*The course helpsstudents 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 2015

9.5 GRADUATION PROJECT

Graduation Thesis **Credits: 10**

Course workload: *10*

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 2015

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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