BỘ GIÁO DỤC VÀ ĐÀO TẠO
ĐẠI HỌC THÁI NGUYÊN
TRƯỜNG ĐẠI HỌC KỸ THUẬT CÔNG NGHIỆP

CHƯƠNG TRÌNH TIÊN TIẾN

GIÁO DỤC ĐẠI HỌC

UNDERGRADUATE ADVANCED PROGRAM

NGÀNH KỸ THUẬT CƠ KHÍ
Mechanical Engineering

XÂY DỰNG TỪ CHƯƠNG TRÌNH CỦA TRƯỜNG ĐẠI HỌC
BASED ON THE CURRICULUM OF

THE STATE UNIVERSITY OF NEW YORK AT BUFFALO

HIỆU TRƯỞNG

PGS. TS. Nguyễn Duy Cương

Thái Nguyên, năm 2020

CONTENTS

1. Educational Objectives

The Mechanical Engineering (ME) BS Program at UB is accredited by ABET, which requires a formal Outcomes Assessment and Continuous Improvement process to ensure excellent educational quality. The Educationcal Objectives for the Advanced Program of the ME BS program at TNUT are:

- ***Knowledge***

To prepare graduates fundamental, basic, specific and societal knowledges for a career or further studies in mechanical engineering or related disciplines, applying the concepts and principles of mathematics, science and engineering in industrial activities.

Understand the the knowledge about development, documentation and presentation of engineering projects, the economy and engineering economics
Understand the required knowledge to start a new career or research and caring about the social issues.

- **skills**

To provide graduates with the technical skills necessary to begin a career or advanced studies in mechanical engineering, the professional skills and societal awareness expected in modern engineering practice.

Ability to design mechanical components and mechanism, Material handling system, Flexible Manufacturing System

Ability to manufacture mechanical components and machines.

Ability to use fluently the professional software such as CAD/CAM/CNC to design, model and simulate the mechanical components, mechanism and machines

Ability to simulate and programming the manufacturing process to produce a mechanical product.

Ability to write a program by software such as C++ to control simple machines.

Ability to synthesis and analysis the data to create a new machine or application in daily life and industry.

Ability to read, listen, speak and write good English in profession.

Ability to work in group, study or work independently.

- **Attitude**

To produce graduates equipped with virtuous characters, committed to the responsibility of work and society.

Obey the job ethics to serve the people and community with highest integrity.

Job Opportunities

Mechanical engineers are involved in research and development, design, manufacturing and technical sales of the widest variety of products. Specific areas of involvement include computer-aided design and manufacturing; robotics; power plants; engines; machine tools; construction equipment; material; agricultural implement; automotive vehicles and systems of transportation; domestic and industrial appliances; control and measurement devides; instrumentation; biomedical devices;apparatus for the control of air, water, noise, refuse and other types of pollution; underwater technology; space flight equipment; safety devices and food processing machinery.

Student can elect to pursue graduate work in engineering or other fields. Graduate study in mechanical engineering can lead to careers in research and teaching.

2. *Program Learning Outcomes - PLO*

PLO-01: *An ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex engineering problems.*

PLO-02: Problem Analysis: *An ability to identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.*

PLO-04: Investigation: *An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data and synthesis of information to derive valid conclusions.*

PLO-03: Design/Development of Solution: *An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.*

PLO-05: Modern Tool Usage: *An ability to create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.*

PLO0-6: The Engineer and Society: *An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.*

PLO-07: Environment and Sustainability: *An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.*

PLO-08: Ethics: *Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.*

PLO-09: Individual and Team Work: *An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.*

PLO-10: Communication: *An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.*

PLO-11: Project Management: *Ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.*

PLO-12: Life-Long Learning: *An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.*

3. *Program Duration*

05 years

4. *Required Total Credits*

153 Credits, exclusive of Physical education, Military Education and English enhancement in the first year.

5. *Enrollment*

Individuals who meet the following requirements can be admitted to this program: Passed the entry examination in group ***A00, A01, D01, D07*** *to Thai Nguyen University or other university and attain benchmark meet the requirements of the advanced program.*

6. Educational process and Graduation Requirements

6.1 *Educational Process*

Students will study in English, in the best learning and teaching environment of TNUT. The curriculum and syllabus are based on the Machanical Engineering (ME) undergraduate program of the State University of New York at buffalo (UB), which is accredited ABET. Compulsory subjects are added as the rule of MOET. The educational process is designed in accordance with the credit-based system, following the follow chart from UB.

6.2 Graduation Requirements

Students who complete 153 credits in the Electrical Engineering Program with a GPA of 2.0 or higher in their engineering courses are awarded the BSc degree. This fact is noted in the graduation program and on the graduate transcript.

In additions, students must pass the final exam in political subjects and have TOEFL-ITP certificate ≥ 500 or equivalent one.

7. Grading System

The 4-scale grading system, which is currently used in TNUT as well as UB will be applied. The system uses either letters or numbers to mark the scores, as shown below.

Granding System	Granding System 4	Granding System 10
A	4	8,50 - 10,00
B	3	7,00 - 8,49
C	2	5,50 - 6,99
D	1	4,00 - 5,49
F	0	<4,00

7. *Curriculum*

7.1. Curriculu Structure

Course moduls			Credits
Compulsory courses (152 credits)	11	General Education, Math and basic Science	63
	22	*Basic core courses*	36
	33	*Concentration courses*	54
Tổng/Total:			153

7.2. List of Courses

7.2.1. *General education*

STT ***No.***	***Courses***	***Code***	***Credits***
1	Principles of Communication	GMA007	3
2	Workshop	TTV001	0
3	Calculus 1	MAT002	4
4	Calculus 2	MAT003	4
5	Calculus 3	MAT004	4
6	National Defence Education	TCV004	0
7	Physical Education 1	TCV001	0
8	Physical Education 2	TCV002	0
9	Physical Education 3	TCV003	0
10	Introductory linear Algebra	MAT001	3

11	General Chemistry	CHE001	4
12	Higher Level Language	GMA006	3
13	Engineering Principles	GMA001	3
14	Philosophy of marxism and Leninism	MLV001	3
15	Political economics of marxism and leninism	MLV002	2
16	Scientific socialism	MLV005	2
17	History of Vietnamese communist party	MLV003	2
18	Hồ Chí Minh's Ideology	MLV004	2
19	Differential Equations	MAT005	3
20	Evolution of the Earth and Solar System)	GMA005	3
21	Physics LAB	PHY003	1
22	Physics I	PHY001	4
23	Physics II	PHY002	3
24	Statics	MAE001	3
25	English for Academic Purposes	ENG104	4
26	English for Engineering	ENG106	3
Total			**63**

7.2.2. ***Basic core courses***

No.	***Courses***	***Code***	***Credits***

1	Fluid Mechanics	MAE009	3
2	Dynamics	MAE002	3
3	Intro to MAE Practice	GMA004	3
4	Electrical Sciences	GEE001	3
5	Theory Of Machines and Mechanisms	MAE003	3
6	Engineering Economy	GEE002	3
7	Thermodynamics	MAE008	3
8	Mechanics of Solids	MAE005	3
9	Fluid/Heat Transfer Lab	MAE012	1
10	Engineering Materials Lab	MAE007	1
11	Heat Transfer	MAE010	3
12	Engineering Materials	MAE006	3
13	Engineering Drawing and CAD	GMA002	4
Total			**36**

7.2.3. Professional education

No.	***Courses***	***Code***	***Credits***
1	Applied Math for MAE	MAT006	3
2	Mechanics of Composite Material	MAE011	3
3	Computer and Instruments	MAE014	3

4	Design Process & Methods	MAE016	3
5	Mechanical Engineering Project	MAE020	6
6	Internship in Industry	TTV002	6
7	Manufacturing Processes	MAE015	4
8	Independent Study in Mechanical Engineering	MAE021	1
9	Product Design with CAD***	MAE017	3
10	Systems Analysis	EE0010	4
11	Control Systems	EE0020	3
12	Design of Machine Elements	MAE004	4
13	Machines and mechanisms Lab	MAE023	1
14	Manufacturing Automation	MAE018	3
15	Probability Theory	MAT007	3
16	Tribology	MAE013	3
17	Design Project in Mechanical Engineering	MAE022	1
Total			**54**

8. Curriculum plan

Curriculum Structure for school year

No	*Code*	**Subject**	*Acc credits*	*Credits*	*Note*
1 st Semester (16 weeks + 1 week for exams)					
1	GEN101	Integrated skills (Elementary)	0	9	FIT
2	GEN102	Learner training 1	0	7	FIT
3	GEN103	Listening skill 1	0	4	FIT
4	GEN104	Reading skill 1	0	4	FIT
	Tổng/Total		**0**	**24**	
2st Semester (16 weeks + 1 weeks for exams)					
1	GEN201	Speaking skill	0	3	FIT
2	GEN202	Learner training 2	0	7	FIT
3	GEN203	Listening skill 2	0	7	FIT
4	GEN204	Reading skill 2	0	7	FIT
	Tổng/Total		**0**	**24**	
3rd Semester (16 weeks + 3 weeks for exams)					
1	GMA001	Engineering Principles	3	3	FIT
2	PHY001	Physics 1	4	4	FIT
3	TCV001	Physical Strength Education 1	0	2	FFS
4	GMA002	Engineering Drawing and CAD	4	4	FIT
5	MAT001	Introductory linear Algebra	3	3	FIT
6	MAT002	Calculus 1	4	4	FIT
7	ENG104	English for Academic Purposes	4	4	FIT
	Total:		**22**	**24**	

4th Semester (16 weeks + 3 weeks for exams)					
1	MAE001	Statics	3	3	FIT
2	GMA007	Principle of Communication	3	3	FIT
3	MAT003	Calculus 2	4	4	FIT
4	PHY002	Physics 2	3	3	FIT
5	PHY003	Physics LAB	1	1	FIT
6	CHE001	General Chemistry	4	4	FIT
7	ENG106	English for Engineering	3	3	FIT
8	TCV002	Physical Strength Education 2	0	2	FFS
	Total		**21**	**23**	
Second year's summer semester					
1	TCV004	National defence education	0	4 weeks	CDE
5th Semester (16 weeks + 3 weeks for exams)					
1	MAT004	Calculus 3	4	4	FIT
2	MAT007	Probability Theory (Science elective)	3	3	FIT
3	MAE002	Dynamics	3	3	FIT
4	GMA004	Introduction to MAE Practice	3	3	FIT
5	MAE006	Engineering Materials	3	3	FIT
6	MAE005	Mechanics of Solids	3	3	FIT
7	TCV001	Physical Strength Education 3	0	2	FFS
	Total		**19**	**21**	
6th Semester (16 weeks + 3 weeks for exams)					
1	MAT005	Differential Equations	3	3	FIT
2	MAE008	Thermodynamics	3	3	FIT

3	MAE003	Theory of Machines and Mechanisms	3	3	FIT
4	MLV001	Philosophy of marxism and Leninism - *For Vietnamese students only*.	3	3	DPT
	EE0017	Introduction to Digital Signal Processing - *Elective for forreign students*	3	3	FIT
5	MAE011	Mechanics of Composite Materials	3	3	FIT
6	GEE001	Electrical Sciences	3	3	FIT
7	MAE021	Independent Study in Mechanical Engineering	1	1	FIT
8	MAE007	Engineering materials LAB	1	1	FIT
9	TTV001	Workshop	0	2 weeks (80 hour)	CPW
	Total/Tổng		**20**	**20**	
7th Semester (16 weeks + 3 weeks for exams)					
1	MAE009	Fluids Mechanics	3	3	FIT
2	MAE017	Product Design with CAD	3	3	FIT
3	MAE004	Design of Machine Elements	4	4	FIT
4	EE0010	Systems Analysis	4	4	FIT
5	MAT006	Applied Math for MAE	3	3	FIT
6	MLV002	Political economics of marxism and leninism - *For Vietnamese students only*.	2	2	DPT

7	MLV005	Scientific socialism- *For Vietnamese students only*.	2	2	DPT
6+ 7	GEE011	Energy Conversion - *Elective for forreign students*.	**(3)**	**(3)**	**FIT**
8	MAE023	Machines and Mechanisms Lab	1	1	FIT
	Total		**22 (21)**	**22 (21)**	
8th Semester (16 weeks + 3 weeks for exams)					
1	MAE010	Heat Transfer	3	3	FIT
2	MAE015	Manufacturing Processes	4	4	FIT
3	GMA006	Higher Level Language	3	3	FIT
4	MAE012	Fluid Mechanics and Heat Transfer Lab	1	1	FIT
5	MAE016	Design Process and Methods	3	3	FIT
6	MLV003	History of Vietnamese communist party - *For Vietnamese students only*.	2	2	DPT
	EE0003	Solid State Electronic Devices - *Elective for forreign students*.	(3)	(3)	
7	MAE013	Tribology	3	3	FIT
8	MAE022	Design Project in Mechanical Engineering	1	1	FIT
	Total		**20 (21)**	**20 (21)**	
9th Semester (16 weeks + 3 weeks for exams)					
1	MAE018	Manufacturing Automation	3	3	FIT
2	MLV004	Ho Chi Minh's ideology - *For Vietnamese students only*.	2	2	DPT

3	GEE002	Engineering Economy	3	3	FIT
2	GMA005	The Evolution of Earth and Solar System	3	3	FIT
5	MAE014	Computer and Instruments	3	3	FIT
6	EE0020	Control Systems	3	3	FIT
	Total		**17 (15)**	**17 (15)**	
10th Semester					
1	TTV002	Internship in Industry	6	8 weeks	FIT
2	MAE020	Mechanical Engineering Project	6	7 weeks	FIT
	Total		**12**	**12**	
Total			**153**	**207**	

Note:

- *In each major semester, there is one week off*
- *72 credits of General English, 06 credits Physical Education 1,2,3 and National defence education is not included in the Electrical advanced Program.*

Dean of FIT **Rector of TNUT**

Dr. Nguyen Tien Hung **Nguyen Duy Cuong**

9. **COURSE DESCRIPTIONS OF THE APM PROGRAM**

1.1 Integrated skills - elementary

1.1.1 Course name:

Vietnamese: Kỹ năng tổng hợp - Sơ cấp

English: Integrated skills - Elementary

1.1.2. Course code: GEN101

1.1.3. Course duration: 9 credits

Total hours	Lecture hours	Practice hours	Laboratory hours
135	105	30	0

1.1.4. Prerequisites:

None

1.1.5. Course description:

This course is designed to provide English language learners with a range of vocabulary and grammatical structures at the elementary level. Students also study the integrated skills including listening, speaking, reading and writing.

1.2 Learner training 1

1.2.1 Course name:

Vietnamese: Đào tạo người học Tiếng Anh trình độ sơ cấp

English: Learner Training 1

1.2.2 Course code: GEN102

1.2.3. Course duration: 7 credits

Total hours	Lecture hours	Practice hours	Laboratory hours
105	75	30	0

1.2.4. Prerequisites:

None

1.2.5. Course description:

This course is designed to provide English language learners with a range of vocabulary and grammatical structures at the elementary level, which then helps them to use English in real life communication as well as for academic purposes, working targets or entertainment activities.

1.3 Listening skill 1

1.3.1. Course name:

Vietnamese: Kỹ năng nghe 1

English: Listening skill 1

1.3.2. Course code: GEN103

1.3.3. Course duration: 4 credits

Total hours	Lecture hours	Practice hours	Laboratory hours
60	45	15	0

1.3.4. Prerequisites:

None

1.3.5. Course description

Listening Skill 1 is a required course for all 1st year students of Advanced Program. It focuses on comprehension of different types of spoken English including casual conversations, instructions, directions, requests, descriptions, apologies and suggestions.

1.4 Reading skill 1

1.4.1. Course name:

Vietnamese: Kỹ năng đọc 1

English: Reading skill 1

1.4.2. Course code: GEN104

1.4.3. Course duration: 4 credits

Total hours	Lecture hours	Practice hours	Laboratory hours
60	45	15	0

1.4.4. Prerequisites:

None

1.4.5. Course description:

This course is designed to provide English language learners with a range of vocabulary at the high elementary level and basic reading skills, which then helps them to use English in real life communication as well as for academic purposes, working targets or entertainment activities.

2.1 Speaking skill

2.1.1. Course name:

Vietnamese: **Kỹ năng nói**

English: **Speaking skill**

2.1.2. Course code: GEN201

2.1.3. Course duration: 3 credits

Total hours	Lecture hours	Practice hours	Laboratory hours
45	30	15	0

2.1.4. Prerequisites:

None

2.1.5. Course description

This course is designed to orient the students on the different principles involved in speaking. It is a known fact that Vietnamese students have a hard time speaking in English. It is in the light of this finding and the desire to teach students the craft of speech communication that this course is created to help the students overcome their weakness in speaking and develop the art of speaking.

2.2 Learner training 2

2.2.1. Course name:

Vietnamese: **Đào tạo người học Tiếng Anh trình độ trung cấp**

English: **Learner Training 2**

2.2.2. Course code: GEN202

2.2.3. Course duration: 7 credits

Total hours	Lecture hours	Practice hours	Laboratory hours
105	75	30	0

2.2.4. Prerequisites:

Learner Training 1

2.2.5. Course description:

This course is designed to provide English language learners with the knowledge of English grammar from pre-intermediate to upper-intermediate level related to Structure and Written Expression section in the TOEFL ITP test.

2.3 Listening skill 2

2.3.1. Course name:

Vietnamese: Kỹ năng nghe 2

English: Listening Skill 2

2.3.2. Course code: GEN203

2.3.3. Duration: 7 credits

Total hours	Lecture hours	Practice hours	Laboratory hours
105	75	30	0

2.3.6. Prerequisites:

Listening Skill 1 (GEN103)

2.3.5. Course description:

In this Listening Skill 2 course, students will practice listening skills from the Pre-Intermediate to Intermediate level and they will be introduced and practice listening skills for the TOEFL-ITP test.

2.4 GEN204 - Reading skill 2

Allocate studying time:

- Lecture in class : 73 periods
- Self-study : 150 periods
- Process test : 02 periods

Prerequisites:

Reading skill 1 (GEN104)

Course description

This course is designed with a view to giving students an introduction to and practice of reading comprehension skills from low to high intermediate level. Moreover, its aim is also to equip students with reading skills of a TOEFL test.

3.1 GMA001 - Engineering principles (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is the first-level course intended to introduce students to various aspects of Engineering and the fundamental principles used in engineering analysis and design. It also introduces students to the engineering professions and aspects of professionalism including ethics and etiquette. Moreover, it presents engineering problem solving methods and several common engineering models.

3.2 PHY001 - Physics 1 (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

This is a first course in general physics for engineering, mathematics and computer science majors. Topics covered include the calculus-based study of vectors, particle kinematics, Newton's laws, friction, conservation of energy and momentum, gravitation and rotation. Emphasis is placed on problem solving and applications to laboratory experience.

3.3 TCV001 - Physical strength education 1 (2 credits / does not accumulate)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Self-study : 60 periods
  - Process test : 02 periods
- *Summary description of module content:*

The content was issued according to Decision No. 3244/GD – DT (dated September 12, 1995) and Decision No. 1262/GD – DT (dated April 12, 1997) by the Minister of Education and Training on the provisional issuance of the Higher Education Program (Phase I) used for Pedagogical Universities and Colleges

3.4 GMA202 - Introduction to engineering drawing and CAD (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

Engineering drawing is a basic course for all undergraduate Engineering program. Though engineering drawing is considered as the language of engineers, most of the universities offer this course as a practical course without any lecture component. This course is therefore introduced to provide the basic understanding of the fundamentals of Engineering Drawing, mainly visualization, graphics theory, standards and conventions of drawing, the tools of drawing and the use of drawings in engineering applications.

3.5 MAT001 - Introductory linear algebra (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is an introduction to the theory and applications of systems of linear equations and linear operations, focusing on these on finite dimension spaces. Applying widely of this theory, especially in the engineering, is very useful for the developing of the model technology. The linear objects are always simplest and do not take much time to handle. And the results we get are normally very nice. Moreover, many complicated processes can be linearization locally, then solve the problems on each local.

3.6 MAT002 - Calculus 1 (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

Calculus 1 is concerned with change and motion; it deals with quantities that approach other quantities. Calculus 1 is the beginning of a three-semester sequence in calculus for students of mathematics, natural sciences, and engineering.

3.7 ENG104 - English for academic purposes (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is based on reading comprehension tasks. It focuses mainly on improving students' understanding the literal meaning of words, the explanation of words and phrases, critical thinking, application skills and creation skills.

4.1 MAE001 - Statics (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is designed to give you an introduction to engineering mechanics in static systems. Statics deals with two- and three-dimensional systems of particles and rigid bodies in static equilibrium. Additional topics include concentrated and distributed forces, centers of gravity and centroids, and moments of inertia. Special attention is devoted to forces in frames, structures, beams, and cables. For many of you, this will be your first engineering course. In fields such as mechanical or civil engineering, statics is indispensable in the design and analysis of structures that must hold their shape while bearing a load or performing a task where dynamic forces (forces arising from acceleration of the system) are absent or negligible.

4.2 Principle of communication (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

"Principles of communication" is a course designed to develop the communication skills for engineering students in the context of creativity, negotiation, interpersonal and problem-solving environment. The course introduces and experiences students with reading academic documents, writing technical definitions, descriptions, instructions and engineering reports. The whole attitudinal framework that enables effective and purposeful exchange of information for learning and working in engineering environment is also provided.

4.3 MAT003 - Calculus 2 (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

  Calculus 2 is a second course in the calculus of one variable intended for technology, biology, computer science, and economics. Topics include applications of Integrations, Parametric Equations and Polar Coordinates, and Infinite Sequences and Series.

4.4 PHY002 - Physics 2 (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

To provide students a calculus-based introductory course primarily for chemistry, engineering, and physics majors. Covers the electric field, Gauss' law, electric potential, capacitance, DC circuits, RC circuits, magnetic field, Faraday's law, inductance, LR circuits, AC circuits, and Maxwell's equations.

4.5 PHY003 - Physic laboratory (1 credit)

- *Allocate studying time:*
  - Lecture in class : 30 periods
  - Self-study : 30 periods
- *Summary description of module content:*

Provide students abilities of conducting experiments on mechanics, as well as electricity and magnetism.

4.6 CHE001 - General chemistry (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

General Chemistry investigate states of matter, atomic and molecular structure, stoichiometry, thermochemistry, and the periodictable. This course includes gases, solutions, intermolecular forces, kinetics, equilibrium, acidbase theory, and electrochemistry.

4.7 ENG106 - English for engineering (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is based on reading comprehension tasks, real life conversations of different engineering topics so that students are exposed to a number of technical terms and everyday technical English expressions. This course focuses on the skills of reading comprehension, speaking and listening.

4.8 TCV002 - Physical Strength Education 2 (2 credits / does not accumulate)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Self-study : 60 periods
  - Process test : 02 periods
- *Summary description of module content:*

The content was issued according to Decision No. 3244/GD – DT (dated September 12, 1995) and Decision No. 1262/GD – DT (dated April 12, 1997) by the Minister of Education and Training on the provisional issuance of the Higher Education Program (Phase I) used for Pedagogical Universities and Colleges

5.1 MAT004 - Calculus 3 (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

This is the third and the final part of our standard three-semester calculus sequence. The distinct feature of this part of the course is its focus on the multi-dimensional analysis, as opposed to one-dimensional analysis that students learned Calculus 1 and Calculus 2.

5.2 GEE001 - Electrical Sciences (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Electrical Science is a fundamental course that introduces the basic concepts of electric circuits, and methodologies that are widely used in theoretical and applied electrical engineering. Basic laws such as Ohm's and Kirchhoff's laws, methods of analysis like nodal and mesh method, and circuit theory, *e.g.*, Thevenin's and Norton's theorems will be covered. The step response of first-order and second-order circuit and introductory-level AC circuits will also be included.

5.3 MAE002 - Dynamics (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is an introduction to the dynamics of mechanical systems. Topics covered include kinematics and kinetics of particles as well as rigid bodies in planar motion, work-energy concepts, momentum and Lagrange's equations for multi-degree of freedom models of mechanical systems.

5.4 GMA004 - Introduction to MAE practice (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is an overview of engineering in industry that introduces engineering design concepts, basics of manufacturing processes, elementary modeling of engineering systems, and technical communications.

5.5 MAE006 - Engineering materials (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Engineering Materials is an interdisciplinary field concerned with inventing new materials and improving existing materials by developing a deep understanding of the microstructure-composition-processing relationship.

5.6 MAE005 - Mechanics of solids (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course studies the mechanical behavior of solid bodies under various types of loading, and the resulting deformations.

5.7 TCV003 - Physical Strength Education 3 (2 credits / does not accumulate)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Self-study : 60 periods
  - Process test : 02 periods
- *Summary description of module content:*

The content was issued according to Decision No. 3244/GD – DT (dated September 12, 1995) and Decision No. 1262/GD – DT (dated April 12, 1997) by the Minister of Education and Training on the provisional issuance of the Higher Education Program (Phase I) used for Pedagogical Universities and Colleges

6.1 MAT005 - Differential equations (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Differential equations are mathematical equations that relate some functions of one or more variables with their derivatives. They provide the students a course of analytic solutions, qualitative behavior of solutions to differential equations. Topics include first-order and higher-order ordinary differential equations, including nonlinear equations, Linear systems, and Laplace transforms.

6.2 MAE008 - Thermodynamics (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Thermodynamics, is a required course for mechanical engineering students. It is a branch of physics concerned with heat and temperature and their relation to energy and work. The behavior of these quantities is governed by the laws of thermodynamics, irrespective of the composition or specific properties of the material or system in question. Its application is emphasized in different states of substances to solve problems in engineering.

6.3 MAE203 - Theory of machines and mechanism (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course is the field of engineering theory, analysis, design and practice in which mechanisms, kinematics and dynamics of machines are studied in general.

6.4a BAS123 - Marx - Lenin philosophy (3 credits)

For Vietnamese students only.

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Philosophy of Marxism and Leninism course is the first compulsory module in the political theory modules system in training program. The module content include 03 chapters which is studying the laws of motion, the most common development of the nature, society and thought; building the worldview, scientific methodology, revolution then applying to cognitive science revolution practice.

6.4b EE0017 - Introduction to Digital Signal Processing (3 credits)

Elective for foreign students

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Introduction to discrete signals and linear systems using difference equations, z transforms, and discrete Fourier transforms. Design of digital filters. Sampling theorems. Multirate DSP techniques. Applications of DSP in theory and practice. MATLAB programming of DSP applications.

6.5 MAE011 - Mechanics of composite materials (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Composite materials is a course that study the concept of composite materials and the behavior of composite materials from elastic behavior to their strength of laminas and laminates. The level of study is macro and micro

6.6 MAT007 - Probability theory (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course aims at introducing students to quantitative uncertainty analysis and rink assessment for engineering applications. Emphasis is on probability theory and its applications, with smaller module at the end covering basis topics in statistics (parameter estimation, hypothesis testing). The probability part includes events and their probability, the Total Probability and Bayes' Theorems, discrete and continuous random variables and vectors, statistical moments, and various probability models such as the exponential, gamma, normal, uniform, beta distributions. Throughout the subjects, emphasis is on application to engineering and everyday life problems.

6.7 MAE221 - Independent Study in Mechanical Engineering (1 credit)

- *Allocate studying time:*
  - Self-study : 30 periods
- *Summary description of module content:*

Courses entitled Independent Study are individual research in a field of special interest under the supervision of a faculty member, the central goal of which is a substantive paper or written report containing significant analysis and interpretation of a previously approved topic. Typically, a student and professor or teacher agree upon a topic for the student to research with guidance from the instructor. The topic of interest does not necessarily fit into a traditional academic curriculum.

6.8 MAE007 - Engineering materials Lab (1 credit)

- *Allocate studying time:*
  - Lecture in class : 30 periods
  - Self-study : 30 periods
- *Summary description of module content:*

Involves experiments designed to illustrate the relationships among the processing, internal structure and properties of engineering materials, emphasizing metals and their heat treatment, microstructure and mechanical properties, includes laboratory report writing and work in groups.

This course plays a role as providing students with hands-on experiences in metallography, heat treatment and mechanical testing, in order to help students obtain deep understandings about engineering materials and develop their engineering analysis and research skills.

7.1 MAE009 - Fluid mechanics (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Fluid Mechanics, is a required course, a very important fundamental one for a mechanical engineering engineer to have essential understandings about basic theory, the behavior, its described equations, and the applications of more than a half-part of the world (fluid and gases).

7.2 MAE017 - Product design with CAD (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

The course “Product Design with CAD” provides the students the knowledge and skills of utilizing CAD software to design and analysis mechanical products according to functionalities, appearance, and manufacturing costs of the products.

7.3 MAE204 - Design of machine elements (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

The course is a basic introduction to the design, function and analysis of mechanical components. The primary focus is analysis from a failure perspective. The course is spent understanding failure of these components under static and dynamic loading and learning about the basic functionality and behavioral modeling of common mechanical components and analyzing those components under the learned failure theories.

7.4 EE0010 - System analysis (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

Physical and mathematical modeling of electrical and mechanical dynamic systems. Transient response of first-and second-order systems. Laplace transform techniques for solving differential equations, transfer functions, frequency response and resonance.

7.5 MAT006 - Applied math for MAE (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Considering the solution of engineering problems using computational methods, this course emphasizes the development of the numerical algorithms to provide solutions to common problems formulated in engineering in particular, and in science as well. The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. The emphasis of the course will be the thorough study of numerical algorithms to understand (1) the guaranteed accuracy that various methods provided, (2 credits) the efficiency and scalability for large scale systems.

Topics include the standard algorithms for numerical computation:

root finding problem for nonlinear equations and optimization of functions,

interpolation and approximation of functions by simpler computational building blocks (for example, polynomials), and linear regression.

numerical differentiation and divided differences

numerical quadrature and integration,

numerical method to Linear Algebra,

An important component of numerical analysis is the computational implementation of algorithms which are developed in the course in order to observe at first hand the issues of accuracy, computational work effort, and stability. Exercises will include computational experiments in a programming language of the student's choice. One class lecture will be devoted to a high-level pseudo-code type programming language (MATLAB) which will suffice in case students have not had prior programming experience. Attendance is required and the exams will be over the lectures and homework.

7.6 BAS215 - Political economics of Marxism and Leninism (2 credits)

For Vietnamese students only

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Self-study : 60 periods
  - Process test : 02 periods
- *Summary description of module content:*

This module content presents the theory of Marxist-Leninist political economy and some problems of Vietnam economy, such as: Market economy in socialist orientation; industrialization; modernization and International economic integration of Vietnam economy in current.

7.7a BAS305 - Scientific socialism (2 credits)

For Vietnamese students only

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Self-study : 60 periods
  - Process test : 02 periods
- *Summary description of module content:*

This course presents the basic contents of Scientific Socialism such as: Historical mission of labouring caste; Socialism and the transition period to Socialism; Socialist democracy and the socialist government; social structure-caste system and caste alliances, caste during the transition period to socialism; ethnic, religious and family issues in the transition period to socialism

7.7b GEE011 - Energy Conversion (3 credits)

Elective for foreign students.

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Physical principles of electromagnetic and electromechanical energy conversion devices and their application to conventional transformers and rotating machines. Network and phasor models; steady-state performance

7.8 MAE203 - Machines and mechanisms Lab (1 credit)

- *Allocate studying time:*
  - Lecture in class : 30 periods
  - Self-study : 30 periods
- *Summary description of module content:*

Machines and Mechanisms Lab provide an experimental foundation for the theoretical concepts introduced in Machines and Mechanisms lectures. This course provides the practical knowledge about various mechanisms & their applications in order to help students obtain deep understandings about kinematic of machines and develop their engineering analysis and research skills. It also familiarizes students with experimental apparatus, the scientific method and methods of data analysis so that they will have some idea of the inductive process by which the ideas were originated.

There are various types of equipment in this lab like cam-follower mechanism, various types of gear & gear train, screw tester, worm and wheel apparatus, bearings etc. Students have to perform at least three experiments from the list.

8.1 MAE010 - Heat transfer (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Heat Transfer, is a required course for mechanical engineering students. The course presents the three modes of heat transfer: conduction, convection, and radiation. One-dimensional steady states of heat conduction are studied for planar, cylindrical, and spherical coordinates. Two-dimensional steady state is also studied in the general form for heat conduction relations. Convection heat transfer is studied and in details mainly in external flows and two-phase transport. Radiation heat transfer is studied by considering both the general characteristics of radiation as well as the properties of radiating surfaces and radiation heat transfer process.

8.2 MAE015 - Manufacturing processes (4 credits)

- *Allocate studying time:*
  - Lecture in class : 58 periods
  - Self-study : 120 periods
  - Process test : 02 periods
- *Summary description of module content:*

The course "Manufacturing processes" is a professional course for undergraduate Mechanical Engineering training. This course will introduce the Mechanical engineering students to Manufacturing Processes and prepare them for an entry-level career in any industrial set up. Students learn basics of Engineering Metrology & Tolerance, Casting, Forming, Metal Removal processes, Powder Metallurgy, Surface Processes, Assembly Technology and manufacturing engineering problems with special emphasis on Mechanical Engineering issues such as design and manufacturing.

8.3 GMA006 - Higher level language (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

C++ (pronounced cee plus plus) is a general-purpose programming language. It has imperative, object-oriented and generic programming features, while also providing the facilities for low level memory manipulation.

8.4 MAE012 - Fluid mechanics and Heat transfer Lab (1 credit)

- *Allocate studying time:*
  - Lecture in class : 30 periods
  - Self-study : 30 periods
- *Summary description of module content:*

Fluid mechanics and Heat transfer lab is a required course for mechanical engineering students. The course provides an experimental foundation for the theoretical concepts introduced in the heat transfer and fluid dynamic lectures. It also familiarizes students with experimental apparatus, the scientific method, and methods of data analysis so that they will have some idea of the inductive process by which the ideas were originated. The course introduces the methods used for estimating and dealing with experimental uncertainties, including simple ideas in probability theory and the distinctions between random (statistical) and systematic "errors."

8.5 MAE016 - Design process and methods (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

The course discusses the fundamental concepts and activities of design processes. Investigates domain-independent topics of design processes. These topics include idea conception, teamwork, quality, experimental design, optimization, and technical communication. In addition, discusses fundamental methods of design, including decision making, conceptual design, embodiment design, cost evaluation, ethics issues, and intellectual property issues, which are investigated through interactive lectures and individual and group exercises

8.6a BAS217 - History of Vietnamese communist party (2 credits)

For Vietnamese students only.

This course provides for student the knowledge about the formation of the Vietnamese Communist Party, the leadership process of the Vietnamese Communist Party throughout the revolutionary period from 1930 to present. Thereby confirming the successes, summarizing the experience of the Party's leadership in the revolution in order to improve the student’s awareness and belief in the Party, then able to apply the learned knowledge to work and contributing to the construction and defense of the Vietnam Country.

8.6b EE0003 - Solid State Electronic Devices (3 credits)

Elective for foreign students.

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Solid state physics basis of modern electronic devices. Introductory quantum mechanics. Energy bands in solids. Electronic properties of semiconductors. Junction diodes. Bipolar transistors. Field effect transistor.

8.7 MAE013 - Tribology (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Tribology, is a required course for mechanical engineering students. The course presents the nature of surfaces and contacts between the surfaces. The phenomena of friction, wear and the role of lubrication to reduce friction and wear is studied deeply throughout the course.

8.8 MAE022 - Design project in mechanical engineering (1 credit)

- *Allocate studying time:*
  - Self-study : 30 periods
- *Summary description of module content:*

In this design project, students are asked to design a reduction gearbox that will take power from the shaft of an electric motor and deliver it to a machine that is to operate a specific task. Project main topics focus on gear transmission design, shaft calculation and bearing selection.

9.1 MAE018 - Manufacturing automation (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

The course is an introduction to the fundamentals of production systems that are used to manufacture products and the parts assembled into those products. Topics covered in the course include automation and control technology, main components in an automation system, sensors and vision systems, NC technology, Programmable Logic Control PLC, robotics, Material Handling System and Flexible Manufacturing System FMS.

9.2 BAS110 - Ho Chi Minh's ideology (2 credits)

For Vietnamese students only.

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Self-study : 60 periods
  - Process test : 02 periods
- *Summary description of module content:*

Ho Chi Minh' Ideology is the compulsory module in the training program of college and university students in which non-speciallist of Marxisim Leninism or Ho Chi Minh' Ideology major. This module aims to equip for students with Ho Chi Minh's viewpoint system about the basic issues of the Vietnamese revolution.

9.3a MLV004 - Engineering economy (3 credits)

For Vietnamese students only.

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Engineering Economy is an introductory course that introduces the basic models of microeconomic theory, and mathematical reasoning that is widely used in theoretical and applied microeconomics. Consumer decision theory, demand curves for goods, producer decision theory, production process and associated cost function, cost-minimizing and profit-maximizing behavior of firms, and introductory-level deregulated electricity market will be covered.

9.4b GMA005 - The evolution of the earth and solar system (3 credits)

Elective for foreign students.
- Allocate studying time:

- Lecture in class : 43 periods
- Self-study : 90 periods
- Process test : 02 periods

- Summary description of module content:

Evolution of the Earth and Solar System is scientific course studying origin, formation and evolution of the Earth and Solar System

9.5 **MAE14 -** Instrumentation and computer (**3 credits)**

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Introduces data acquisition using A/D converters. Theory of A/D and D/A converters, fundamentals and examples of transducers used for mechanical measurements, static and dynamic response, amplifiers, theory of A/D and D/A converters, error analysis, elementary statistics.

9.6 EE0020 - Control systems (3 credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Self-study : 90 periods
  - Process test : 02 periods
- *Summary description of module content:*

Control system optimization and compensation techniques, digital control theory, computer simulation studies.

10.1 TVV002 - Internship in industry (6 credits)

The course is practical working of solving engineering problems in the real industry. The primary focus As an integral part of engineering education, the course “Internship in Industry” provides students with an opportunity to gain work experience that will enhance and complement their academic learning; Enables correlation of class room learning with its application in industry; Broadens understanding of the types of employment available in the field; Helps students discover their individual interests; Builds resume credentials for the students; and develops relationships between TNUT and industrial companies.

10.2 MAE220 - Mechanical engineering project (6 credits)

Student must gain enough 146 credits to make the subject. Students should not take this course unless you have senior standing and have passed MAE 451(Design Process and Methods). A working knowledge of engineering principles and the design process will be essential.

10. Teaching Facilities

10.1. Existing laboratories

10.1.1. Chemistry and Physics Laboratory

- For experiments of Physics I, Physics II and Physics lab: TNUT supplements and co-ordinates with Hanoi University of Natural Sciences in order to offer the experiments for which contents are suitable with Advanced Program.

- For experiments of Physics general Chemistry: TNUT supplements and co-ordinates with Hanoi University of Natural Sciences in order to offer the experiments for which contents are suitable with Advanced Program.

10.1.2. Mechanical engineering laboratory

- The laboratory is to help the experiments of the subject "An introduction to practicing Mechanics"

- It helps the experiments of the subjects "Manufacturing processes"

10.1.3. computing laboratory

- The laboratory is to assist the experimental activities of the subject "Technical drawing and CAD". This is to give assistance to practicing contents of the Advanced program.

10.1.4. Technical Heat laboratory

- The laboratory is to provide technical – know how for the subject of "Heat transfer and Heat transfer lab".

10.1.5. Materials Technology laboratory

- TNUT takes the expenditure from ADB project to improve the experimental activeties of the subject "Material for Engineering".

10.1.6. Automation laboratory

- The laboratory is to give aid to the experiments of the subject "General technical Electronic".

10.1.7. Measurement laboratory

- The laboratory is to help the experiments of the subject "Computer and measurement device".

10.2 The list of labs for the Advanced program

10.3. Library

10.4. Other facilities

- Advanced program student has their own studying theathe satisfying the requirement of partner university with full devices for teaching and studying.

- The university has a block of dormitory for the advanced program students only to stay.