ASEAN University Network

Self-Assessment Report

at Program Level

July 2013

Bachelor of Engineering Program in Computer Engineering,
Department of Electrical and Computer Engineering,
Faculty of Engineering, Naresuan University,
Phitsanulok, Thailand

Table of Content

1. Introduction

1.1. Executive Summary

To ensure the high quality level of computer engineering education, the Department of Electrical and Computer Engineering (ECPE), Faculty of Engineering, Naresuan University has conducted a self-assessment in 15 criteria, 68 indicators according to the guideline suggested in the *Guide to AUN Actual Quality Assessment at Programme Level* published by AUN Secretariat. Many aspects of the program are reviewed. They include the curriculum structure, applied teaching and learning strategies, quality and quantity of students and staffs, services and supports provided by the university (mainly the Department of ECPE and the faculty) and stakeholder opinions. Based on the gathered information, no area is assessed below 4 (= adequate as expected) and the overall result is rated at 5 (= better than adequate). Table 1.1-1 shows the opinion on each criterion. Note that the highest score of 6 (= example of best practices) is given to the Criterion 4 Teaching and Learning Strategy according to the successful applications of adapting teaching/learning strategies. This process of self-assessment has reinforced the assessed program by revealing obvious relationships among key factors in each assessed criterion. The process has also identified the weak points of the program and thus allow us to further improve it. Based on the evaluated information, plans for improvement have established and they are divided into short, medium, and long terms. The involved staffs strongly believe that the identified weaknesses will be reduced or eliminated while some new strengths will emerge before an official assessment is conducted.

Table 1.1-1 the overall opinion on each criterion

No.	Description	Score
1	Expected Learning Outcomes	5
2	Program Specification	5
3	Program Structure and Content	5
4	Teaching and Learning Strategy	6
5	Student Assessment	5
6	Academic Staff Quality	5
7	Support Staff Quality	4
8	Student Quality	5
9	Student Advice and Support	5
10	Facilities and Infrastructure	4
11	Quality Assurance of Teaching and Learning Process	5
12	Staff Development Activities	5
13	Stakeholders Feedback	5
14	Output	5
15	Stakeholder Satisfaction	5
	OVERALL VERDICT	**5**

1.2. Organization of the Self-Assessment

The self-assessment process is begun at about 12 months before the self-assessment report (SAR) submission (July 2013). The involved staffs can be divided into two teams. They are (i) program development staffs who are academic staffs of the ECPE Department and (ii) university staffs.

The first team is lead by the Head of ECPE Department and they are lecturers on most of the major courses in Computer Engineering (CPE) program. Beside AUN-QA, this team also responses for the regular curriculum improvement and keeps trace of Thai Qualifications Framework for Higher Education (TQF:HEd). There are 9 staff members in this team. They are working individually on either one or two assigned criteria. The relationships among different criteria are developed during internal meetings (inside the department). Official and unofficial meetings/discussion concerning AUN-QA are regularly performed.

The second team is the involved university staffs. Their main responsibility is to facilitate the first team in the developing of the SAR. This includes document translation (from Thai to English), document filing, review and collect related information and arrangement the meetings with AUN-QA related staff from outside the university. The faculty and university administrators supervise the whole self-assessment process.

1.3. Overview of the University, Faculty and Department

Naresuan University (NU) is conveniently located in Phitsanulok province in the lower North of Thailand. NU is named after the Great King Naresuan and was developed from the College of Education in 1967 and later established as the Phitsanulok Campus of Srinakharinwirot University in 1974. The university was officially granted university status on July 29, 1990. NU has been emphasizing decentralization of education and equality of study opportunity for people in the lower northern part of Thailand and other regional provinces. Figure 1.1-1 shows the timeline of the university. *The vision of NU is to become a research-based university before 2017.*

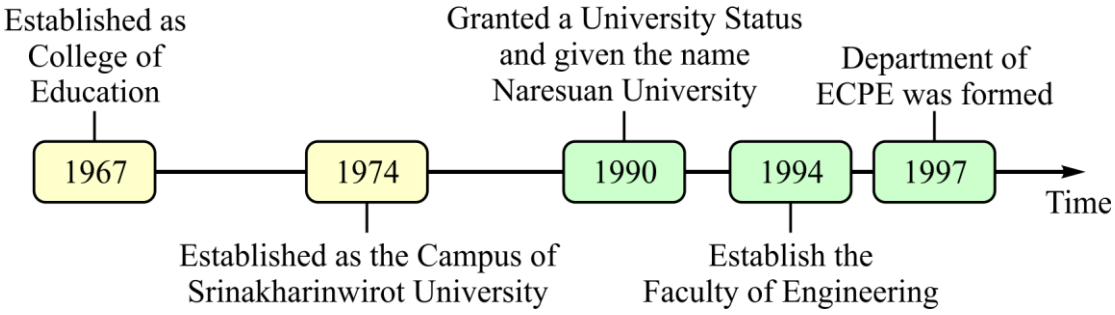


Figure 1.1-1 Timeline of the Naresuan University, Faculty of Engineering and Department of ECPE

The University Mission: In pursuit of a 'free from ignorance society,' the university has pledged to fulfill the following four key missions: well-qualified students, research excellence, a wide range of academic services, and arts and culture conservation.

Objectives of NU: To be an excellent university that focuses on producing and developing human resources at a high level, which is reflected in our interdisciplinary academic and research studies.

1. To serve as a memorial of loyalty to King Naresuan the Great for his lifetime dedication in freeing the Thai people.

2. To act as a comprehensive higher education institution striving to achieve its motto "Thai people to be free from ignorance." The university dedicatedly aims to produce well-qualified students, who are well-rounded, professionally trained, moral, and ethical. The students are expected to be models who bring peace and happiness to the society sustainably.

3. To become one of the leading universities engaged in potential human resource development. It also acts as a source of research and multidisciplinary curricula to help drive the country to be a paragon of knowledge hub.

4. To achieve academic excellence and international recognition by initiating alliances with domestic and international institutions.

5. To serve as the knowledge hub of the lower northern region covering 9 provinces.

6. To implement technology transfer for teaching and learning and research.

7. To conserve arts and culture, including the environment.

8. To become a place of academic decentralization in the region.

Quality Policy, which was officially announced by the president of NU, are the following:

1. Organizations at every level have to initiate short-term and long-term plans or implement either a strategic plan or an action plan (annually) which brings current and likely future issues into consideration of the said action. This includes well-thought analyses of weaknesses and strengths and participation of stakeholders.

2. The university encourages faculties and academic supporting organizations to establish curriculum development systems and mechanism in accordance with the Thai Qualification Framework. This will enhance student centered teaching methodology and result in production of well-qualified students who are hard working, healthy, well-rounded, intellectually updated, and capable of problem-solving skills. More importantly, the students should have initiative corresponding to the university's identity.

3. Academic staff members and researchers are encouraged to come up with research works and innovations, which are integrated into academic service and/or

properly adapted into teaching instructions. Research outcomes should also be published nationally or internationally.

4. Academic staff members are enthusiastic to commit to academic achievements in order to receive a better promotion. This expands to obtaining of rights, patents, and petty patents.

5. University staff members work independently based on their academic interests for which public health and energy for the environment are primarily emphasized.

6. The university strives to become the institution of knowledge contributing to development of the region.

7. Appreciation of arts and culture is conserved.

8. Good governance is equally practiced at all levels of organizations in the university to assure that transparency, risk management, budgeting, and quality are appropriately administered.

9. Faculties are committed to quality assurance development and comply with Education Criteria for Performance Excellence.

10. Organizations at the division level are in line with sustainable quality development framed by Thailand Quality Award.

The Faculty of Engineering was established in 1994 (See Figure 1.1-1). At first, there were only two bachelor programs: civil engineering and industrial engineering. Other programs have been opened since then. As of 2013, eight bachelor programs and eight master programs, and four Ph.D. programs have been established. The Faculty has a vision to be a center for enhancing the body of technological knowledge for developing human resources and the Thai community that leads to self-reliance and international competitiveness.

According to the faculty vision, the Faculty of Engineering is committed to the following missions:

1. Produce quality graduates with a body of knowledge who are self-reliant and of high morals and ethics.

2. Strengthen personnel and research in an integrated fashion.

3. Create a result-oriented management system.

4. Transfer knowledge in order to lead to a self-reliant society.

In order to achieve our missions, the following objectives have been set:

1. The graduate is equipped with knowledge and skills that meet the requirements of the labor market.

2. The graduate is of high morality and ethics.

3. The strength of cultural capital is promoted.

4. Faculty members produce high quality academic work.

5. An efficient internal management system is in place.

6. A database system is ready for usage.

7. Risk management is an integrated part of the information technology (IT) system.

8. Customers are happy with the academic services.

Quality Policy of the Faculty of Engineering augments the university's quality policy with the following policy:

1. Encourage the students to apply the quality improvement process in their learning processes

2. Provide the insights into how various processes are and what may be improved to achieve better outcomes

The Department of ECPE was formed in 1997, three years after the establishment of the Faculty of Engineering. In 1997, a Bachelor of Electrical Engineering and a Bachelor of Computer Engineering have been offered. After that in 2005, 2012 and 2013, a Master of Electrical Engineering, a Ph.D. of Electrical Engineering and a Master of Computer Engineering have been offered, respectively. A Ph.D. of Computer Engineering is planned to be offered in 2014. Figure 1.1-2 shows the timeline of the programs offered by the department.

The philosophy of the department is to produce the electrical and computer engineers with academic and research excellence, technological leadership, morals, and ethics who apply their knowledge to develop publicly useful applications. The Department of ECPE employs the same quality policy as the Faculty of Engineering.

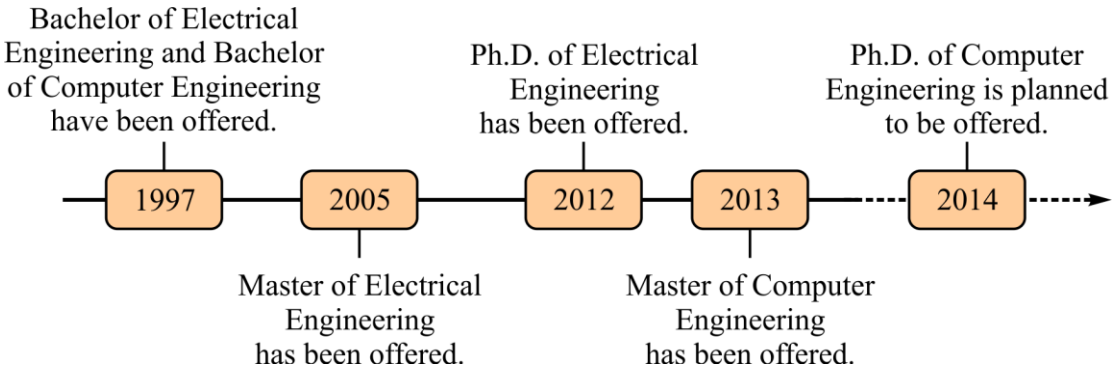


Figure 1.1-2 Timeline of the programs offered by the Department of ECPE

2. AUN Criteria

2.1. Expected Learning Outcomes

2.1.1. The expected learning outcomes have been clearly formulated and translated into the program.

The expected learning outcomes of the graduate are formulated and explicitly stated in the CPE curriculum [Exh. 2.1(1)].

The graduate should possess the following characteristics:

1. Have integrated fundamental knowledge and skills in CPE, particularly in human and computer interaction (HCI), embedded system and software engineering.

2. Be ready to work with professional engineering ethics and are appreciation of Thai culture.

3. Be inquisitive and life-long learners.

4. Be creative in thinking and applying CPE knowledge.

The curriculum development staffs have meetings to gather information from stakeholders (administrators, staffs, students, alumni, and employers) and then analyze and synthesize to establish the expected learning outcome.

Sources for developing expected learning outcome are requirements from stakeholders, whom can be categorized into 5 groups. The sources from each group are listed as follows:

- Stakeholder group 1 (administrator): It consists of two sources, i.e., (1) TQF:HEd [Exh. 2.1(2)], in particular, the latest 2009 standard qualification for undergraduate degree programs in computing [Exh. 2.1(3)] issued by the Office of the Higher Education Commission, which supervises all universities in Thailand and (2) Faculty of Engineering, who proposes NU Engineering identity as SMART Engineer [Exh. 2.1(4)]. The identity is derived from the identity of the NU [Exh. 2.1(5)]. The TQF:HEd is the most important requirements for developing the expected outcomes.

- Stakeholder group 2 (staff): varieties of abilities and specializations of staff [Exh. 2.1(6)] and the 2004 curriculum guidelines for undergraduate degree programs in CPE [Exh. 2.1(7)].

- Stakeholder group 3 (student): survey of requirements from student in skill and knowledge [Exh. 2.1(8)].

- Stakeholder group 4 (alumni): survey of requirements from alumni in skill and knowledge [Exh. 2.1(8)].

- Stakeholder group 5 (labor market): survey of requirements from labor market in skill and knowledge [Exh. 2.1(8)].

On the basis of the most important requirement listed above, the characteristics mapping is formed. This characteristic mapping maps between the expected learning outcome and the five domains of desired characteristics as shown in Table 2.1-1 [Exh. 2.1(9)].

Table 2.1-1 Characteristics Mapping of expected learning outcomes and desired characteristics

		TQF:HEd desired characteristics				
		Ethics and Morals	Know-ledge	Cognitive Skill	Interper-sonal Skill	Analytical Skill
Expected Learning Outcome	Have integrated fundamental knowledge and skills in CPE		✓			✓
	Be ready to work with professional engineering ethics and are appreciation of Thai culture	✓				✓
	Be inquisitive and lifelong learners			✓	✓	
	Be creative in thinking and applying CPE knowledge		✓	✓		✓

2.1.2. The program promotes lifelong learning

The program lays down the foundation for lifelong learning through the seven strategies shown in Figure 2.1-1. The seven strategies are developed with a view to complement each other to encourage students to commit themselves to self-study, try out new ideas, transfer knowledge and skills in different contexts, integrate knowledge and skills into multiple courses, and continue their education beyond what they have learned during the class. Moreover, the faculty of Engineering provides adequate resources for students, such as classroom, laboratories, faculty library, Wi-Fi, and workspace. Student can access to learning opportunities including faculty library, university library, internet, faculty excellent centers, and so on.

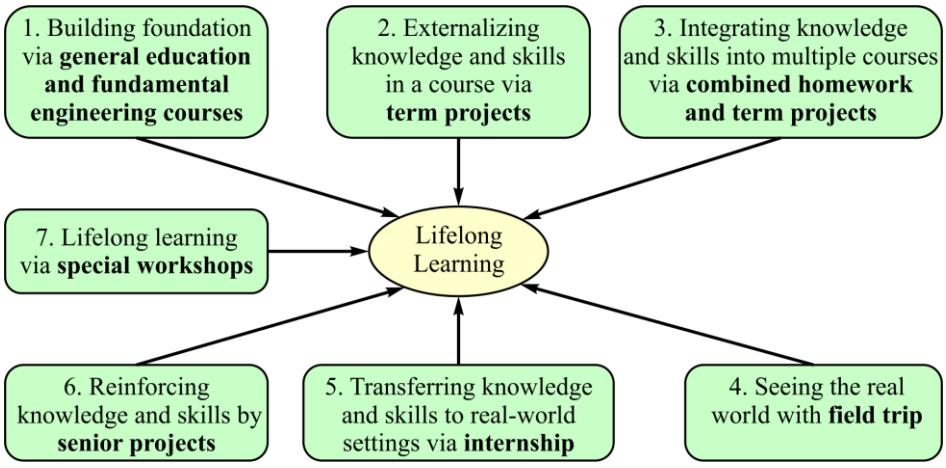


Figure 2.1-1 Seven strategies for promoting lifelong learning

1. Building foundations via general education and fundamental engineering courses

To successfully pursue lifelong learning, students need to have adequate fundamental knowledge and skills such as language skills both Thai and English, social skills, human skills, and science skills. NU builds these foundations via general education courses (33 credits).

In addition, in order to prepare the students for the upcoming ASEAN Economic Community (AEC) and to reinforce the language skills, the university has added three more English courses for upper undergraduate students. These courses aim at enhancing the students' English language skills so that they are ready for real-world work [Exh. 2.1(1)]. The courses are (1) 205200 Communicative English for Specific Purposes (2) 205201 Communicative English for Academic Analysis and (3) 205202 Communicative English for Research Presentation.

The Faculty of Engineering augments the generic skills with courses focusing on specific engineering skills. These courses totally have 21 credits in fundamental mathematics and sciences and 9 credits in fundamental engineering concepts [Exh. 2.1(1)]. Additionally, the 2012 curriculum adds a few more courses. This include 305111 Fundamental Skills in Computer Engineering, which is suggested by alumni and employers. This course serves two main purposes: first it gradually exposes the students to the world of CPE by providing the overview of required and elective courses to the students; second, it introduces the necessary skills for good engineering, such as time recording, data analyzing, time management, estimating, planning, scheduling, prioritizing, time budgeting, work velocity, searching for information, summarizing information, 7 habits of highly effective people, and team work [Exh. 2.1(10)].

2. Externalizing knowledge and skills in a course via term projects

This strategy focuses on building students' ability to transfer what they have learned during the course to a small real-world project. Depending on the course, the project may be done individually, as a team, or both. The courses listed in Table 2.1-2 are samples of courses which require students to do term projects.

3. Integrating knowledge and skills in multiple courses via combined homework and term projects

Instead of learning each course independently, students are encouraged to combine term projects in several courses or to enhance term projects from previous courses in the current ones. In addition, starting in 2008, two courses—305433 Algorithm Analysis and Design (AAD) and 305453 Software Engineering combined

Table 2.1-2 List of Courses with term projects

Year / Semester	Course	Type of term project
1/1	305171 Computer Programming	Individual
2/1	305272 Advanced Computer Programming	Individual or team
2/2	305214 Data Structures	Team
3/1	305381 Microcontroller and Microcomputer Interfacing	Team
3/1	305361 Database	Individual
3/2	305344 Computer Network	Both
3/2	305383 Operating Systems	Individual
4/1	305450 Artificial Intelligence	Team
4/1	305453 Software Engineering	Team
Elective	305434 Digital Image Processing	Team

the homework and term projects by requiring students to use software engineering practices in doing homework for the AAD course. Not only does this approach reduces the workload for the students, but it also requires students to integrate the concepts from two courses simultaneously. Based on the success of this approach, The Department of ECPE plans to extend this strategy to other courses as well. With this approach, students practice integrating knowledge and skills. As a result, students are more ready to integrate knowledge and skills from different subjects.

4. Seeing the real world with a field trip

The Department of ECPE annually arranges a two-day field trip for the junior CPE students during the first semester of their third year in the CPE program. During the visit, students are required to observe and identify what knowledge and skills they have studied and what are used in each organization. Students are encouraged to ask questions during the field trip. Each trip will visit at least 4 organizations—either government agencies or commercials. The exposure to the real-world environment will help students prepare for their internship at the end of the academic year. This also encourages them to go beyond what is taught during the class.

5. Transferring knowledge and skills to real-world settings via an internship

The curriculum requires that the students take at least a 270-hour internship in the industry after completing the third year of study. Before taking the internship, students are required to do research on the workplace: the business of the workplace, location, type of work expected from the students, and the knowledge and skills required to do the work. The summary of the research is then reported and presented. In addition, an orientation is arranged by the Faculty of Engineering and the Department of ECPE to give an overview and recommendations about the proper demeanor during the internship.

6. Reinforcing knowledge and skills by senior projects

The engineering programs at NU require students to integrate everything they have learned into a senior project. The project is carried out in two semesters. Students will propose the problems and approaches for solving the problems under the supervision of their project advisors. In the process of achieving the solutions, students will be required to think, plan, implement, communicate, and assess their work.

The process of doing the senior project is similar to the process of doing a thesis at the master level, but to a lesser extent (see Section 2.3.2 for the detailed senior project process). In short, students need to defend their senior project proposals to the committee in the first semester and defend their completed projects in the second semester. In addition, the senior projects usually require students to undertake the study by themselves—a foundation for lifelong learning.

7. Lifelong learning via special workshops

Since IT is ever-changing, what students learn today may become obsolete by the time they graduate. Therefore, each year ECPE Department arranges two or three workshops to update faculty members, supporting staff members, and students with the latest knowledge or skills. For instance, in 2010 the department arranged a two-day workshop on network and system administration, a two-day workshop on security. In 2011, a 5-day workshop on Agile Software Development and a 3-day workshop on ISO 29110 were arranged. In 2012, a 3-day workshop on Basic Concept of User Experience was conducted. Another workshop on Software Testing is also planned. The audience for the workshops is not limited to the current students. Alumni, faculty members, and supporting staff are also encouraged to attend. These workshops provide the opportunities for the students to learn outside the classroom and further sharpen their knowledge and skills.

2.1.3. The expected learning outcomes cover both generic and specialized skills and knowledge.

Table 2.1-3 shows how the expected learning outcomes can be classified into generic and specialized categories. The generic parts focus on students' attitude, personality, generic competencies, and ability to do advanced studies. The specialized parts emphasize students' technical identity, technical competencies, and cultural awareness.

Table 2.1-3 Classification of expected learning outcome

	Generic	Specialized
Knowledge	- Fundamental CPE	- HCI - Embedded system - Software engineering
Skills	- Fundamental skill in CPE	- Creative thinking - Integrating of knowledge and skills
Attributes	- Inquisitive - Lifelong learners - Ready to work - Having strong professional ethic	- Appreciation of Thai culture

2.1.4. The expected learning outcomes clearly reflect the requirements of the stakeholders.

As mentioned earlier in the Section 2.1.1, the expected learning outcome of the graduate were derived from the inputs from 5 stakeholder groups. The stakeholder mapping (Table 2.1-4) shows the mapping between the inputs from the stakeholders and the expected learning outcomes of the graduate for the 2012 curriculum.

AUN-QA Criterion 1 – Checklist

1	**Expected Learning Outcomes**	1	2	3	4	5	6	7
1.1	The expected learning outcomes have been clearly formulated and translated into the program.					✓		
1.2	The program promotes life-long learning.					✓		
1.3	The expected learning outcomes cover both generic and specialized skills and knowledge.					✓		
1.4	The expected learning outcomes clearly reflect the requirements of the stakeholders.					✓		
	Overall opinion					✓		

Table 2.1-4 Stakeholder mapping — expected learning outcome as derived from stakeholder inputs

Expected Learning Outcomes	Office of the Higher Education Commission and University	Academic Staff	Students	Alumni	Employers
1. Have integrated fundamental knowledge and skills in computer engineering, particularly in HCI, embedded system and software engineering	Knowledge and analytical skills (TQF) Technology (Faculty)	Graduate with knowledge and skills in - HCI - Embedded system - Software Engineering	- Programming Skills - Embedded system - Mathematics - Able to create and program a workable embedded system - Able to think, create, and apply knowledge to the real situations	- Software developer ready to work after graduation - Graduate with knowledge and skills in Programming, Network, Database and Software engineering	Graduate with knowledge and skills in Hardware, Software, Programming, Network and Data Communication, User Design Experience, Software Engineering, and Business and Process
2. Be ready to work with professional engineering ethics and appreciation of Thai culture	Ethics and morals, interpersonal skills and analytical skills (TQF) Spirit, moral, and reliability (Faculty)	- Teamwork - Appreciation of Thai culture	- Unselfishness - Honesty - Punctuality - Tolerance - Accountability	- Tolerant - Kind-hearted	- Good human relations - Good communication - High ethics - Diligence - Honesty - Respect the rules of society and law
3. Be inquisitive and lifelong learners	- Cognitive skills and interpersonal skills (TQF) - Activation (Faculty)	- Self-studying	- Always striving for new knowledge	- Willing to learn	- Able to learn new technology and able to apply appropriately both in terms of effectiveness and efficiency
4. Be creative in thinking and applying computer engineering knowledge	- Knowledge, cognitive skills and analytical skills (TQF) - Technology (Faculty)	- Designing skills - Mathematics skills - Able to think, create, and apply knowledge to the real situations	- Programming skills - Problem-solving skills - Designing skills	- Problem solving	- Creative

2.2. Program Specification

2.2.1. The University uses program specification.

Currently, there are three CPE curricula in use. They are CPE 2008, 2010, and 2012 curricula. They have been approved and the usage began in 2008, 2010, and 2012, respectively.

All program specifications are available in electronic format and hard copy (Details are provided in Section 2.1.3). The following program structure and course listing are extracted from the published program specification [Exh. 2.1(1)].

Table 2.2-1 CPE program structure

Category	Credits			
1. General Education	30			
1.1 Language Skills		12		
1.2 Humanities		6		
1.3 Social Science		6		
1.4 Science		6		
2. Specialized courses				
2.1 Core courses	30			
2.1.1 Fundamental Courses in Mathematics and Science		21		
2.1.2 Fundamental Courses in Engineering		9		
2.2 Major courses	82			
2.2.1 Required Course		70		
2.2.1.1 Major Required Courses			67	
- Application Technology				6
- Software Methods and Technologies				11
- Systems Infrastructure				22
- Computer Hardware and Architecture				22
2.2.1.2 Projects				6
- Required Courses in English Language			3	
2.2.2 Major Electives		12		
3. Free Electives	6			
4. Required Course (no credit)[1]	(6)			
Total	**148**			

Program structure comprises 4 categories which are general education courses, specialized courses, free electives, and training.

1. General education courses are provided by the university. General education courses have 30 credits in total which include language skills courses (12 credits), humanities courses (6 credits), social science courses (6 credits), and science courses (6 credits). Language skills courses will increase student ability in language especially English. Students will have an aesthetic sense after taking humanities courses. Social science courses provide students with a greater understanding of their role in society. Science course will enable students to live with nature wisely.

[1] Condition for graduation: every engineering student must enroll in the course for internship—305390 Training in Computer Engineering (at least 270 hours)—and the student must pass the evaluation.

2. Specialized courses are provided by the Faculty of Science, Faculty of Engineering, and the Department of ECPE. Specialized courses have 118 credits in total which include core courses (30 credits) and major courses (82 credits). Core courses are divided into fundamental courses in mathematics and science and fundamental courses in engineering which are provided for students to achieve general knowledge and skills. Major courses are provided for students to achieve specific knowledge and skill.

3. Students can freely select 6 credits of courses offered by the university in total which are called free electives.

4. Training is one of the required courses that students need to take. Students need to work in an outside company or enterprise for at least 270 hours. This industrial training enables students to enhance their knowledge, working experience, and social life skills.

2.2.2. The program specification shows the expected learning outcomes and how these can be achieved.

The expected learning outcomes can be achieved when students take courses as stated in program structure. Table 2.2-2 shows a map between the expected learning outcome and program structure.

Table 2.2-2 Mapping between the expected learning outcome and program structure

Expected Learning Outcomes	Program Structure
Have integrated fundamental knowledge and skills in computer engineering, particularly in HCI, embedded system, and software engineering	Specialized courses
Be ready to work with professional engineering ethics and appreciation of Thai culture	General education and training
Be inquisitive and lifelong learners	General education, major courses and free electives
Be creative in thinking and applying computer engineering knowledge	Major courses and term project

2.2.3. The program specification is informative, communicated, and made available to the stakeholders.

Every program specification at NU conforms to the following layout [Exh. 2.2(1) and Exh. 2.1(1)]:

1. General information
2. Specific information
3. Curriculum management
4. Learning outcome, learning strategy, and assessment

5. Student evaluation
6. Instructor development
7. Quality assurance
8. Curriculum evaluation and improvement

All program specifications is published in both hard copy and electronic formats.

Electronic copy

The easiest way to access the program specifications is via the websites. All the following websites are publicly accessible. More specifically, prospective students, current students, parents, alumni, and employers can freely retrieve the information from the web sites.

- **http://reg.nu.ac.th** The specifications of all programs are made available online through the university registrar website.
- **http://web.eng.nu.ac.th** All engineering program specifications are also made available online from the Faculty of Engineering websites.
- **http://www.ecpe.nu.ac.th** The CPE Program specification is accessible from the ECPE Department website.

Hard copy

Every engineering student will receive two handbooks on the orientation days. One is the NU Student Handbook. It contains the program structure, study plan, and course descriptions of all programs. Another is NU Engineering Student Handbook, which contains the program structure, study plan, and other information specific to engineering programs.

Course syllabus

In addition, the instructor for each course will make the course syllabus available in hard copy format or electronic format or both. Starting from the 2012 academic year, the syllabi are standardized by the university and they are called TQF3. Typical course syllabi contain information about course number, credits, course title, pre-requisite, responsible department, course category, offering time, class time, instructor names, course manager, course description, course objectives, and lesson plan. The syllabi are published prior to the beginning of each semester.

AUN-QA Criterion 2 – Checklist

2	**Program Specification**	1	2	3	4	5	6	7
2.1	The university uses program specification.					✓		
2.2	The program specification shows the expected learning outcomes and how these can be achieved.					✓		
2.3	The program specification is informative, communicated, and made available to the stakeholders.					✓		
	Overall opinion					✓		

2.3. Program Structure and Content

2.3.1. The program content shows a good balance between generic and specialized skills.

The program structure shown in Section 2.2.1 (Table 2.2-1 [Exh. 2.1(1)]) shows a good balance between courses that promote generic and specialized skills. Overall distribution of courses is shown in Table 2.3-1. General education (30 credits) focuses on building foundation skills necessary for pursuing lifelong learning and student identity through general education. Core courses (30 credits) focus on laying the ground work for studying in engineering programs. Slightly over half of all credits (82 credits) are more specific to the CPE major reflecting the strong emphasis on specialized skills per inputs from stakeholders. The remaining 6 credits (4.05%) are free electives which students select.

Table 2.3-1 Overall distribution of courses

Category	Credits	Percentage
General education	30	20 %
Core courses	30	20 %
Major courses	82	55 %
Free electives	6	4 %
Total	**148**	**100 %**

2.3.2. The program reflects the vision and mission of the University.

With the aim to become a research-based university as stated in university vision, the CPE curriculum development put a particular emphasis on research. First, the computer project courses were expanded from 3 credits to 6 credits in order to increase the intensity of the project content. In addition, these two courses are treated as a mini-thesis where the process of developing the thesis at the graduate level is used at a lesser extent. The generic process is shown in Figure 2.3-1.

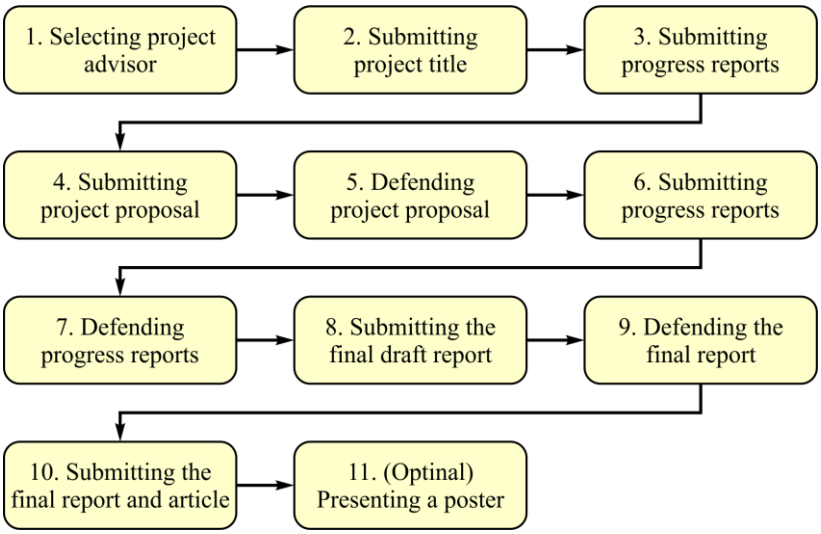


Figure 2.3-1 The generic senior project process

2.3.3. The contribution made by each course to achieve the learning outcomes is clear.

Each course specifies its contribution toward the five domains of expected learning outcomes in the curriculum mapping (See Table 2.2-2). Combining the curriculum mapping with the characteristics mapping (Table 2.1-1), the contribution of each courses toward the expected learning outcomes and desired characteristics are explicitly stated. Together with the stakeholder mapping (Table 2.1-4), the contribution of each course to the requirements from the stakeholders is clearly stated.

2.3.4. The program is coherent and all subjects and courses have been integrated.

The sequencing of individual courses assumes that strength in foundation areas is pre-requisite to strengths in more advanced areas. In the case of core CPE courses and specialization courses, they are arranged into a logical succession where post-requisite courses indicate increasing complexity in the subject matter as illustrated in Figure 2.3-2. This figure indicates a good coherent and integration of subjects and courses.

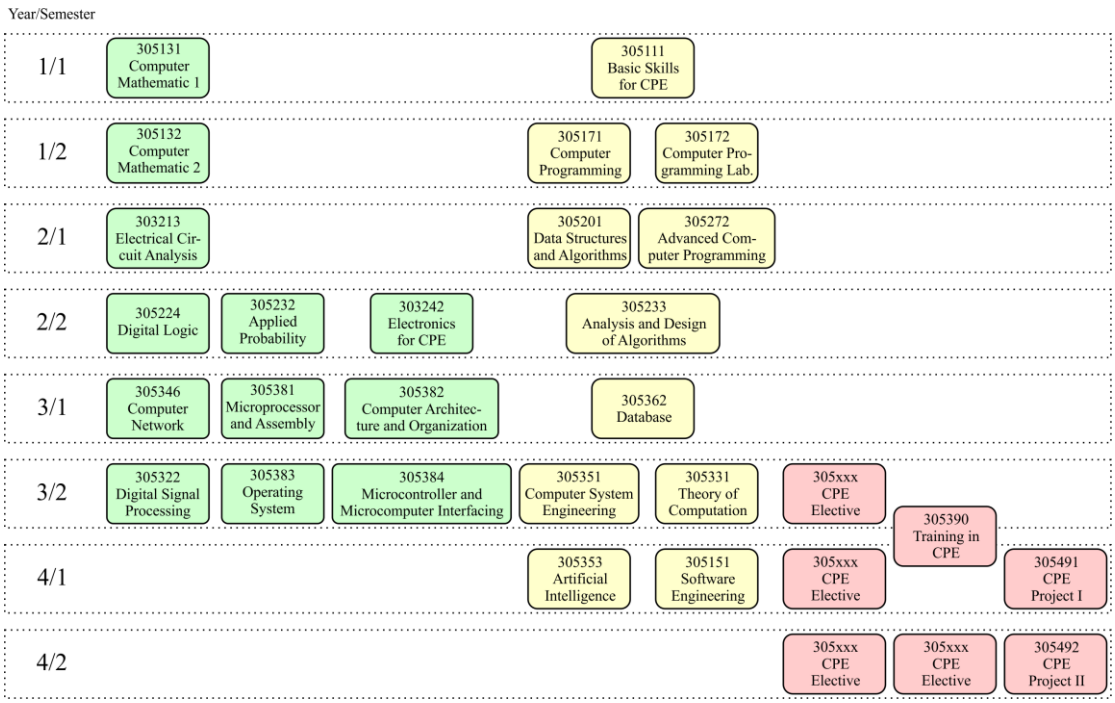


Figure 2.3-2 Course sequence showing good program coherency and integration.

2.3.5. The program shows breadth and depth.

The CPE program consists of general education (30 credits), additional English course (3 credits), core courses (30 credits), and major courses (82 credits). It shows both breadth in general education and depth in specialized CPE courses.

General Education: The 30 credits of general education courses are provided in Table 2.3-2 below.

Table 2.3-2 Distribution of general education courses and additional English language courses

Category	Credit
Language Skills	12
Humanities	6
Social Science	6
Science	6
Total	**30**
Additional English courses	**3**

Core courses: The core courses are courses related to establishing a firm foundation for more specialized engineering courses. The 30 credits of the engineering core curriculum consist of 21 credits in basic sciences such as Calculus, Physics, and Chemistry focusing on fundamental mathematics and sciences necessary for studying engineering. The remaining 9 credits introduce the students to the fundamental engineering concepts such as, engineering economics, engineering drawing, and computer programming. Table 2.3-3 shows the classification of core CPE courses.

Table 2.3-3 Distribution of core courses

Category	Credit
Fundamental Mathematics and Sciences for Engineering	21
Fundamental Engineering Concepts	9
Total	**30**

Major courses: Besides conforming to the curriculum guidelines for undergraduate degree programs in computer engineering, the major courses are selected to emphasize the desired characteristics of the graduate. Table 2.3-4 shows the distribution of major CPE courses.

Table 2.3-4 Distribution of major courses

Category	Credits
Application Technology	6
Software Methods and Technologies	11
Systems Infrastructure	22
Computer Hardware and Architecture	22
Projects	6
Required Coursed in English Language	3
Major electives	12
Total	**82**

The 6 credits of application technologies reflect how the CPE may be applied in various ways. The courses under this category include artificial intelligence and database. The 11 credits of software methods and technologies reflect the software side of the computer engineering field. The courses under this category include fundamental skills for computer engineering, computer programming laboratory, algorithm analysis and design, advanced computer programming, and software engineering.

The 22 credits of systems infrastructure reflect the nature of the CPE field that focuses strongly on systems and hardware. The courses under this category include computer mathematics, data structures, applied probability, theory of computation, computer networks, computer system engineering, and operating systems.

The 22 credits of computer hardware and architecture reflect the nature of the computer engineering field that focuses strongly on systems and hardware. The courses under this category include electrical circuit analysis, electronics, digital logic, digital signal processing, microprocessor and assembly language, computer architecture and organization, and microcontroller and microcomputer interfacing.

The 6 credits of projects reflect the expected learning outcome of having integrated knowledge and skills and the university vision of becoming a research-based university.

The 3 credits of English skills aim to enhance the life-long learning skills for the students. The courses under this category include communicative English for specific purposes, communicative English for academic analysis, and communicative English for research presentation.

The 12 credits of major electives give the students freedom to pursue the computer engineering topics they are most interested in. Students may select to become specialists in one of the three specific areas—human and computer interaction, embedded system, and software engineering by taking all 12 credits in the chosen area or they may select one or two courses from each area to be a well-rounded computer engineer.

2.3.6. The program clearly shows the basic courses, intermediate courses, specialized courses, and the final project, thesis or dissertation.

The course sequences and the study plan were deliberately designed to reinforce each other so that the students who graduate will possess the desired characteristics mentioned in Section 2.1.1. See the sequences of courses in Figure 2.3-2 for more details of the sequence of major required courses.

2.3.7. The program content is up-to-date.

Not only does the CPE 2012 curriculum reflect the needs of all stakeholders, it also addresses the latest development in the computer technology area. For instance, the courses on ubiquitous computing, service oriented architecture, embedded system, and software process were added. The course descriptions were updated to reflect the curriculum guidelines for undergraduate degree programs in CPE.

AUN-QA Criterion 3 – Checklist

3	Program Structure and Content	1	2	3	4	5	6	7
3.1	The program content shows a good balance between generic and specialised skills and knowledge.					✓		
3.2	The program reflects the vision and mission of the university.					✓		
3.3	The contribution made by each course to achieving the learning outcomes is clear.					✓		
3.4	The program is coherent and all subjects and courses have been integrated.					✓		
3.5	The program shows breadth and depth.					✓		
3.6	The program clearly shows the basic courses, intermediate courses, specialised courses, and the final project, thesis or dissertation.					✓		
3.7	The program is up-to-date.						✓	
	Overall opinion					✓		

2.4. Teaching and Learning Strategy

2.4.1. The Faculty or Department has a clear teaching and learning strategy.

At the tactical level, NU has encouraged all programs to employ learning approaches that emphasize more on how students learn than on how instructors teach—**student-centered learning**—hence, the seven strategies are developed to establish the lifelong learning capability in students. The TQF:HEd also provided a frameworks, regulations, and guidelines about teaching strategies and guidelines for monitoring, which CPE teaching staff conforms.

Several learning approaches that are centered on increasing students' perceiving ability are used in many CPE courses [Exh. 2.4(1)]. These strategies include

Simulation-based and Game-based learning: The students participate in a controlled setting that abstracts out the less important details of the real-world situation. This leaves only the key things for students to learn. These strategies visualize what they may encounter and how they would act while enjoy the fun during the game. Many CPE courses have incorporated simulations and games in the class to help students learn the complex concepts during the class [Exh. 2.4(1)].

Research-based and Project-based learning: They comply with the University vision. NU has a vision to be a research-based university by 2017, which encourages

academic staffs and students to learn through doing research and experience. In consistent with the orientation of the university, the Department of ECPE, specifically the CPE program employs a teaching and learning strategy which is characterized predominantly by project-based learning while incorporating researching activities [Exh. 2.4(1)]. The senior project in their fourth year enables the students to integrate bodies of knowledge, both prior knowledge from courses taken earlier and unexplored knowledge which they have to research in the final year [Exh. 2.4(2)].

Laboratory-based learning: It is used to support project-based learning, which enables students to learn and gain experience by doing. Students are encouraged to learn, individually and collaboratively, to construct deliverables, such as pieces of programs or electronic artifacts in either laboratory settings or taken home as their assignments under the guidance of academic staff [Exh. 2.4(1)].

Other activities: are used in addition to formative assessments. These activities include peer evaluation, paper writing, and presentation, and other assessment methods. Guest speakers from IT industry have been invited regularly to give lectures about the industry and real-life work. Not only does this approach widen the student perspectives, but it also helps the students in establishing a connection with the industry [Exh. 2.4(1) and Exh. 2.4(3)].

Internship: At the end of the students' third year encourages and requires them to apply their knowledge that they learned to real work in the industry. Students are required to do their internship during their summer semester between their third and fourth years. This also allows them to identify their strengths and weaknesses, so that they can have time in the final year to improve [Exh. 2.4(4)].

Along the learning path from the first year, the students have been informed about the concept of being a computer engineer and the rationale that they have to learn each course. In every course, the lecturers provide background and motivation at the course introduction and overview to make sure that the students know what lie ahead in the course and what are the reasons they have to learn those particular courses [Exh. 2.4(5), Exh. 2.4(6), Exh. 2.4(7) and Exh. 2.4(8)].

To reinforce the internalization of the reasons to learn, field trips to visit companies and invited speakers, especially ECPE alumni, are crucial to motivate the students. The students are also encouraged to participate in seminars, workshops, and competitions from faculty-level to international level. These activities have been conducted regularly [Exh. 2.4(9) and Exh. 2.9(10)]. Quality learning occurs when the learners are supported and offered with adequate learning environment. The library of the Faculty of Engineering offers a wide selection of readings and materials both in the fields of engineering and non-technical materials. The university library also offers resources in various fields. Section 2.10.2 describes more detail on the libraries.

To encourage learning activities outside the classroom, the department, the faculty, and the university also provide students with high-speed wireless network access so that the learning opportunity is made available to students in all appropriate areas: study halls, classrooms, conference rooms, library, etc. as described in Section

2.10.4. The Faculty of Engineering also organizes trainings on the learning management systems (LMS) for organizing courses and e-learning [Exh. 2.12(3) and Exh. 2.12(4)] as described in Section 2.12.2. The department even creates community groups and pages on Facebook and webboards for communicating among the department, current students and alumni. These channels enable an active learning environment for the students to share, compete, research, and be motivated and supported in learning throughout the program.

To monitor and to ensure that the quality learning occurs in the program, the department applied the TQF guideline, which requires the academic staff in each course of the department to submit the syllabus (called TQF3) every semester [Exh. 2.5(1)]. Each course follows the course syllabus and the teaching strategy and assessment methods based on the course curriculum. Each academic staff also prepares an individual course syllabi and presents them to the students on the first day of the course. The TQF3 are submitted to the faculty and the university for reference.

2.4.2. The teaching and learning strategy enables students to acquire and use knowledge academically.

Almost all courses offered by the Department of ECPE consists of both theoretical and practical elements. Having been equipped with the necessary foundation from the theoretical elements, the latter allows students to apply their theoretical knowledge in problem solving situations both in laboratory sessions and course projects. In addition, to complete the degree in CPE, the students are required to undertake a senior project, which is a one-year long project aiming to encourage students to integrate and apply their knowledge in solving real-world engineering problems. Moreover, in the senior project course, students are expected to do self-learning in order to solve their project problems. Senior project is a smaller counterpart of master thesis. It involves an extensively research on particular topics, analysis, and applies the research knowledge and/or prior knowledge to tackle problems. The students are required to do an extensive research on their literature review part, and to apply the knowledge to solve targeted problems.

The university also has a strategy that enables students to evaluate academic staff in their teaching activities. Academic staff are expected to take the assessment and comments from students into account and improve their teaching activities accordingly. From the records, it can be seen that the academic staff evaluations are in satisfactory levels [Exh. 2.6(3)].

2.4.3. The teaching and learning strategy is student-oriented and stimulates quality learning.

The program has been designed to ensure that courses have theoretical, practical and self-learning elements. This is shown in the course credit, i.e., *A*(*B*-*C*-*D*), where *A*

is the total credit, *B* is the number of hours per week for theoretical components, *C* is the number of hours per week for practical components, and *D* is the number of hours per week for self-learning [Exh. 2.4(10)].

To improve teaching quality, the Faculty of Engineering provides LMS such as Moodle, which are used by academic staff of the department to assist their teaching activities and to support students in their self-learning tasks. Moodle also enables academic staff to publish their teaching materials as well as conduct exercises online. Moreover, academic staff can monitor student progress in each subject through Moodle [Exh. 2.4(11)].

The department encourages academic staff to conduct their courses as project-based learning. Hence, in each course, students are assigned to do a course project and lab-based assignments. Students are also required to learn how to do research and work on a long-term project in their senior project course, which is a one-year long project that enables students to improve their skills in solving more sophisticated problems [Exh. 2.4(2)].

Moreover, the department also requires students to attend industrial training, in which students need to work in an outside company or enterprise for at least 270 hours. This industrial training enables students to enhance their knowledge and working experience that they may not be able to obtain from their study courses [Exh. 2.4(4)].

All of the above activities show that our study program is student-oriented, where students are the center of our program design and implementation. The program enables students to obtain knowledge, to apply their knowledge to real-world engineering problems, as well as to encourage students to be self-learners so that they can discover and learn new knowledge by themselves for lifelong learning.

2.4.4. The teaching and learning strategy stimulates action learning and facilitates learning to learn.

The learning strategies including the game-based, simulation-based, project-based and laboratory-based strategies enable students to learn by doing, through cooperative learning from the smallest scale; i.e., the student him/herself to a larger scale; such as, the university, the community, and the society at large.

The CPE curriculum facilitates the means of learning for students to learn. The CPE students are required to finish their internship during their summer semester of the third year. Under the internship, students are recruited by companies and organizations both domestic and international. Students are expected to practice real work with the companies. By the end of the internship, students are visited by academic staff to evaluate their performances with the companies. When students come back from their internship, they have to submit internship reports and present the reports to academic staff and the junior year students. Students whose work is satisfactory to the companies are able to continue their fourth year education, while

students who fail have to repeat their internship [Exh. 2.4(4), Exh. 2.4(12) and Exh. 2.4(13)].

The senior project in the fourth year also provides a great opportunity for students to learn by doing. By the end of their third year, students have to approach academic staff to choose research topics, which are from student idea or staff interest. Usually, senior project teams consist of 2 to 3 students. Students have freedom to select their group mates. The senior project teams have 2 semesters to complete their projects, starting from the proposal and progressing to design, implementation, evaluation, and final documentation stages of the project development. Research activities involve almost all of these stages of development. The students are guided mainly by their project advisors and members of the project defense panel committee through regular consultation. Feedback on the projects comes from various sources: their own teammates, peers, academic staff, and even from the general public (through presentations at symposia, workshops, or competitions) [Exh. 2.4(2) and Exh. 2.4(9)].

The game-based style is also used in many courses such as 305233 Algorithm Analysis and Design and 305471 Software Engineering. For instance, the students manually sort pieces of paper using different algorithms in the Algorithm Analysis and Design course. The building a house game, the guess-what game, and the test design for noodle dishes are used to stimulate learning in the Software Engineering course [Exh. 2.4(14), Exh. 2.4(15) and Exh. 2.4(16)].

AUN-QA Criterion 4 – Checklist

4	**Teaching and Learning Strategy**	1	2	3	4	5	6	7
4.1	The faculty or department has a clear teaching and learning strategy.					✓		
4.2	The teaching and learning strategy enables students to acquire and use knowledge academically.						✓	
4.3	The teaching and learning strategy is student oriented and stimulates quality learning.						✓	
4.4	The teaching and learning strategy stimulates action learning and facilitates learning to learn.						✓	
	Overall opinion						✓	

2.5. Student Assessment

2.5.1. Student assessment covers student entrance, student progress, and exit tests.

Student Entrance

To enter the program, the students must satisfy the requirements defined in the student manual [Exh. 2.4(10)]. The department requires students to first pass the national entrance exam, and then the department considers their entrance exam together with their high school grading results (six consecutive semesters). The national entrance exam evaluates student's performance on two main aspects:

(i) general aptitude

(ii) professional aptitude

The latter consists of engineering related topics such as Engineering Mathematics, Engineering Sciences, Information Technology, and so on, while the prior consists of English Language, Thai Language, Life Sciences, Physics, Chemistry, Mathematics, etc. However, according to the university policy, the department also has another entry path in which students who ranked highly in their high schools can apply directly with the department. The department conducts a separate entrance exam for this direct entry of students. Once they have passed the exam, they are required to pass an interview exam with the department's academic staff.

Student Progress

Once students are admitted to the department, each of the students has two advisors who mainly monitor the student's academic progress throughout their study in the university as well as help them on any issues that might affect their study. Each semester, the advisors provide the official office hours for advising his/her students. The advising time is checked by the department to make sure that most of the students are available. The university provides a web-based application system named E-registrar (http://www.reg.nu.ac.th) as a tool for advisors to monitor student progresses and to communicate with any particular students as needed.

Students need to satisfy the university's GPA system as shown in Figure 2.5-1, i.e., to pass the first year, students are required to have a total GPA of not less than 1.50. In order to pass the second year, the students must have a total GPA of not less than 1.75. From the third year, the students must have total GPA not less than 1.75 for any two consecutive semesters [Exh. 2.4(10)]. Table 2.5-1 shows the average GPA of the 2nd, 3rd and 4th year students of CPE program.

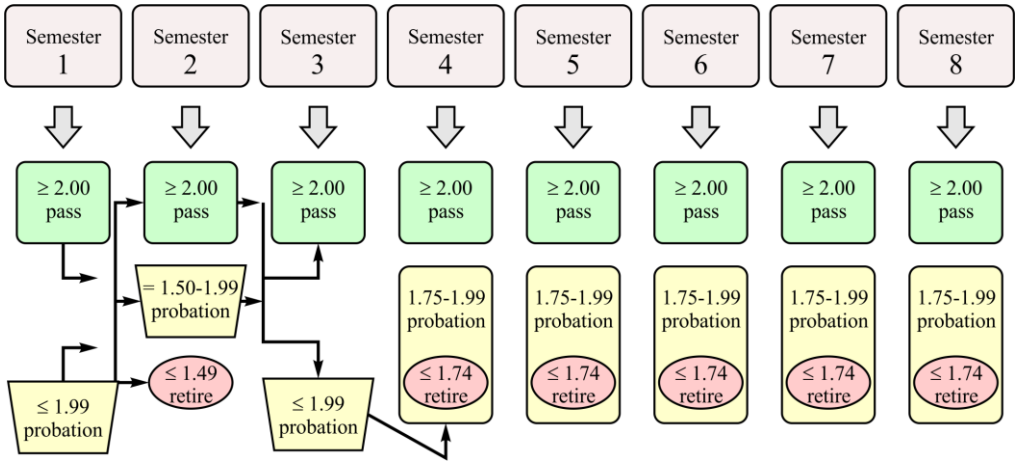


Figure 2.5-1 Academic probation chart

Table 2.5-1 Average GPA of the 2nd, 3rd and 4th year students

Class	Average GPA
2nd	2.19
3rd	2.26
4th	2.40

Student Graduation

To finish the program, each student must demonstrate his/her ability by doing a project, which is one of the important requirements. The project is started in the first semester of the 4th year and it takes at least one year to finish. In addition, to graduate, each student needs to complete 148 study credits, and have a total GPA of not less than 2.00 [Exh. 2.4(10)]. Average GPAs of students who graduated in the last four years are shown in Table 2.5-2.

Table 2.5-2 Average GPA of students graduated in year 2008-2011

Year	Average GPA
2011	2.70
2010	2.64
2009	2.66
2008	2.54

2.5.2. The assessment is criterion-referenced.

Academic staff in each course of the department is required to assess students based on the definition in the program course syllabus. And the academic staff needs to declare all components which made up the final student grades [Exh. 2.5(1)]. In general, the grading system used in the department follows the well-accepted assessment standard; i.e., the four-point grading system, which is classified into accountable and non-accountable grades as described in the Tables 2.5-3 and 2.5-4 [Exh. 2.4(10)].

Table 2.5-3 Accountable grades that are calculated into GPA

Grade	Description	Points
A	Excellent	4.0
B+	Very good	3.5
B	Good	3.0
C+	Fairly good	2.5
C	Fair	2.0
D+	Poor	1.5
D	Very poor	1.0
F	Failed	0.0

Table 2.5-4 Non-accountable grades that are not calculated into GPA

Grade	Description
S	Satisfactory
U	Unsatisfactory
I	Incomplete
P	In progress
W	Withdrawn

2.5.3. Student assessment uses a variety of methods.

In the Department of ECPE, academic staff use a combination of group, self and teacher assessment methods to assess student performance. In particular, academic staff discuss the assessment methods with students at the beginning of the semester and write it down in the course syllabus. The assessment methods depend on the nature and the needs of the course as specified in the expected learning outcome of the program defined in section 2.2.1, in which assessments are composed of different aspects as follows.

<u>Ethics and Morals</u>

- Class attendance time and assignment submission time
- Student discipline
- Student morality in examination
- Student responsibility

<u>Knowledge</u>

- Take-home assignments
- Lab tests
- Quiz
- Research reports
- Term projects
- Oral presentations
- Examinations

Cognitive skills

- Collecting and analyzing data for making decisions effectively.
- Systematic thinking, analyzing, and solving computing problems.
- Application of computing knowledge in real-world applications

Interpersonal skills and responsibility

- Ability to adapt and work with others, both as leaders and followers efficiently.
- Act appropriately according to his/her responsibility in group activities, discussions and presentations.

Analytical skills

- Analyze information for statistical or mathematical applications to solve problems creatively
- Communicate to various groups of audiences via speech and writing materials
- Use engineering tools and equipment to complete their work professionally.

2.5.4. Student assessment reflects the expected learning outcomes and the content of the program.

Each course follows the course syllabus [Exh. 2.5(1)] and assessment methods based on the definition of the program course curriculum. Hence, the assessment of each course covers the designed characteristics of the program as defined in Section 2.1.1.

In particular, courses in the department can be defined as theoretical courses, project-based courses, training, and CPE project. The assessment of each type of course is described below.

- In the theoretical courses, students are required to work on take-home assignments, research reports, oral presentations, and written examinations. The work is assessed based on the teacher's opinion.
- For project-based courses and CPE project, students need to work on lab tests and long-term projects, in which progress needs to be reported periodically. The assessments of lab tests are based on self- and peer assessment, while term-projects are grading by group-based scoring.
- For the CPE project, any issues related to CPE can be selected as the topic of the project. Both qualities of the project and outcome (students understanding what they learned in the program and can apply in the project) are the goal of the department. To achieve the goal, the department also organizes a panel to evaluate student proposals, progress, and experiments through oral presentations. In particular, at end of the 2nd semester of the 4th year, students must defend their proposals, progress and experiments in front of the committee, which consist of at least one project advisor and two or three committee members. If the committee are satisfied that the presentation and materials show evidence of sufficient growth and skill development, they will recommend that

the student pass the project. If a student does not pass, the committee will tell why and give advice on what to do next.

- Finally, the training program is evaluated through site visits by academic staff to discuss the student's working feedback with companies and organizations in many aspects as defined in the training guideline [Exh. 2.5(2)]. An example of the training course evaluation is shown in Exh. 2.5(3).

2.5.5. The criteria for assessment are explicit and well-known.

As mentioned earlier student assessments for each course are defined according to the curriculum mappings; they are published in the course curriculum. However, each academic staff also prepares an individual course syllabus which is presented to the students on the first day of the course and submitted to the faculty and the university for reference [Exh. 2.5(1)]. Depending on the nature of the course, the course syllabus and assessment methods are also provided online on the courses' websites [Exh. 2.5(4)].

For project and training, assessments are not only specified in the course syllabus, but the department also organizes an orientation for explaining to students about the objectives, procedures, and assessments of the training and thesis courses. The department provides a thesis and training guideline to students as shown in Exh. 2.4(2), Exh. 2.4(4) and Exh. 2.5(5).

2.5.6. The assessment methods cover the objectives of the curriculum.

As mentioned in Sections 2.5.4 and 2.5.5, each course syllabus is conducted according to the program course curriculum as well as the expected learning outcomes of the department. Academic staffs create their assessment methods based on the specification of the program course curriculum and the expected learning outcomes [Exh. 2.5(1)]. Therefore, the assessment methods of each course can cover both the objectives of the curriculum and the expected learning outcomes.

2.5.7. The standards applied in the assessment are explicit and consistent.

Standards used in the assessment are clearly stated on the first day of each course as well as in the program course curriculum. The grading system can be either group-based or score-based depending on the nature of the courses and consideration of the course conductor. Most courses are also published in the course syllabus and the assessment methods on the course website [Exh. 2.5(4)]. Academic staffs are also required by the department to submit their course syllabus as well as assessment methods to the Vice Dean's office at the end of the semester [Exh. 2.4(5), Exh. 2.4(6), Exh. 2.4(7) and Exh. 2.4(8)]. The Vice Dean's office can, therefore, monitor whether the assessment methods correspond to what is defined in the program course

curriculum. Moreover, in courses for which multiple academic staff are involved (e.g., CPE project) a subject coordinator is assigned to coordinate all course activities. All the involved academic staff are those who designed the course components, assessment methods, and so on. For the evaluation aspect, each academic staff is responsible for assessing his/her components. This enables the department to ensure that student assessments are consistent throughout the course. At the end of the course, students are asked to evaluate the teaching; the academic staff can then use the evaluation results to improve their teaching contents as well as the assessment schemes and methods in the subsequent semesters. Moreover, the university has a reasonable appeal procedure in which students can request academic staff clarify their assessments within five years.

AUN-QA Criterion 5 – Checklist

5	**Student Assessment**	1	2	3	4	5	6	7
5.1	Student assessment covers student entrance, student progress, and exit tests.					✓		
5.2	The assessment is criterion-referenced.					✓		
5.3	Student assessment uses a variety of methods.					✓		
5.4	Student assessment reflects the expected learning outcomes and the content of the programme.					✓		
5.5	The criteria for assessment are explicit and well-known.					✓		
5.6	The assessment methods cover the objectives of the curriculum.					✓		
5.7	The standards applied in the assessment are explicit and consistent.					✓		
	Overall opinion					✓		

2.6. Academic Staff Quality

2.6.1. The staffs are competent for their tasks.

The CPE program is under the Department of ECPE in which there are academic staff members who have background knowledge in both CPE and electrical engineering (EE) fields. In the academic year 2012, more than 80% of the staff members were Ph.D. holders while the remaining held master's degrees as shown in Table 2.6-1. Since the department and the CPE program have been established for about 15 years, most of the academic staffs have strong experience in academic teaching and have continuously improved their teaching skills and methodologies in order to achieve the desired learning outcomes.

Table 2.6-1 Number of Staff [Exh. 2.6(1)]

Category	Male	Female	Total number		Number of Ph.D.
			People	FTEs	
Professors	0	0	0	0	0
Associate/ Assistant Professors	7	1**	8	8	8 (100%)
Full time Lecturers	10*	6	16	16	12 (75%)
Part time Lecturers	0	0	0	0	0
Visiting professors/ lecturers	0	0	0	0	0
Total	17	7	24	24	20 (83%)

* Four staffs are not listed here because of study leave.

** One staff is not listed here because of study leave.

FTE = Full-Time Equivalent

Table 2.6-2 Field of Expertise and Experience

Field of Expertise	Experiences			Total
	< 2 years	2 – 5 years	> 5 years	
Electrical Engineering	3	2	5	10
Human and Computer Interaction	1	0	3	4
Embedded System	1	3	1	5
Software Engineering	0	4	1	5
Total	4	9	10	24

Each staff member is engaged in research in his/her area of interest according to the vision of the university that aspires to be a research-oriented university. It is easy for each staff to get research funding from both internal (at a faculty-level and a university-level) and external funding with good support from the university [Exh. 2.6(2)]. All staff members have been regularly engaged to integrate the knowledge from their research into the class as it is one important aspect of the faculty internal quality assurance.

Regularly, there is a teaching performance evaluation performed by the students at the end of each semester for every course. Recently, the department had an average rating result in level 4 from 5 which means very satisfactory based on the institutional student evaluations from all courses opened in academic year 2010 [Exh. 2.6(3), Exh. 2.6(4), Exh. 2.6(5) and Exh. 2.6(6)].

The department has funding for each staff to take a training course according to his/her particular interest. Each one can take any appropriated training courses using as much as their limited quota of funding [Exh. 2.6(7)].

2.6.2. The staffs are sufficient to deliver the curriculum adequately.

There are currently 24 full-time academic staff members in the department based on the 40-hour residency requirement set by the university. The department undertakes a process of assessing academic staff's needs every academic year to determine if the current pool is capable of delivering existing curricular requirements.

Table 2.6-3 Ratio between staffs and students in 2009 - 2011

Academic years	Number of student for all levels	Number of full-time teaching staff	Number of students per one teaching staff
2011	633	25	25.32
2010	640	24	26.67
2009	662	21	31.52

Adequate delivery of the curriculum is accomplished by managing the student-staff ratio. The size of each class is arranged to be appropriate for each type of class (lecture and laboratory) and also the availability of the equipment. Funding for teacher assistants is available for each staff member. Most of the staffs have his/her own teacher assistant primarily assisting the staff in the laboratory-based classes.

Each staff member is assigned the number of classes based on his/her knowledge and the balance ratio of work load according to the work load regulation of the university.

2.6.3. Recruitment and promotion are based on academic merit.

Recruitment

The recruitment for new staff both for the case when there is currently insufficient staff and for the long term plan of staff preparation follows the standard process of the university and the faculty [Exh. 2.6(8)].

Typically, the department's corresponding committee will initially set up the expected qualification for the position and then process the request for new staff. The applicants' credentials are paper-screened by the department committee based on experience and academic profile. Those applicants who have appropriate qualifications will go through an interview with the department head and/or the department committee and subsequently with the dean of the faculty. Finally, the desired applicants will take the final interview with the president or committee of the university. Accepted applicants are assigned an appropriate rank depending on academic profile and experience.

Promotion

Promotion of academic staff is merit-based. It follows the standard process of the university and the faculty [Exh. 2.6(9)].

2.6.4. The roles and relationship of staff members are well defined and understood.

Each staff has his/her roles corresponding to the organizational structure of the department. Following the organizational structure, the department is headed by a the Head of Department and special functions are handled by specific staff members who directly take responsibility for each function; such as, student affairs, thesis coordination, and internal quality assurance. The department head reports directly to the dean of the faculty while most positions for specific functions are a member of the faculty level committee related to those functions.

All tasks in the department are appropriately distributed to most staffs with well-defined roles and relationships with both internal staff and other offices or units. Mostly, roles and relationships for each position are defined formally at the faculty level while others are typically defined informally at the department level from the regular department meetings or conferences.

2.6.5. Duties allocated are appropriate to qualifications, experience, and skills.

All staffs have the same workload structure based on the university workload regulation in which the weight for each task can be different for individual staff. Each staff must have his/her tasks corresponding to the minimum work load. Responsibilities of each staff are assigned based on his/her skills, knowledge, personal interests, and experiences.

The teaching class allocation of the previous academic year is used as the baseline for adjusting in the subsequent academic year. The class allocation will be adjusted every semester according to the courses opened, number of students expected to register in each course, and the availability of staff. The process of considering class allocation is performed at the department meeting, and the final decision is the authority of the department head. An example of a class allocation with a teaching workload can be seen in Exhibit 2.6(10).

2.6.6. Staff workload and incentive systems are designed to support the quality of teaching and learning.

Workload

Each staff is assigned a workload based on the university workload regulation which covers teaching, research, academic services, cultural activities and department administrative tasks [Exh. 2.6(11)]. For teaching workload, each staff member must have a 12.25-unit minimum teaching workload per semester. In general, a single class has the equivalent of a 3-unit teaching workload. The workload for each staff member is implicitly controlled by the process of class allocation which resulted from the

department meetings and by the final decision of the Head of Department who has authority over many tasks that each staff intend to perform.

Incentives

Many incentives are provided by the university to advocate academic staff. In order to support the use of IT for work, each lecturer receives 20,000 baht to purchase the computing equipments [Exh. 2.6(12)]. If a lecturer passes the criteria of promotion to be a professor, he/she will receive 200,000 baht as a reward [Exh. 2.6(13)].

There are also other incentives in the form of welfare: inexpensive accommodation, home loan, reserved fund for life, accidental compensation, death fund, pension, and providence fund (http://office.nu.ac.th/person/w6.php).

There are many rewards and funds for the researcher who publishes research articles, i.e.,

1. Expenses of presenting the research results abroad [Exh. 2.6(14)]
2. Reward for publishing research article according to the impact factor of the journal [Exh. 2.6(15)]

    a. National Journal
    - Impact factor < 1 = 3,000 baht
    - Impact factor 1-2 = 6,000 baht
    - Impact factor > 2 = 9,000 baht

    b. International Journal
    - Impact factor < 1 = 5,000 baht
    - Impact factor 1-2 = 10,000 baht
    - Impact factor > 2 = 15,000 baht

3. Rewards for research patents or petty patents [Exh. 2.6(16)]

    a. Patent = 5,000 baht

    b. Petty patent = 3,000 baht

2.6.7. Accountability of the staff members is well-regulated.

All staffs are governed by the department head and the dean, and they are expected to perform their tasks following the lecturer ethics guideline of the university [Exh. 2.6(17)]. Most department-level activities are noted in official standard documents or the minutes of the meetings. Staff activities may be reported directly to the department head or appear in any specific documents used as evidence for the regular evaluation process.

In general, each staff member must submit all of his/her tasks and activities into the online workload report system provided by the university which will be used for annual performance evaluation [Exh. 2.6(18)]. Since the information of teaching classes including the teaching schedule and the student information for each class are recorded in the registration system of the university, everyone concerned can easily monitor the teaching workload of each staff member.

Any activities performed outside the department in working hours, such as participation in conferences and training workshops must be approved by the department head or the dean following regulations. It is the task of the department head to ensure that academic staffs comply with the university and department policies. In cases of non-compliance, a formal procedure designed to provide due process is also outlined in the faculty manual for the academic staff concerned.

2.6.8. There are provisions for review, consultation, and redeployment.

Shortly after the end of each semester, the department head will begin to plan for subsequent teaching class allocation for each staff. This process will be performed via directly communicating with each staff member at the department meeting. Staffs that have the plans for any researches, activities, or special functions may consult with the department head who will be the coordinator for all staffs.

Reassigning staff to be a coordinator of any special functions of the department which have a great impact on the teaching work load is usually done shortly at the end of the academic year before the class allocation process. During the semester, if any staff has too much work load, it is the responsibility of the head of department to reallocate the academic staffs or reassign the tasks to other related staffs.

Individual academic staff can develop his/her career path according to the guidelines provided by the university [Exh. 2.6(19)].

2.6.9. Termination and retirement are planned and well-implemented.

The NU Provident Fund (called Sin Sathaporn) was founded to help university personnel in savings and welfare; this will secure their families' members in the future when the applicant has died, quits the job, resigns from the fund, or retires [Exh. 2.6(20)].

2.6.10. There is an efficient appraisal system.

A new lecturer has to be on a probation period, and if he/she passes the criteria, he/she will be a tenured lecturer. After that every tenured lecturer will be evaluated at every specific period. The head of department will evaluate each lecturer using a form of core competencies and functional competencies. The evaluation process follows the regulation of the university as seen in the relevant Exhibits [Exh. 2.6(21), Exh. 2.6(22), Exh. 2.6(23), Exh. 2.6(24) and Exh. 2.6(25)].

According to above descriptions (Sections 2.6.1-2.6.10), Faculty of Engineering and the Department of ECPE have supported the academic staffs in several ways to direct them to gain a strong experience in academic teaching and continuously improve their teaching skills and methodologies in order to achieve the desired

learning outcomes. Below checklist displays the checklist showing the self-rated opinion on academic staff quality.

AUN-QA Criterion 6 – Checklist

6	Academic Staff Quality	1	2	3	4	5	6	7
6.1	The staff are competent for their tasks					✓		
6.2	The staff are sufficient to deliver the curriculum adequately					✓		
6.3	Recruitment and promotion are based on academic merits					✓		
6.4	The roles and relationship of staff members are well defined and understood					✓		
6.5	Duties allocated are appropriate to qualifications, experiences and skills					✓		
6.6	Staff workload and incentive systems are designed to support the quality of teaching and learning					✓		
6.7	Accountability of the staff members is well regulated					✓		
6.8	There are provisions for review, consultation and redeployment					✓		
6.9	Termination and retirement are planned and well implemented					✓		
6.10	There is an efficient appraisal system					✓		
	Overall opinion					✓		

2.7. Support Staff Quality

The Department of ECPE advocates for a support staff quality development policy and its implementation. This includes library staff, laboratory staff, facilities staff, administrators, and student service staff. Furthermore, the department focuses its efforts on encouraging support staff to achieve even higher quality performance, as well as to obtain greater knowledge and skills relevant to their functions through technology, team building, and training. This will certainly contribute towards a more effective system, in both academic and management aspects. Details of individual staff are shown in Table 2.7-1.

Table 2.7-1 Support staffs

Name	Degree / Certificate	Task
Ms. Nutchanart Kaeodaeng	M.S. (Information Technology)	library staff
Mr. Thanee Gosoom	B.Eng (Electrical Engineering)	laboratory staff
Ms. Pawanrat Mannuch	B.Eng (Electrical Engineering)	laboratory staff
Mr. Kantinan Makmee	M.S. (Information Technology)	computer facility staff
Ms. Mattareeya Rachbuasri	B.S. (Computer Engineering)	computer facility staff
Mr. Wisut Keawpokpong	B.S. (Computer Science)	computer facility staff
Mr. Trirong Ruangpitak	B.S. (Industrial Technology)	computer facility staff
Mr. Nirundon Kabbua	M.S. (Information Technology)	computer facility staff
Ms. Sukanya Panukthong	B.E. (Physics)	student services staff
Ms. Kusuma Thermsuta	B.A. (Accounting Management)	student services staff

Note: see Exh. 2.7(1) for the degree descriptions

The Faculty of Engineering have "Academic and support staff development plan", that includes library staff, laboratory staff, facilities staff, administrators and student service staff plan for developing their service ability. At first, the Faculty of Engineering set the academic and support staff development plan. Next, the faculty implements this plan to the Department of ECPE, to get information about needed or interested subject for staff development. The department then sends back all records to the faculty for accepting the needed training or seminar. Then support staff must be take the action by following the plan, report conclusion to the faculty and find the way to apply the knowledge and skill to improve their service ability for each unit. This process shows in Figure 2.7-1 below.

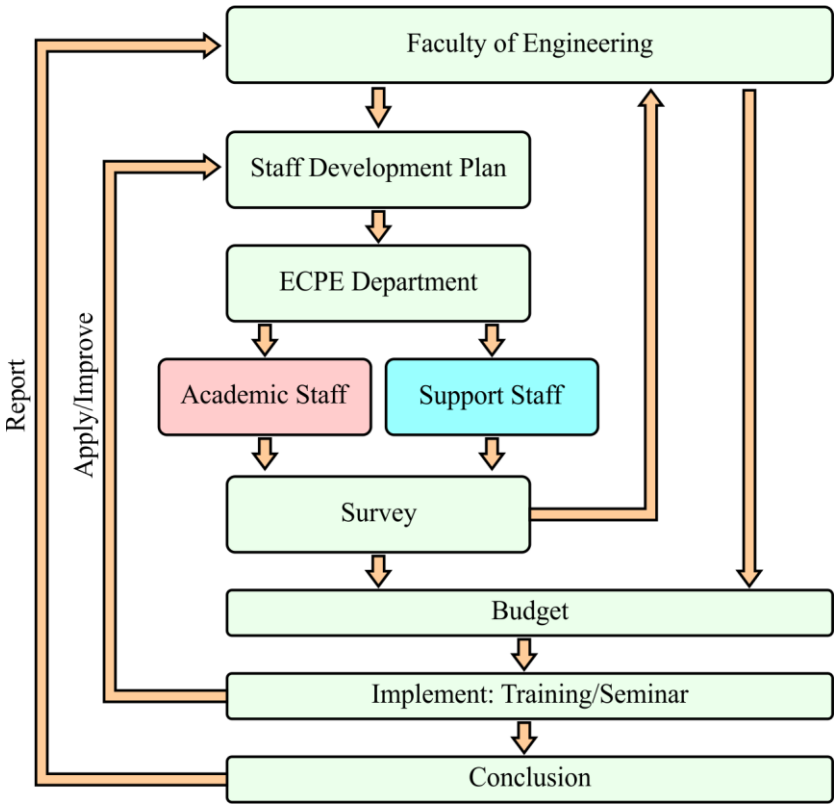


Figure 2.7-1 Support and academic staffs development chart

To monitor and improve the quality of service, the department and the faculty have assessment on the service system for each service in every semester to providing a satisfactory level of service. All support staff work follows their job description and ethical issue that focuses to support all education unit (student, academic staff or other support staff) to move forward in faculty and university's direction. After every semester, student and staff will assess the satisfactory level of service by following the below process in Figure 2.7-2. After assessment process the feedback will be send to the department and the faculty to analyze and find the way to improve the satisfactory level of service for all support staff unit.

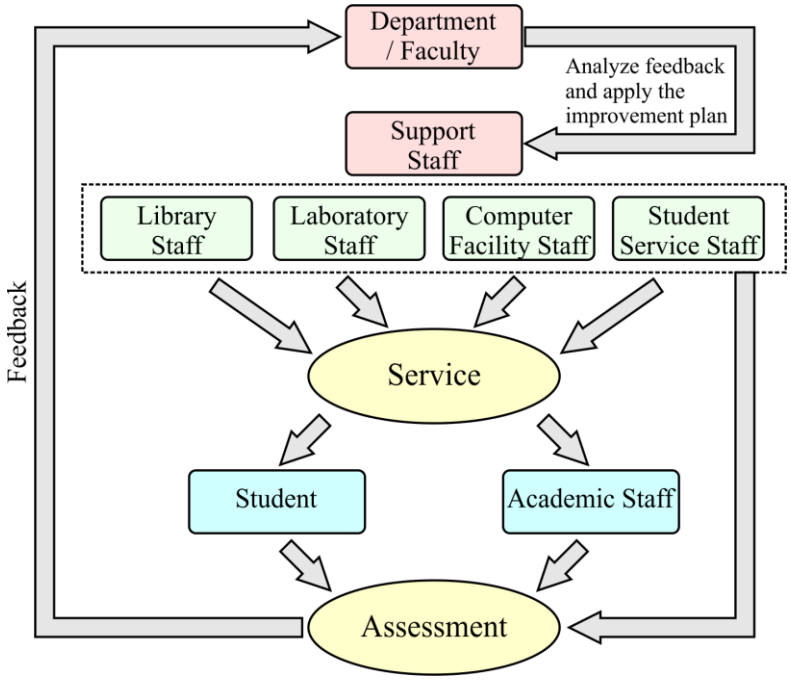


Figure 2.7-2 Assessment cycle chart of support and service

2.7.1. The library staff are competent and adequate in providing a satisfactory level of service.

The library of the Faculty of Engineering offers a wide selection of readings and materials in the fields of engineering. The librarian is available from 8:30 a.m. – 21:00 p.m. daily for any consultation, book recommendation, and lending service.

Our librarian is the qualified staff with training and experience on library management and online library service, providing appropriate service and assistance to students and academic staff. Satisfactory level of service of the library [Exh. 2.7(2)] shows result about satisfactory level of service of the faculty library. It has an average score of 3.47 point. It means average satisfactory level of service.

Students also access services from the NU library. The NU library has more books, learning materials and librarians, who can help and support students for their interested articles. NU librarian is available from 8:00 a.m. – 20:30 p.m. for Monday

to Friday and from 9:30 a.m. – 17:30 p.m. for Saturday and Sunday in semester. More details on NU lbrary staffs are made available online through “http://www.lib.nu.ac.th /web/About/index.php?view =admin”.

The NU library have “NU Library Strategy Plan: in university academic development plan (2012-2016)”. It aims to improve the performance of library service for students and staffs. One of the strategies in this plan is the development of library staff to perform good work [Exh. 2.7(3)].

The NU library implements SAR for tracking and analyzing information to improve a better service quality in next year. In the evaluation of the “Satisfactory level of service”, in a part of this index it shows about “NU library staff ’s satisfactory level of service”. NU library gets 3.70 point (ranging from 1-5). This indicates the library staffs are adequate and give satisfactory service [Exh. 2.7(4)].

2.7.2. The laboratory staff are competent and adequate in providing satisfactory service

Four laboratory staff members are employed in the Department of ECPE. They are in charge of preparation of teaching materials, maintenance of laboratories and equipment, as well as supporting assistance to lecturers and academic staff.

All laboratory staff members have educational background or relevant bachelor degrees in their responsible fields of studies, as well as thorough and updated knowledge on laboratory tools and teaching equipment at the faculty. This hence contributes to smooth class preparation and laboratory research arrangements.

Laboratory staff in the Department of ECPE provides support in the teaching of laboratory subjects by specialized skill and knowhow. They have well-scheduled timetable for working in laboratory class in every semester. For this semester, one laboratory staff provides and takes care of about 40 students in a laboratory class. If laboratory class has student of more than 40, we must separate the class into 2 sections since the laboratory staff has to provide and take care of attended students comprehensively.

In a free time (in office hour), students can borrow material, equipment, or ask for entering laboratory rooms for their self-studying or for performing an experimental work in their project. They must be under the supervision of the laboratory staff.

Every laboratory staff in the Department of ECPE has typically supported laboratory subject on average of 3-4 subjects. The department allows the academic staff or teacher to have a teacher assistant (TA) for helping the teaching process. This implies that the TA may help laboratory staffs to provide service based on the individual teacher opinion.

An example of laboratory staff schedule task is shown in Exhibit 2.7(5). They can provide and assist lecturer staff to teach. This shows the adequate of service.

2.7.3. The computer facility staff are competent and adequate in providing a satisfactory level of service.

Five computer administrators are employed to perform daily IT maintenance tasks, software and equipment installation, as well as IT maintenance for office computers, personal computers, and networks for the Department of ECPE.

The another task for the computer facility staff are also provide some computer laboratory class for engineering student for every department in faculty of engineering. If department need to use computer service for teaching and examination for student, we can reserve computer room that supported by computer facility staff.

One important task for computer facility staff is a development the website of department of the Department of ECPE and the Faculty of Engineering. Webmaster or web administrator regularly updates information on website. Interesting news is, for instance, student scholarship announcement, research funding announcement, and related engineering news/activities. The staff can serve and manage an online service system for academic staff and students, such as, online student training system, withdrawal to pay material online system for academic staff, and so on.

The computer facility staff members are qualified personnel with training or degrees in computer areas. The faculty stresses on importance of using licensed equipment and software. Knowledgeable and professional computing staff provides sound IT systems and facilitate efficient academic and organizational performance.

2.7.4. The student services staff are competent and adequate in providing a satisfactory level of service.

Two student service staff at our department are responsible for student enrolment procedures, registration amendments, such as adding or dropping of courses, administrative contact point for students, and the faculty's student-related activities and projects.

Staff in this area have good knowledge of student-related administrative procedures, with skills in handling relevant forms and documents in both hard copies and electronic formats. They also tend to have good communication skills which help in their coordinating and liaising tasks.

The Faculty of Engineering has more student service staff in the center service of faculty. They provide many services for student such as provide the information about student scholarship and funding, interlink with student clubs and activities, collect alumni information, provide and update academic information, facility and building service, etc.

In conclusion, the Department of ECPE and the Faculty have several expert support staff in many tasks (library, laboratory, computer facility and student services tasks). These people are recruited and qualified by Faculty of Engineering and the department. All support staff have minimum education degree in a bachelor degree,

and some part of support staff have a master degree (and the rest of them have a study plan in a master degree soon). These signify us the quality of support staff and we can see some assessment result in Exhibit 2.7(2) and Exhibit 2.7(4) for the library support staff satisfaction. And Exhibit 2.7(5) shows the example laboratory staff timetables are adequate of service.

AUN-QA Criterion 7 – Checklist

7	**Support Staff Quality**	1	2	3	4	5	6	7
7.1	The library staff are competent and adequate in providing a satisfactory level of service.				✓			
7.2	The laboratory staff are competent and adequate in providing a satisfactory level of service.				✓			
7.3	The computer facility staff are competent and adequate in providing a satisfactory level of service.				✓			
7.4	The student services staff are competent and adequate in providing a satisfactory level of service.				✓			
	Overall opinion				✓			

2.8. Student Quality

The ECPE Department stresses the importance of measures to assure student quality; namely sound admission policy and its implementation, as well as an adequate and balanced academic program.

2.8.1. There is a clear student intake policy.

The CPE program has two methods of student acceptance, which conforms to the university's admission systems. Seventy percent of accepted students are from direct admission method while the rest are from the Central University Admission System (CUAS). The brief of admission process is outlined as Figure 2.8-1.

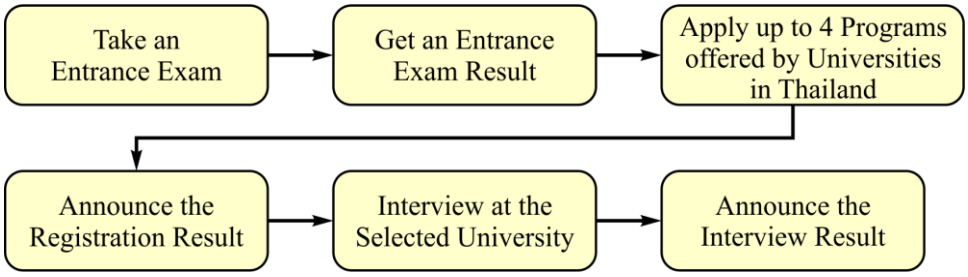


Figure 2.8-1 The central admission process

1. Direct admission method criteria: The acceptance is based on the score of
1.1. GAT 30%
1.2. PAT2 20%
1.3. PAT3 30%
1.4. GPA 20%

2. CUAS: The acceptance is based on the score of
2.1. O-NET 30%
2.2. GAT 15%
2.3. PAT2 15%
2.4. PAT3 20%
2.5. GPA 20%

The Ordinary National Education Test (O-NET) is a nation-wide test aiming to test basic knowledge across the subjects: Thai Language and Literature, English Language, Mathematics, Comprehensive Sciences, Social Studies, Health Education, Arts and Culture, and Occupation and Technology.

The General Aptitude Test (GAT) tests the reasoning ability and English proficiency of the students. It asks students to link and identify relationships between events. The English section is comparable to the TOEFL test, but is completely objective in nature. The GAT covers reading, writing, analytical thinking, problem solving and English communication. Both O-NET and GAT examinations are scored by a computer program.

Another aptitude test is the Professional Aptitude Test (PAT). This test is voluntary. Students may choose to take the tests from the seven subjects that are required by the program they are applying to. PAT2 is a test on the subject of advanced mathematics which tests students' ability in discrete mathematics, pure mathematics, and descriptive mathematics, including Calculus and Statistics, while PAT3 is about science, including Physics, Chemistry, and Biology. All examinations and tests are prepared, organized, and conducted by the National Institute of Educational Testing Service (NIETS).

2.8.2. The student admission process is adequate.

The admission process for prospective students is clearly explained and published on the NU website (http://www.admission.nu.ac.th/). Information on the process of direct admission (quota) can also be found on the website (http://www.acad.nu.ac.th/acad_admission/data/2556/SQU/ANNOUCE_ADMISSION.pdf). Results of admission each year are made public and all admission processes is subjected to the university's regulations, accessible for all. Figure 2.8-2 shows the number of first year CPE students admitted in the past six academic years.

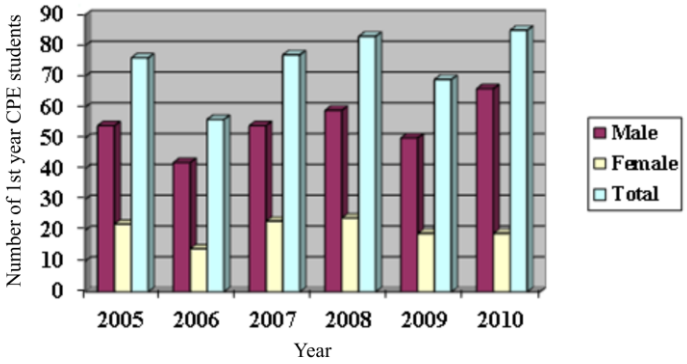


Figure 2.8-2 Intake of first-year CPE students in 2005-2010

The size of the student intake is defined by the committees of the university. To stabilize the number of the intake encourages staff in order to control the quality of enrolled students. The ratio of staff per monitored students is adequate. Thus, the staff can monitor students efficiently. Typically, the intake size is stable at 80 students each year [Exh. 2.8(1)].

The quality of the student intake is approved by their grade and entrance scores. Moreover, the committees of Engineering faculty agreed to announce criteria of student admissions that the student intake should have O-NET score more than 30.

The admission policy is acceptable as explained in Section 2.14. It illustrates that the student drop-out rate and graduation rate are satisfied. Students are indicated by their GPA. Therefore, staff can monitor student progress and evaluate performance via their grades. As in Section 2.14 an average student can complete the program in the planed time and the number of four year graduation is risen.

2.8.3. The actual study load is in line with the prescribed load.

Each semester, students are allowed to enroll no more than 22 credits. The maximal credits are designed following a concept that students should spend around 40 hours per week or 8 hours per day for studying in class rooms. In addition, the self study hours are used to suggest students to manage free time to review the enrolled subjects. Students can enroll for more than 22 credits upon approval of the Dean of the Faculty of Engineering [Exh. 2.4(10)]. The design of our curriculum takes into consideration a well-adjusted and balanced assignment workload and suitable learning difficulty level. Lecturers follow the academic design and periodically adjust student assignments and examinations in order to cover all topics and necessary laboratories required for the program.

From the CPE curriculum [Exh. 2.1(1)], the workload and the level of difficulty are ideally balanced and appropriate for students. From the first year to the third year, students have a workload of 21 – 22 credits for each semester, while in the fourth year, students have a work load of 13 credits so that they can focus on their senior

projects (See Figure 2.3-1 and Exh. 2.4(10)). This setting provides remedy for the delay problems of students after the fourth year since they have adequate time in the last two semesters to finish their senior projects. The structure of our curriculum is presented in [Exh. 2.8(2)].

To conclude, the student intake policy and the entrance exam are defined and announced by CUAS. Most of Thai students have already known the admission process through academic advisors of schools. Moreover, the admission criteria include both multiple parts of examination and three years of high school GPA. Thus, students can have a good preparation before the starting of an admission process. Therefore, intake students are basically filtered in order to control the quality of them via these procedures.

The curriculum is designed to encourage students to adjust their basic knowledge in the first year of study. Course works in later years are deep and much more specific to support students' project. Thus, study load is planned appropriately as shown in the curriculum that is not over 21 credits in each semester and take courses only 13 credits in the fourth year of study. From the above statements, 5 points is appropriate to this assessment criterion because there are supported procedures as the standard.

AUN-QA Criterion 8 – Checklist

8	**Student Quality**	1	2	3	4	5	6	7
8.1	There is a clear student intake policy.					✓		
8.2	The student admission process is adequate.					✓		
8.3	The actual study load is in line with the prescribed load.					✓		
	Overall opinion					✓		

2.9. Student Advice and Support

2.9.1. There is an adequate student progress monitoring system.

At the course level, academic staff members arrange office hours [Exh. 2.9(1)] for consultation with students enrolled in their course. Each student class year has two advisors who will be in charge of students monitoring and advising [Exh. 2.9(2)]. The monitoring system covers all subjects offered in the course. The dean and the department head also monitor student progress via term reports. In addition, the university provides online website(http://www.reg.nu.ac.th/registrar/home.asp) that keep tracks of all students. The system includes a student's profile service, notification service, appointment service etc. which are useful for staffs to monitor and advice their students. [Exh. 2.9(3)].

Furthermore, the faculty still keeps track of alumni by collecting an employment status survey during the commencement period. [Exh. 2.9(4)] The department creates

a community group on Facebook and webboard that are used to contact among the department, current students and alumni.

Student progress monitoring at course level.

Academic staff members arrange office hours for advising students enrolled in their course and report student progress [Exh. 2.9(1)]. In addition, academic staff record student performance and report student evaluation in the classroom, the staff website, and through announcements.

Advisors can also access data to follow up and monitor their students performance via the website (http://reg.nu.ac.th/registrar/home.asp). Available data includes student information, grades, and evaluation. This system is helpful in order to lock students' registration service. The locked students can not add or drop in the course until they meet the instructors and be unlocked by the class instructors.

Academic performance of students will be sent to the head of the department, dean and the university, which will be stored as a database that can be searched for useful purposes in the future.

Student progress monitoring at program level.

Every semester, academic staffs have to submit all students' grade reports to the head of the department and dean for inspection. Any unusual circumstances; for example, unusually high unsatisfactory academic results, will require discussion amongst faculty members in order to address the challenges and find solutions.

Moreover, students are also given an opportunity to give their opinions on their classroom experiences via the university website (http://reg.nu.ac.th/registrar/home.asp); their inputs are then analyzed and considered for ways to improve teaching [Exh. 2.6(3), Exh. 2.6(4), Exh. 2.6(5) and Exh. 2.6(6)]. The brief process of academic advisor system in the department can be depicted as follows.

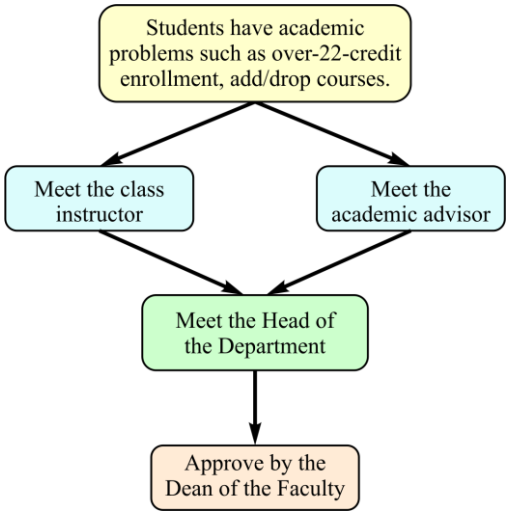


Figure 2.9-1 Students advisory process

2.9.2. Students get adequate academic advice, support, and feedback on their performance.

Student advisors have job descriptions to advice and support their students. [Exh. 2.9(5)] The advisors meet with advisees at least twice per semester to clarify and give consultation about how to live and study. Furthermore, an online system (http://reg.nu.ac.th/registrar/home.asp) is used to support academic advisors to make an appointment and control students' activities. For example, monitored students are locked to enroll classes until they are advised and guided by their advisors.

If students want to modify the plan of study or need consultation, they can contact their advisor. In the process of modification of the study plan, students always have to meet the head of the department to receive comments and it has to be approved by the dean [Exh. 2.9(6)].

2.9.3. Mentoring for students is adequate.

Academic advisor

Academic staff office hours are available for counseling students. Each student class year has two advisors whom students can meet throughout the school year [Exh. 2.9(2) and Exh. 2.9(5)]. The university provides an online system to support the advisors in order to access students' profiles, lock their enrolment activities, publish announcements and make appointments. In addition, students who have low GPA will be interviewed by the advisors to find their problems and give them suggestions [Exh. 2.9(7)]. In case students need the second advice, they can meet the dean or vice dean of the faculty and academic staff of the faculty as in Figure 2.9-1.

Senior project advisor

For consultation on projects, project advisors will have hours of counseling and report the results periodically [Exh. 2.9(8)]. There is a student report system where academic staff, advisors, and the head of the department can monitor student information which is illustrated by the senior project process in Figure 2.3-1.

Student affairs

There are three levels of support for student affairs: university level, faculty level, and department level.

The university student affairs provides consultation for student learning, activities, and job training. For example, a seminar is set up for students before they join in an internship program. Senior students must be trained well to prepare for their careers. Moreover, new students are asked to join in the orientation program in the first week of learning [Exh. 2.9(9)].

The Student Affairs of Faculty of Engineering provides consultation specifically for engineering students on scholarships, student welfare, and so on.

The Student Affairs provide consultation more specifically on the ECPE students on the job internships.

2.9.4. The physical, social and psychological environment for students is satisfactory.

There are courses on social life, language, and strengthening life skills, such as health education, life skills, Thai language, English language, and law can be seen in the structure of the curriculum in 2.8.3.

For social and psychological development, the university provides academic classes, academic activities and non-academic activities as follows.

- There is a course about studying adaptation for freshman in the computer engineering field [Exh. 2.1(10)]. This course invites all staffs in the department to instruct students in every week.
- There is also an orientation program for freshman, student internship program orientation before third-year students leave the university to be trained in the summer, and concluding supervision for senior students before graduation.
- In addition, seminars and workshops are provided for students to see the larger view, for example CPE return project which is a seminar where alumni are invited to share their experiences, visit entrepreneurs, and so on [Exh. 2.9(10)].
- Students are included into many activities in order to have close relationship with the department such as Big Cleaning Day and Embedded Camp which asks for volunteers.
- Apart from the advisors' program, academic tutoring has been provided for some subjects such as calculus, and physics, as a form of support for freshman students [Exh. 2.9(11)]. Not only are there classes and academic activities related to computing and electrical engineering, the department also provides other classes related to languages, social studies, and physical exercise. Special campus life orientation is also offered to all freshmen.
- Regarding integration to the labor market, the department offers a student internship program orientation prior to the summer internship of third year students. In addition, seminars and workshops are organized to widen students' professional perspectives with participation of faculty's alumni and the private sector, namely the 'CPE return project' and 'visit entrepreneurs project'.
- Moreover, group and extra-curricular activities such as sports and community services are supported and encouraged as a means to promote student integration to campus life and enhance their sense of responsibility towards society [Exh. 2.9(12)].

- Students receive information about living and life in the university both academic and non-academic aspects via many events such as The University Open House, Naresuan Research Open House and Science Week. They can also get these information from the department and faculty website.

To summary, students are monitored in many levels including academic advisors, class teachers, senior project advisors, head of department and dean of faculty. The processes of monitoring system are various consisting of both interviewing and tracking students' study progresses via a computer program.

Furthermore, the registration system supports academic advisors to lock students' enrollments without discussing with them. Therefore, students must make an appointment to ask some suggestions from advisors before making any decision. From the above statements, 5 points is appropriate to this assessment criterion because there are supported procedures as the standard.

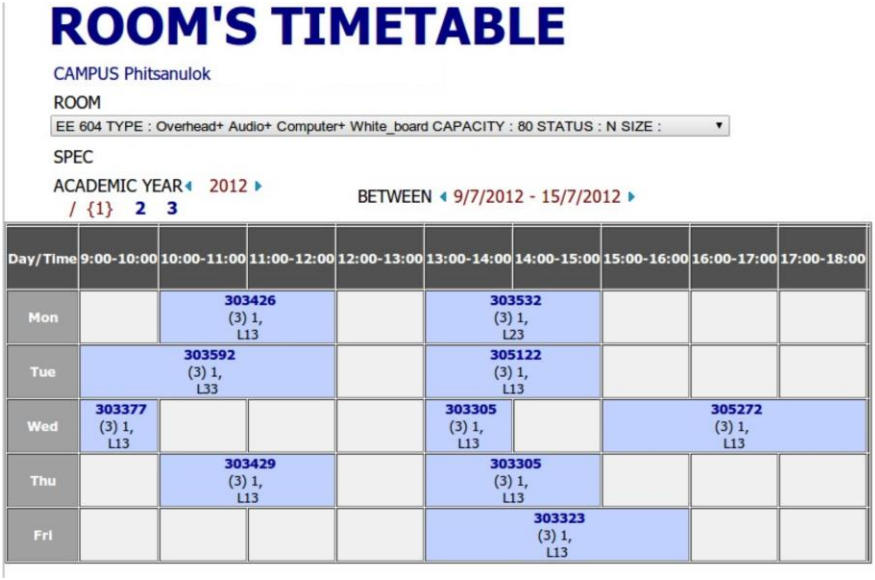
AUN-QA Criterion 9 – Checklist

9	**Student Advice and Support**	1	2	3	4	5	6	7
9.1	There is an adequate student progress monitoring system.					✓		
9.2	Students get adequate academic advice, support, and feedback on their performance.					✓		
9.3	Mentoring for students is adequate.					✓		
9.4	The physical, social, and psychological environment for the student is satisfactory.							
	Overall opinion					✓		

2.10. Facilities and Infrastructure

2.10.1. The lecture facilities (lecture halls, small course rooms) are adequate.

We have 3 levels of lecture facilities: department, faculty, and university level. Most of the major courses use the departmental and faculty facilities. For small class, we usually use the classrooms in the EE-building and EN-building at Faculty of Engineering. For larger class, we usually use the classrooms in the EN-building while the general education courses use the university facilities [Exh. 2.10(1)]. Anyone can view the classroom usage via the university registrar website [Exh. 2.10(2)]. Figure 2.10-1 shows the usage of room EE-604 (a department level classroom) in the first semester, academic year 2012.



ROOM'S TIMETABLE

CAMPUS Phitsanulok

ROOM

EE 604 TYPE : Overhead+ Audio+ Computer+ White_board CAPACITY : 80 STATUS : N SIZE :

SPEC

ACADEMIC YEAR 2012 BETWEEN 9/7/2012 - 15/7/2012

/ {1} 2 3

Day/Time	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00
Mon		303426 (3) 1, L13			303532 (3) 1, L23				
Tue	303592 (3) 1, L33				305122 (3) 1, L13				
Wed	303377 (3) 1, L13				303305 (3) 1, L13		305272 (3) 1, L13		
Thu		303429 (3) 1, L13			303305 (3) 1, L13				
Fri					303323 (3) 1, L13				

Figure 2.10-1 The usage of room EE-604 for the first semester, academic year 2012

1. Department level

The Department of ECPE mainly locates in a part of 7-floor building (EE-Building). The spaces in the this building are arranged and assigned to offices of lecturers and department, and rooms for small projects, computer laboratories, microprocessor laboratories, control laboratories, classes and research units [Exh. 2.10(1)].

2. Faculty level

The Faculty of Engineering has one 7-floor building (EN building), dedicated for engineering classes, engineering library and student activities. Currently 5 floors of the building are being used (Floor 1–3, 5–6). The 4th floor of building is reserved for future [Exh. 2.10(1)].

The total number of rooms that are available is summarized in Table 2.10-1. It shows the capacity and number of the lecture rooms and computer laboratory rooms that the faculty and department are providing and maintaining. In addition, students can use the space areas around the buildings for self study. Whiteboard, table, chairs, electrical outlet, and Wi-Fi access are provided for students [Exh. 2.10(3)].

Table 2.10-1 List of lecture and computer laboratory rooms

Type (Capacity)	Number of Rooms	
	EN Building	ECPE (EE building)
Computer laboratory (60 – 73 persons)	2	2
Lecture room (40 persons)	4	4
Lecture room (80 persons)	11	3
Lecture room (150 persons)	3	-
Auditorium (120 – 150 persons)	1	1

3. University level

The university also has two buildings shared among all faculties. However, ECPE rarely uses these facilities because there are more than enough lecture rooms at the Faculty of Engineering.

2.10.2. The library is adequate and up-to-date.

As of December 2011, all kinds of materials in the library of Faculty of Engineering are summarized in the Table 2.10-2. Table 2.10-3 shows the summary of materials in the university library as of December 2011, the table summarizes the only materials that are in the science and technology. The university and faculty update library resources every year. Usually book fair is a regular event in the university for every year. At the book fair, publishers display their latest offerings for everyone to choose. Faculty members and students can recommend materials for library acquisition. The recommended materials are reviewed and verified by the department, the faculty, and library staff before the final purchasing decision is made. [Exh. 2.10(4)]

Table 2.10-2 The faculty of engineering library contents

Category	Language	Quantity
Books	Thai	6,846
	English	2,557
Journals and Magazines	Domestic	51
	International	28
CD-Rom, VDO, etc.		1,400

Table 2.10-3 The main NU library contents

Category	Language	Quantity
Books	Thai	56,209
	English	24,411
Journals and Magazines	Thai	60
	International	25
CD-Rom, VDO, etc.	Thai	2,246
	International	956

In addition, students can access to more than 30 digital databases. For the CPE field, NU subscribes to major digital libraries such as ACM, IEEE, Science Direct, Springer, etc. These resources are accessible through the NU network on campus or through authenticated web services for off campus accessing. Figure 2.10-2 shows the library webpage (http://www.lib.nu.ac.th/web) displaying the list of digital materials that are available online that students may use.

Figure 2.10-2 Part of the NU webpage for accessing online databases and other related information

2.10.3. The laboratories are adequate and up-to-date.

The all equipments in Faculty of Engineering are inspected and reported their status once a year. The one that are not able to used or worn out must be cleared out. The budget planning of equipment replacements, module additions and maintenances is ongoing process for every year. If the equipments are out-date or not able to function well, the priority to request those ones will be the highest. [Exh. 2.10(5)]

Computer Laboratories

While there are many computer laboratories around the campus that we may use, four computer labs are usually used: two in the EE building and two in the EN building. The labs in the EE building are mainly for CPE courses while the labs in the EN building are for the service course (305171 computer programming) in which we support other departments.

One computer laboratory in the EE building is equipped with 50 Intel Core i5 computers that students can use. The space is also enough for students to bring their own laptop computers to use in the laboratories.

Another computer laboratory in the EE building is equipped with 50 Intel Dual Core computers. The department has a renovation plan for this laboratory. The obsolete computers will be moved away. The student desks with high speed wired and wireless LAN will be provided for mobile computers of students which most of them in this computer engineering program currently have their own machines.

The two computer laboratories in the EN building are also available. Each laboratory is equipped with 60 Intel Core i5 computers. Figure 2.10 3 shows the usage of room EN-609, the 73-seat computer laboratory for the first semester, academic year 2012.

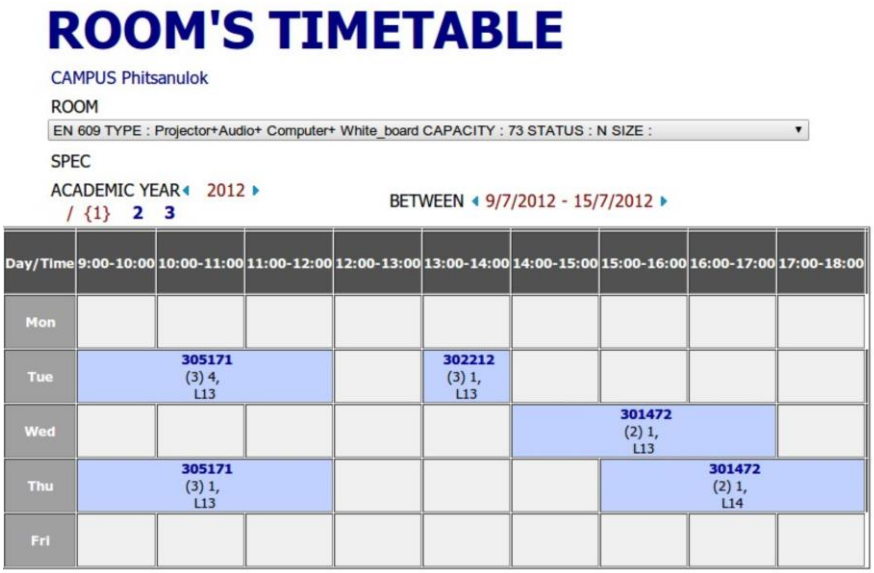


Figure 2.10-3 One of the computer laboratories at the faculty level

Each semester the faculty members will provide the list of software to use for instructional purposes to the support staffs that will then make sure that the software and computers are ready to use once the semester starts. Technician support staffs are always available during the lab time to assist in case of impromptu problems.

Laboratories of Research Units

In 2012, three advanced research laboratories have been found:

- Advanced Systems and Software Engineering Research Team Lab (ASSERT Lab, EE-602)
- Embedded System and Smart Device Research Unit (Device Lab, EE-607)
- Computer Vision and Human Interaction Technologies Laboratory (Vision Lab, EE-609)

These research labs are provided for academic staff members to promote their research works and to allow students to gain research experience and advanced skills.

2.10.4. The computer facilities are adequate and up-to-date.

Other than the computer laboratory as mention in the Section 2.10.3, the important facilities, wireless access points, high-speed network gateways, and software campus agreements are actively and continuously maintaining.

To encourage learning activities outside the classroom, the department, the faculty, and the university also provide students with high-speed wireless network access so that the learning opportunity is made available to students in all appropriate areas: study halls, classrooms, conference rooms, library, etc. [Exh. 2.10(3)]

The core network of the university is connected together with optical fiber. Three 1.6 Gps links to three Internet service providers (3BB, CAT, UniNet) are used to ensure that the university always has access to the Internet. Everyone on the university network can fully accesses these high-speed network links [Exh. 2.10(3)].

NU has a campus agreement for using Microsoft software, all computers belonging to NU are always up-to-date for MS Office and MS Windows. The Department of ECPE also has 5 Autodesk software modules for each of 120 machines in department (http://nunet.nu.ac.th/public/download.aspx) [Exh. 2.10(6)].

2.10.5. Environmental health and safety standards meet requirements in all aspects.

In general, policies regarding environmental health and safety standards are enforced by the university. For examples, smoking is prohibited inside the building; students must wear a helmet while driving a motorcycle. The university always monitors the number of accidents, death, and other aspects of injured. The university provides the services of the medical needs to the students and the faculty stuffs. The students can seek a free medical service supported by NU Student Medical Benefit Fund [Exh. 2.10(7)].

In conclusions, Faculty of Engineering is able to provide very broad range of rooms for many types of teaching, small classes, large classes, up-to-date computer laboratories, electronics laboratories and lecture halls. The number of lecture rooms is excess than the number of requests. The Faculty of Engineering also has spared areas and rooms that can fulfill extra requests in future. The room data, its type and its capacity, are in the Schedule-for-Teaching Management System that is enabling to arrange the rooms for appropriate uses. For accessing the Internet, all students and faculty members can access the wireless points provided by NU other than the regular wired internet system in teaching rooms and their own rooms. The library is up to date with new books for every year. The computers for teaching are up to date, many

new software and their updates are able to download from the university server. The university monitors all accidents on the students. The students can access a free medical service supported by Naresuan University Student Medical Benefit Fund.

AUN-QA Criterion 10 – Checklist

10	Facilities and Infrastructure	1	2	3	4	5	6	7
10.1	The lecture facilities (lecture halls, small course rooms) are adequate.				✓			
10.2	The library is adequate and up-to-date.				✓			
10.3	The laboratories are adequate and up-to-date.				✓			
10.4	The computer facilities are adequate and up-to-date.				✓			
10.5	Environmental health and safety standards meet requirements in all aspects.				✓			
	Overall opinion				✓			

2.11. Quality Assurance of Teaching and Learning Process

Besides the quality assurance of the teaching and learning process at the university and the faculty levels, the Department of ECPE has adopted the quality assurance system similar to that required by the Office of Higher Education Commission regulations (regulations only required the quality assurance system only at the university and the faculty level). Every year, the assessment is conducted on the teaching and learning processes. Comments and feedback are gathered from students, staff, labor markets, and assessors and have been used to improve the curriculum within the duration of the curriculum revision period.

In addition, The curriculum development process for CPE 2012 has followed the TQF:HEd guideline which uses Plan-Do-Check-Action (PDCA) process both in course level and curriculum level.

2.11.1. The curriculum is developed by all academic staff.

All academic staff actively involves throughout the curriculum development and revision process. First, staff are assigned to two committees: the developing committee and the reviewing committee [Exh. 2.11(1) and Exh. 2.11(2)]. All staff meet to define the desired characteristics based on the inputs from stakeholders. Then, the expected learning outcome is derived from the defined characteristics. The strengths of all staff were also considered during curriculum development by asking each staff to write a course description that is compatible with the requirements of the ACM-IEEE recommended computer engineering curriculum and, therefore, full advantages can be taken of each staff member's knowledge and skills. Then, the developing committee proposes the draft curriculum to all staff for reviewing. While the reviewing committee is officially responsible for the reviewing, the comments and

suggestions from all staff are sought and collected by the reviewing committee. The process is repeated until the curriculum is officially approved by the university council for use.

2.11.2. The curriculum development involves students.

The curriculum development uses feedback from student evaluation on each course. At the end of each semester, the course report called TQF5 (also called TQF6 for training course) is submitted to Faculty of Engineering. The report includes the actual teaching plan, assessment result based on the ELOs, summary of student feedback, and development plan.

In each year, TQF5 and TQF6 of each course are combined into a program assessment report called TQF7 then report to the university. The report includes the related data, e.g. number of the students in each year, student pass rate, job obtaining rate of the graduated, changes that affect the program, the performance of the students in each course, overall feedback from the students, and the improvement plan.

2.11.3. The curriculum development involves the labor market.

Each curriculum takes a survey on labor market (employer) in every year to collect the result of satisfaction on the graduate. The result is collected and analyzed for used in the curriculum improvement.

2.11.4. The curriculum is regularly evaluated at reasonable time periods.

Under the regulation by the Office of Higher Education Commission, the ministry of education, the curriculum has to be revised every 5 years. The revision must be based on the result from the curriculum evaluation. The revised curriculum must also be approved by the University Council and the Office of Higher Education Commission prior to official announcement. Since computer engineering is a fast-changing field, ECPE implemented a short revision period as the last revisions occurred in 2003, 2005, 2008, 2010, and 2012. The latest revision (2012) was a reflection of both the result of curriculum evaluation and the inputs from all stakeholders: students, staff, and labor markets.

2.11.5. Courses and curriculum are subject to structured student evaluation.

At the end of each semester, students evaluate the course via the university website. The feedback and evaluation are provided to the academic staff members anonymously. The academic staff members can then view the evaluation and feedback for improvement.

2.11.6. Feedback from various stakeholders is used for improvement.

In the curriculum development process, comments have been received from a variety of fields, as discussed previously. These comments have been brought to improve the program design.

2.11.7. The teaching and learning process, assessment schemes, the assessment methods and the assessment itself are always subject to quality assurance and continuous improvement.

The PDCA process has been used in each course. For example, before the course starts, academic staff have to prepare the course syllabus including lesson plans and guidelines for improving teaching by using evaluation data from the previous semester. At the end of the semester, students will evaluate teaching and learning via the website. At last, the responsible officer will provide a summary of the results and feedback to the instructors individually. The data will be used the next time the course is offered and for the next curriculum revision. Starting from the second semester of the academic year 2011, the peer review for each course was conducted at the end of each semester to determine how the course should be improved the next time it is offered and to set the proper expectation for the subsequent courses.

AUN-QA Criterion 11 – Checklist

11	**Quality Assurance of Teaching and Learning Process**	1	2	3	4	5	6	7
11.1	The curriculum is developed by all academic staff members.					✓		
11.2	The curriculum development involves students.					✓		
11.3	The curriculum development involves the labour market.					✓		
11.4	The curriculum is regularly evaluated at reasonable time periods.					✓		
11.5	Courses and curriculum are subject to structured student evaluation.					✓		
11.6	Feedback from various stakeholders is used for improvement.					✓		
11.7	The teaching and learning process, assessment schemes, the assessment methods, and the assessment itself are always subject to quality assurance and continuous improvement.					✓		
	Overall opinion					✓		

2.12. Staff Development Activities

The department supports a lot of staff development activities, such as seminar and training (both inside and outside the university), as well as national and international conference participation. Staff are expected to apply knowledge gained from such activities to improve the efficiency and quality of their work.

The staff development system use the same process as in Section 2.7 and it follows OHEDC #2.4 about "Academic and supported staff development plan". It shows in Figure 2.12-1.

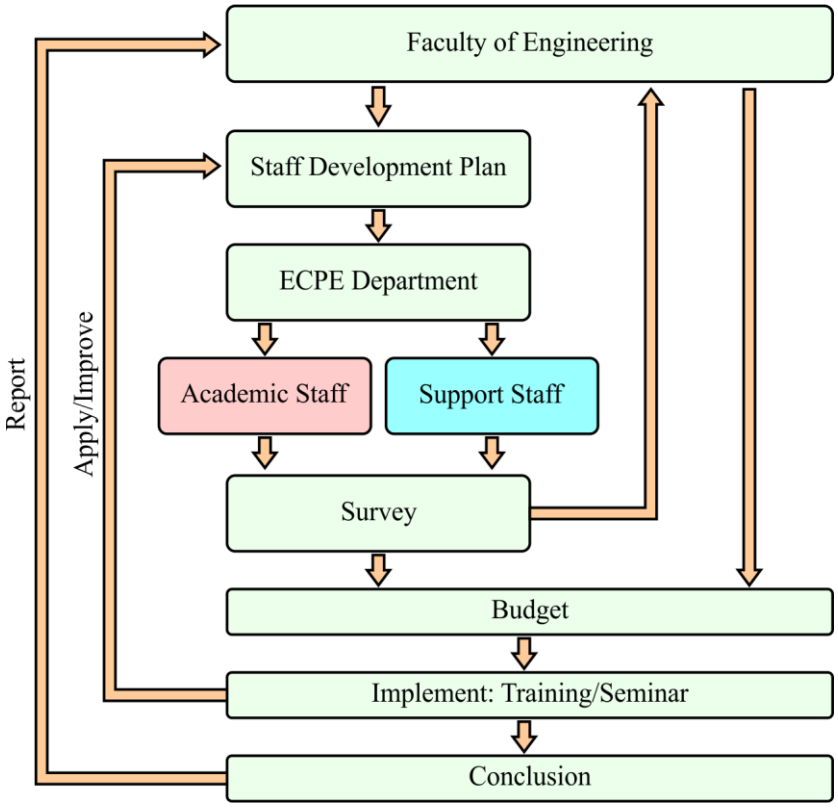


Figure 2.12-1 Academic staff development chart

2.12.1. There is a clear plan on the needs for training and development of both academic and support staff.

The department will develop a plan to learn the needs for training and development of both support staff and academic staff. The plan starts from collecting requirements from all academics and support staffs in the department and then analyzing and identifying the topics they found lacking [Exh. 2.12(1)]. These topics are then checked to see whether they align with the staff development plan of the university. Once alignments are verified, a staff development plan will be created.

Next, the department will inform the staff about the staff development plan. Staff can find training or seminars they found relevant and attend them to gain knowledge in said topics [Exh. 2.12(2)]. If topics are specific and cannot find public training or seminar, staff can propose to organize a training or seminar in such topics themselves. In this case, the department will provide financial support as appropriate [Exh. 2.12(3)].

Next, the department will ask the staff to evaluate the results obtained from the training or seminars they attended or organized. The evaluations can be in the form of key performance indexes or questionnaires in order to provide an evaluation.

In addition, the staff are expected to share their knowledge and experiences they gained from the training with others in the form of sharing documents, briefings about the training, workshops, and so on.

Finally, to encourage the implementation of best practices, the Faculty of Engineering arranges a contest of best laboratories among supporting staff. The contest aims at promoting best practices, rewarding the staff, and motivating the staff.

2.12.2. The training and development activities for both academic and support staff are adequate to the identified needs.

Academic Aspect

Activities or seminars need to meet the criteria of being able to enhance the teaching and learning activities of the department. This involves applying new knowledge and trendy technology in computer hardware and software into the classes. The fact that computer technologies frequently change and new trends are required to be brought to the department labs and instructors.

Now, the department has supported condition academic development activities by distributes budget for any academic staff at 15,000 baht for activities and seminars to improve teaching and learning in department for each year.

Service Aspect

In this aspect, the department organizes a lot of events to educate both students and staff in available facilities; for example, trainings in the online registration and academic records software for the students and the document management software for the staff [Exh. 2.12(3)]. The department also encourages the staff and students to participate in the electronic document system exams to evaluate student's and staff's knowledge on the topic. The training on advanced usage of word processing, spreadsheet, presentation, and bibliography management software are also offered regularly by the central library so that both staff and students can use the tools effectively and efficiently.

Teaching and Learning Support Aspect

In this aspect, the Faculty of Engineering organizes trainings on the LMS for organizing courses and learning-aided programs [Exh. 2.12(3)]. An example of these systems is Moodle [Exh. 2.12(4)] which applies computer and networking systems to assist class announcement, scheduling, assignment submission, knowledge sharing, and so on.

And the most important aspect, the department needs staff to grow and acquire the knowledge and academic position follow the development plan, and follow by career path. [Exhibit 2.6(19) Academic Staff Career Path]

In conclusion, the Department of ECPE has a clearly staff development plan that follows the development plan form Faculty of Engineering and shows in Exh. 2.12(1). These development activities are formulated by development process that shows in Figure 2.12-1. The Department of ECPE has used this plan and practiced to develop staff to get the knowledge and the experience more and more. Exhibit 2.12(2) shows example of development activities that follow the development plan.

AUN-QA Criterion 12 – Checklist

12	Staff Development Activities	1	2	3	4	5	6	7
12.1	There is a clear plan on the needs for training and development of both academic and support staff.					✓		
12.2	The training and development activities for both academic and support staff are adequate to the identified needs.					✓		
	Overall opinion					✓		

2.13. Stakeholders Feedback

High-tech industry—particularly those related to computers—is well-known for rapid evolution. To ensure that students received the best possible education, not only do faculty members need to keep up with the latest trend, but regular feedbacks from stakeholders is also required. Feedback is obtained through various means: survey, in-depth interview, questionnaire, feedback form, social networks, etc. The feedback is then reported to the relevant parties for consideration.

2.13.1. There is adequate structured feedback from the labor market.

Faculty of Engineering is monitoring the labor market of graduated students every year. The number of employed graduated student related to kinds of employer organizations directly reported to Faculty Management Board [Exh. 2.9(4)]. The Employer Feedback Satisfactory survey, corresponding to TQF:HEd expected learning outcome mapping directly to desired characteristics of the student for the

CPE curriculum is conducted and reported by Faculty of Engineering [Exh. 2.13(1)]. The faculty does these routine works every year.

2.13.2. There is adequate structured feedback from the students and alumni.

To ensure that students received the best possible education, not only do faculty members need to keep up with the latest trend, but regular feedback from current students is also required. The feedback is obtained through an existent survey system provided by the university. The student feedback system is an online system. The feedback information is processed instantaneously after the end of each semester [Exh. 2.13(2)]. Normally, the department and the faculty are ready for complaint feedback at all time. If there is any special case, anyone can go directly to meet the Head of Department or the Dean of the Faculty.

For the alumni feedback, the survey of the 1-year-after-graduate alumni feedback usually is performed at the day before the commencement day for every year [Exh. 2.13(3)]. To have more alumni feedbacks, NU Alumni Relations Development Division have been established, alumni database system and web based alumni service are implemented for gathering general information and complaints of alumni. The response action of the university can process in a formal manner even the case is not about the curriculum [Exh. 2.13(4)].

2.13.3. There is adequate structured feedback from the staff.

At the end of each semester, the report TQF5 of each course for the curriculum is mandatory submitted to Faculty of Engineering. In the report, the teaching staffs of each class have to write their own feedbacks, opinions, problems and discussions for teaching and curriculum improvements in the future. The academics division of the faculty is continuously monitoring and collecting the feedback. The report TQF3, TQF5 and all other information will be gathered and used to assess the curriculum and to address both academics and management problems as needed.

AUN-QA Criterion 13 – Checklist

13	Stakeholders Feedback	1	2	3	4	5	6	7
13.1	There is adequate structured feedback from the labour market.					✓		
13.2	There is adequate structured feedback from the students and alumni.					✓		
13.3	There is adequate structured feedback from the staff.				✓			
	Overall opinion					✓		

2.14. Output

2.14.1. The pass rate is satisfactory and dropout rate is of acceptable level.

Table 2.14-1 shows that from the academic year 2003 to the academic year 2008 (past six years), the average pass rate of CPE students in the program was satisfactory at 83%; the average dropout rate was at 17%. Figure 2.14-1 presents the graduation rate of CPE students who entered the program from academic years 2003 to 2008, while Figure 2.14-2 shows the dropout rate of the students from academic years 2003 to 2011 [Exh. 2.14(1)].

Table 2.14-1 Performance of CPE students by academic year

Academic year	**Size of cohorts**	**Percentage first degree after* -**		**Percentage dropout after* -**			
		4 years	> 4 years	1 year	2 years	3 years	> 3 years
2003	64	77%	11%	13%	1%	0%	0%
2004	60	53%	28%	12%	5%	1%	1%
2005	76	61%	14%	13%	9%	2%	1%
2006	54	68%	17%	13%	0%	2%	0%
2007	77	81%	7%	9%	3%	0%	0%
2008	79	52%	30%	8%	6%	0%	5%
2009	70	-	-	9%	4%	3%	-
2010	78	-	-	1%	4%	-	-
2011	89	-	-	4%	-	-	-
2012	83	-	-	-	-	-	-

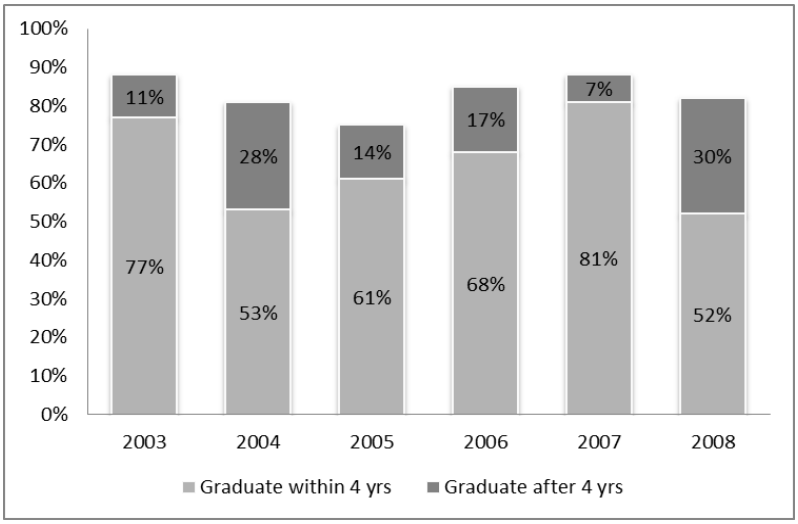


Figure 2.14-1 Pass (graduation) Rate of CPE Students from 2003 to 2008

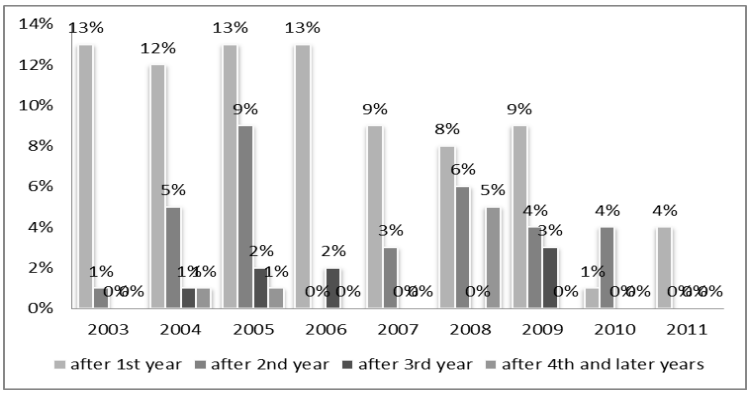


Figure 2.14-2 Dropout Rate of Students from Academic Years 2003-2010

2.14.2. Average time to graduate is satisfactory

The average rate of students who graduate as scheduled (within 4 academic years) for entering the program in the academic year 2003 up to the academic year 2008 is 65% as shown in the Table 2.14-1. The average rates of students who are delayed for one, two, three, and more than three academic years are 11.4%, 0.6%, 1.0%, and 3.3%, respectively [Exh. 2.14(1)].

From focus group discussion among faculty and students, most delays take place during the senior projects in the students' fourth year. Another cause of delay is when students fail, either getting an F grade, or withdrawing from certain courses especially ones that are prerequisite for later courses, and they are not offered immediately to retake because they are not offered in the regular enrollment. In order to lessen the problems and promote more timely graduation, the faculty staff have agreed to encourage students to do their senior projects as early as the second semester or the summer of their third academic year [Exh. 2.14(2)]. The department also applies strict rules to make students meet their project advisors regularly at least once a month [Exh. 2.9(8)].

2.14.3. Employability of graduates is satisfactory.

The department and the faculty conduct an annual tracer study of alumni which includes employability. The 2010 study reveals that the majority of graduates were employed immediately after graduation and some pursued further studies, while the remaining graduates worked and studied at the same time. Figure 2.14-3 presents the employability rates of CPE graduates who graduated in academic years 2009 and 2010. The chart shows that most of the CPE graduates were employed (71.43% in 2009 and 68.67% in 2010), were self-employed/entrepreneur (1.79% in 2009 and 4.82% in 2010), or pursued higher education (7.14% in 2009 and 9.64% in 2010) [Exh. 2.9(4)].

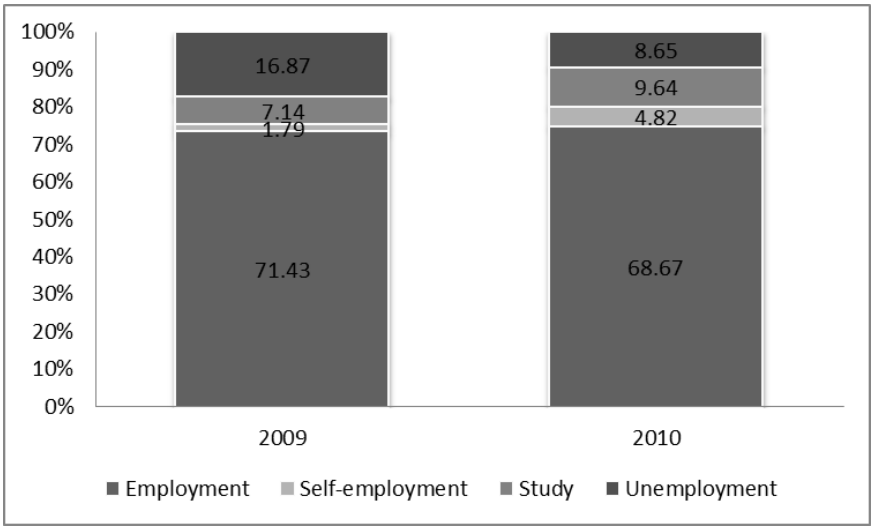


Figure 2.14-3 Employability Rate of Graduates 2009-2010

Furthermore, many of the graduates are employed in notable technology and IT firms such as Hitachi, Microsoft, and Seagate as well as in the IT departments of highly recognized companies like Charoen Pokphand Foods (CPF) and Siam Commercial Bank (SCB). Figure 2.14-4 illustrates employability of the graduates who graduated in 2010 classified by employer sectors, which shows that most of the graduates (90.2%) worked in private business.

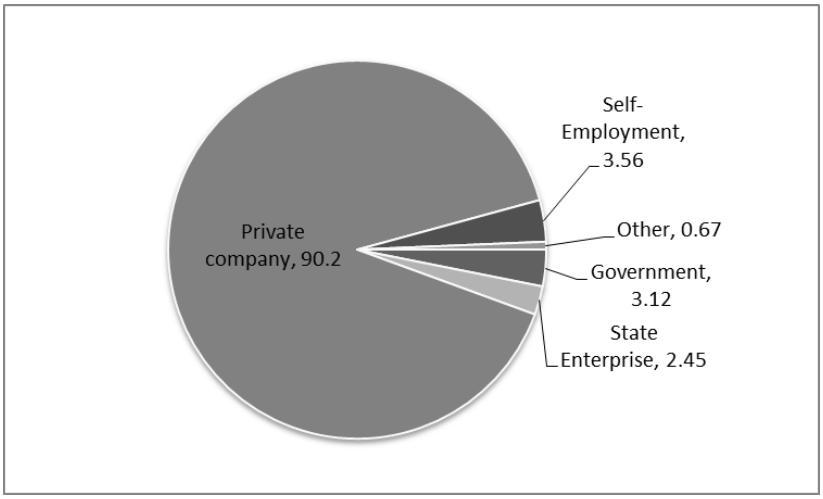


Figure 2.14-4 Employability of 2010 Graduates Classified by Employer Sectors

NU CPE graduates are highly praised by the employers and industries for their hard work, behaviors, and skills.

2.14.4. The level of research activities by academic staff and students is satisfactory.

Since NU aims to become a leading research-oriented university, all faculty staff of the Department of ECPE actively pursue research and publish in their respective areas of expertise. Research data of the Department show an improvement in terms of research outputs.

As of the fiscal year 2010, the Department of ECPE had 24 academic staff. The department research budget consists of

1. University research fund 240,000 baht
2. Annual government budget 300,000 baht
3. External funding 3,103,016 baht.

The sum is 3,643,016 baht. Thus, the department has an average research budget 151,793 baht per academic staff.

The academic staff performs research through individual efforts, collaborations, or through the support of the research units. For computer engineering, there are 3 research units which include Advance Systems and Software Engineering Research Team: **ASSERT**, Embedded System, and Smart Device Research Unit: **Device Lab**, and Computer Vision and Human Interaction Technologies Laboratory: **Vision Lab**. Student research topics are aligned with the research thrusts of their advisors and the research units. Fourth year students are required to do their senior project and have to submit a research paper as part of the final deliverables of the theses in preparation for submission to national or international conferences. Each year, there are student project competitions held by both the university and the faculty. Outstanding student projects are awarded by the university and the faculty [Exh. 2.14(3), Exh. 2.14(4), Exh. 2.14(5) and Exh. 2.14(6)].

In conclusion, the pass rate (83%) and the rate of students who graduated within 4 years (65%) of CPE graduates are satisfactory, while the dropout rate (17%) is acceptable. The employability of Computer Engineering graduates is satisfactory (91.35% in 2010). The research activities by academic staff and students are also satisfactory. The checklist below shows the self-rated opinion on output.

AUN-QA Criterion 14 – Checklist

14	**Output**	1	2	3	4	5	6	7
14.1	The pass rate is satisfactory and dropout rate is of an acceptable level.					✓		
14.2	Average time to graduate is satisfactory.					✓		
14.3	Employability of graduates is satisfactory.					✓		
14.4	The level of research activities by academic staff and students is satisfactory.					✓		
	Overall opinion					✓		

2.15. Stakeholders Satisfaction

2.15.1. The feedback from stakeholders is satisfactory.

In order to ensure that the stakeholders obtain great satisfaction, the Faculty provides several policies to survey their opinions, as follows;

Student

The Faculty of Engineering has generally conducted a survey to assess the satisfaction of the students on a regular basis [Exh. 2.15(1)]. A summary of such information is then reported to the department and the instructor, in order to improve a teaching quality [Exh. 2.15(2)]. The flow diagram of such process is displayed in Figure 2.15-1.

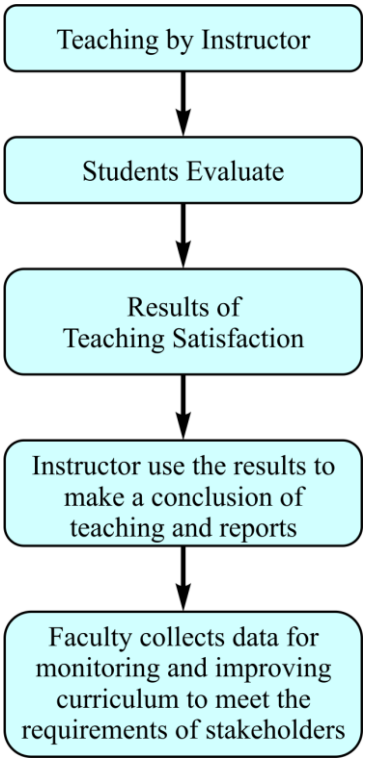


Figure 2.15-1 A flow diagram to assess students satisfaction

Alumni

The alumni survey has been conducted when graduated students came back to NU during the graduation ceremony (about one year after graduation). Additionally, the online survey is also available (in case that the alumni are not able to attend the graduation ceremony).

The survey has been carried out using a questionnaire comprising the information that the faculty needs from alumni, for example the employment status,

condition of employment, job categories, income satisfaction, and etc [Exh. 2.15(3) and Exh. 2.15(4)].

Labor Market

In order to assess the degree of satisfaction of the labor market, the Faculty of Engineering has conducted a survey by sending the questionnaires to several companies, industrial factories, and organizations that employ our graduated students. The assessment is divided into 5 sections according to the TQF namely [Exh. 2.15(5)];

1. Ethics and morals
2. Knowledge
3. Cognitive skills
4. Interpersonal skills
5. Analytical skills

And the results of such survey are in the level of "very satisfied" [Exh. 2.15(6)]. A self-assessment in this criterion has been conducted using several policies mentioned above and the Faculty of Engineering can ensure that the stakeholders obtain a great satisfaction. As a result, the score in this section is 5.

AUN-QA Criterion 15 – Checklist

15	**Stakeholders Satisfaction**	1	2	3	4	5	6	7
15.1	The feedback from stakeholders is satisfactory					✓		
	Overall opinion					✓		

3. Strengths and Weaknesses Analysis

3.1. Summary of Strengths

Expected Learning Outcomes: The bachelor of Engineering in CPE has clearly formulated expected learning outcomes. They are well translated into the program as everyone can find them in the curriculum. Moreover, with these outcomes the lifelong learning is well promoted. By mappings the expected learning outcomes with various requirements, we have shown that they can cover both generic and specialized skills and knowledge. Requirements of the stakeholders especially the TQF are clearly used as an input in the developed expected learning outcomes.

Program Specification, Structure, and Content: The CPE program is well-organized, informative, communicated, coherent and integrative. Expected learning outcomes are explicitly included in the program. They can step-by-step achieved by following the program. The NU has widely announced and utilized the program

specification to structure the learning process and its development. Therefore, it can seamlessly reflect the university vision and mission. Detailed categorized program without any overload, conflict or contradiction problem has well designed prior to announcement and usage. The program is made available in both online electronic and hard copy format. It is thus convenient to check and review. In addition, the program content is up-to-date.

Teaching and Learning Strategy: The Department of ECPE employs the project-based teaching and learning strategy in order to balance between the principles and theories in CPE and the real-world practical applications of these theories and principles. This strategy facilitates the sense of self-learning of the students and enables them to discover new knowledge, integrate prior knowledge through assignments, experiments and research. This strategy also enables students to become familiar with a real-world working environment and helps them to promptly adjust themselves to life after graduation.

Student Assessment: Well-established criterion-based student assessment has widely been used in the CPE program. They are the combination of centralized governmental (Entrance test), NU regulation and the organization in the Department of ECPE. Various assessment methods from individual ECPE courses/staffs are regularly reviewed and used. The standard made by TQF is consistently applied to the program.

Academic Staff Quality: CPE has competent academic staffs (24 in total). The large number of Ph.D. qualified the teaching support/service from ECPE. Processes to recruit and promote are well-defined and based on academic merit. Relatively high incentives/rewards are provided to the academic staff in order to encourage the staff quality improvement process via researches. Academic staff in ECPE has therefore experience and skillful in teaching.

Student Quality: The student intake policy is clear and method is well-known for Thai students. It is managed in a centralized manner by the Ministry of Education, which is standardizing. The university have a clear support system for this task. The actual study load well follow the prescription in expected learning outcomes and each course. The workload and quality of learning is adequate and balanced in the curriculum.

Student Advice and Support: The advisory and mentoring system in the Department is adequate uses several channels. The academic staff keep track of student performance and provide advice and support in specific courses while the assigned advisors oversee specific batches of students for both academic and personal matters. Students working on senior projects are mentored by their project advisor

while students on internship programs are monitored and supported by assigned staff. The Head of the Department and the Dean of the Faculty also supervise the whole process.

Quality Assurance of Teaching and Learning Process: Requirement from stakeholders are clearly considered in the program development process. Most of academic staffs are involved in the curriculum development. Opinions from students (including alumni) and labor market are taken into account. With effort from the program development staff, the curriculum is regularly revised and updated. These assure the high quality and up-to-date teaching and learning process of the bachelor of Engineering in CPE program.

Stakeholders Feedback and Satisfaction: The well-structured feedback process and the obtained result gave a good satisfactory level. The feedback are evaluated in many aspects. Expected learning outcomes, curriculum, changes of subject are all be considered based on the result. Organization of this process is well-established.

3.2. Summary of Weaknesses

While the vision of becoming a research-based university is well known by all parties, the research concept has been introduced but has not yet been deeply ingrained in all activities. While modern teaching and learning techniques are employed in many courses, the classroom research and research-based learning has been limited. The Department of ECPE has began research activities via many channels. Several research units within the ECPE have found in 2012. Three of them are related to teaching and learning in CPE program. At this time, they are still in initializing phase. Therefore, the professional classroom research and research-based learning are being developed.

In addition, workplace research is rarely used in improving the quality of service by the supporting staff. The constant feedback has been established but it has not yet been fully integrated into the program/system. The PDCA process has not yet been integrated in the students' own activities and students' self-management activities. There are still rooms for better organizing this aspect.

The lecture facilities and related infrastructure are adequate. The number of lecture rooms, laboratories, computers are sufficient and up-to-date. However, there are still difficulty in accessibility of this facilities. Due to the large number of users and the limited number of support staffs the service are not excellent. Ability of staff does sometimes relate to the quality of facility and availability of infrastructure.

3.3 Completed Checklist

1	**Expected Learning Outcomes**	1	2	3	4	5	6	7
1.1	The expected learning outcomes have been clearly formulated and translated into the programme.					✓		
1.2	The programme promotes life-long learning.					✓		
1.3	The expected learning outcomes cover both generic and specialized skills and knowledge.					✓		
1.4	The expected learning outcomes clearly reflect the requirements of the stakeholders.					✓		
	Overall opinion					✓		
2	**Program Specification**							
2.1	The university uses programme specification.					✓		
2.2	The program specification shows the expected learning outcomes and how these can be achieved.					✓		
2.3	The program specification is informative, communicated, and made available to the stakeholders.					✓		
	Overall opinion					✓		
3	**Program Structure and Content**							
3.1	The program content shows a good balance between generic and specialised skills and knowledge.					✓		
3.2	The program reflects the vision and mission of the university.					✓		
3.3	The contribution made by each course to achieving the learning outcomes is clear.					✓		
3.4	The program is coherent and all subjects and courses have been integrated.					✓		
3.5	The program shows breadth and depth.					✓		
3.6	The program clearly shows the basic courses, intermediate courses, specialised courses, and the final project, thesis or dissertation.					✓		
3.7	The program is up-to-date.						✓	
	Overall opinion					✓		
4	**Teaching and Learning Strategy**							
4.1	The faculty or department has a clear teaching and learning strategy.					✓		
4.2	The teaching and learning strategy enables students to acquire and use knowledge academically.						✓	
4.3	The teaching and learning strategy is student oriented and stimulates quality learning.						✓	
4.4	The teaching and learning strategy stimulates action learning and facilitates learning to learn.						✓	
	Overall opinion						✓	
5	**Student Assessment**							
5.1	Student assessment covers student entrance, student progress, and exit tests.					✓		
5.2	The assessment is criterion-referenced.					✓		
5.3	Student assessment uses a variety of methods.					✓		
5.4	Student assessment reflects the expected learning outcomes and the content of the programme.					✓		

5.5	The criteria for assessment are explicit and well-known.					✓		
5.6	The assessment methods cover the objectives of the curriculum.					✓		
5.7	The standards applied in the assessment are explicit and consistent.					✓		
	Overall opinion					✓		
6	Academic Staff Quality							
6.1	The staff are competent for their tasks					✓		
6.2	The staff are sufficient to deliver the curriculum adequately					✓		
6.3	Recruitment and promotion are based on academic merits					✓		
6.4	The roles and relationship of staff members are well defined and understood					✓		
6.5	Duties allocated are appropriate to qualifications, experiences and skills					✓		
6.6	Staff workload and incentive systems are designed to support the quality of teaching and learning					✓		
6.7	Accountability of the staff members is well regulated					✓		
6.8	There are provisions for review, consultation and redeployment					✓		
6.9	Termination and retirement are planned and well implemented					✓		
6.10	There is an efficient appraisal system					✓		
	Overall opinion					✓		
7	**Support Staff Quality**							
7.1	The library staff are competent and adequate in providing a satisfactory level of service.				✓			
7.2	The laboratory staff are competent and adequate in providing a satisfactory level of service.				✓			
7.3	The computer facility staff are competent and adequate in providing a satisfactory level of service.				✓			
7.4	The student services staff are competent and adequate in providing a satisfactory level of service.				✓			
	Overall opinion				✓			
8	**Student Quality**							
8.1	There is a clear student intake policy.					✓		
8.2	The student admission process is adequate.					✓		
8.3	The actual study load is in line with the prescribed load.					✓		
	Overall opinion					✓		
9	**Student Advice and Support**							
9.1	There is an adequate student progress monitoring system.					✓		
9.2	Students get adequate academic advice, support, and feedback on their performance.					✓		
9.3	Mentoring for students is adequate.					✓		
9.4	The physical, social, and psychological environment for the student is satisfactory.							
	Overall opinion					✓		
10	**Facilities and Infrastructure**							

10.1	The lecture facilities (lecture halls, small course rooms) are adequate.				✓			
10.2	The library is adequate and up-to-date.				✓			
10.3	The laboratories are adequate and up-to-date.				✓			
10.4	The computer facilities are adequate and up-to-date.				✓			
10.5	Environmental health and safety standards meet requirements in all aspects.				✓			
	Overall opinion				✓			
11	**Quality Assurance of Teaching and Learning Process**							
11.1	The curriculum is developed by all academic staff members.					✓		
11.2	The curriculum development involves students.					✓		
11.3	The curriculum development involves the labour market.					✓		
11.4	The curriculum is regularly evaluated at reasonable time periods.					✓		
11.5	Courses and curriculum are subject to structured student evaluation.					✓		
11.6	Feedback from various stakeholders is used for improvement.					✓		
11.7	The teaching and learning process, assessment schemes, the assessment methods, and the assessment itself are always subject to quality assurance and continuous improvement.					✓		
	Overall opinion					✓		
12	**Staff Development Activities**							
12.1	There is a clear plan on the needs for training and development of both academic and support staff.					✓		
12.2	The training and development activities for both academic and support staff are adequate to the identified needs.					✓		
	Overall opinion					✓		
13	**Stakeholders Feedback**							
13.1	There is adequate structured feedback from the labour market.					✓		
13.2	There is adequate structured feedback from the students and alumni.					✓		
13.3	There is adequate structured feedback from the staff.				✓			
	Overall opinion					✓		
14	**Output**							
14.1	The pass rate is satisfactory and dropout rate is of an acceptable level.					✓		
14.2	Average time to graduate is satisfactory.					✓		
14.3	Employability of graduates is satisfactory.					✓		
14.4	The level of research activities by academic staff and students is satisfactory.					✓		
	Overall opinion					✓		
15	**Stakeholders Satisfaction**							
15.1	The feedback from stakeholders is satisfactory					✓		
	Overall opinion					✓		
	OVERALL VERDICT					✓		

3.4. Improvement plan

According to the strengths and weaknesses analysis described in Section 3.2. We have several strategies to improve the CPE program in various aspect. The strategies are divided into 3 plans according to the timescale. It is briefly described as follows:

3.4.1. Short term

- There will be a pilot study on implementing classroom research in some classes, such as advanced computer programming. The research-based learning will be tried on the fundamental skills for computer engineering class.

- The PDCA concept will be explicitly introduced to all students in the form of a workshop at the beginning of the academic year 2012.

- A integrated test will be offered to the students voluntarily. The test will assist both instructors and students in assessing the students' level of knowledge and skills.

3.4.2. Medium term

- Supporting staff will be rewarded for their workplace research in the form of special recognition on the department's web page.

- A proper feedback mechanism will be derived to provide constant input from all relevant stakeholders. The monitoring mechanism will also be implemented to ensure that all issues are addressed.

- To assist students' awareness of their knowledge and skills, there will be integrated tests at the end of the academic year. The integrated tests cover all subjects from the first year up to that point.

- The academic advisors will assist students on using the PDCA process to improve their academic performance and on applying the concept with their personal life.

3.4.3. Long term

- Learning activities will be based on the result of research: academic research, classroom research, community research, and so on.

- The students will be required to identify their area of interests and conduct the research on a regular basis.

- The students will be required to self-identify their personal strengths and weaknesses with respect to the expectation from the industry; then propose the plans for improvement. The academic advisor will assist students in monitoring that all these plans are appropriately executed.

4. Appendices

4.1. List of Abbreviations

AAD	Algorithm Analysis and Design
ACM	Association for Computing Machinery
AEC	ASEAN Economic Community
ASSERT	Advanced Systems and Software Engineering Research Team
AUN	ASEAN University Network
CPE	Computer Engineering
CPF	Charoen Pokphand Foods
CUAS	Central University Admission System
ECPE	Electrical and Computer Engineering
EE building	Electrical Engineering building
EEC	Engineering Core Curriculum
EN building	Engineering building
FTE	Full-Time Equivalent
GAT	General Aptitude Test
GPA	Grade Point Average
HCI	Human and Computer Interaction
HEd	Higher Education
IEEE	Institute of Electrical and Electronics Engineers
IT	Information Technology
LAN	Local Area Network
LMS	Learning Management System
MS	Microsoft
NIETS	National Institute of Educational Testing Service
NU	Naresuan University
O-NET	Ordinary National Education Test
PAT	Professional Aptitude Test
PDCA	Plan-Do-Check-Action
QA	Quality Assurance
SAR	Self-Assessment Report
SCB	Siam Commercial Bank
TA	Teacher Assistant
TQF	Thai Qualifications Framework

4.2. List of Exhibits

Exhibit	Description
2.1(1)	CPE 2012 Curriculum
2.1(2)	Requirement from Stakeholders from TQF:HEd
2.1(3)	TQF:HEd:Computer 2009
2.1(4)	NU Engineering Identity
2.1(5)	NU Graduate Identity
2.1(6)	Staff Specialization
2.1(7)	CE2004
2.1(8)	2011 Survey

2.1(9)	Detailed Characteristics mapping
2.1(10)	305111 Course Syllabus
2.2(1)	Detailed Template
2.4(1)	Teaching Strategies
2.4(2)	Computer Engineering Project I Syllabus
2.4(3)	Picture of AIT-NU CV class
2.4(4)	Internship Manual
2.4(5)	Principles of Computer Graphics Syllabus
2.4(6)	Operating Systems Syllabus
2.4(7)	Digital Image Processing Syllabus
2.4(8)	Computer Vision Syllabus
2.4(9)	Picture of Senior Project Contest
2.4(10)	Student Guide Book
2.4(11)	Moodle Instruction for Students
2.4(12)	Internship Evaluation
2.4(13)	Picture of Internship Presentation
2.4(14)	Software Engineering Syllabus
2.4(15)	Algorithm Analysis and Design Syllabus
2.4(16)	Data Communication and Computer Networks Syllabus
2.5(1)	Sample of TQF3
2.5(2)	Training Course Manual
2.5(3)	Training Course Evaluation
2.5(4)	List of Course Websites
2.5(5)	Training Course Assessment
2.6(1)	Academic Staff List
2.6(2)	Research Projects 2010
2.6(3)	Teaching Evaluation by Students 1
2.6(4)	Teaching Evaluation by Students 2
2.6(5)	Teaching Evaluation by Students 3
2.6(6)	Teaching Evaluation by Students 4
2.6(7)	Training Fund
2.6(8)	Staff Admission Guideline
2.6(9)	Academic Staff Qualification Guideline
2.6(10)	Teaching Workload Final Semester 2010
2.6(11)	Academic Staff Workload Regulation
2.6(12)	IT Equipment Fund
2.6(13)	Reward for Professor
2.6(14)	Incentive for Academic Presentation Abroad
2.6(15)	Incentive for Academic Publications
2.6(16)	Reward for Patents
2.6(17)	Academic Staff Ethics
2.6(18)	Teaching Workload System User Manual
2.6(19)	Academic Staff Career Path
2.6(20)	Sin Sathaporn Provident Fund

2.6(21)	Staff Evaluation Guideline 1
2.6(22)	Staff Evaluation Guideline 2
2.6(23)	Staff Probation Guideline
2.6(24)	Staff Probation Form
2.6(25)	Staff Evaluation Form
2.7(1)	Degree Descriptions of Supporting Staffs
2.7(2)	Satisfactory level of Service of the Library
2.7(3)	Develop Library Staff to Good Work
2.7(4)	Library Staff are adequate and Satisfactory of Service
2.7(5)	Example Laboratory Staff Schedule Task
2.8(1)	Intake Size Plan
2.8(2)	The Curriculum Structure
2.9(1)	Course Syllabus
2.9(2)	Academic Advisor Announcement
2.9(3)	Student Progress Monitoring System
2.9(4)	The Number of Employed Students
2.9(5)	Advisory Description
2.9(6)	Overload Registration Form
2.9(7)	Low GPA Students Advisory Detail
2.9(8)	Senior Project Logbook
2.9(9)	Orientation and Internship Seminar
2.9(10)	Field Trip and Alumni Activities
2.9(11)	First Year Tutorial
2.9(12)	Non-academic Activities
2.10(1)	List of Room Data
2.10(2)	Schedule-for-Teaching Management System
2.10(3)	Wireless Access Point Location Map
2.10(4)	List of New Books for the Department of ECPE
2.10(5)	List of Inventory, Status and Request Planning of Equipments
2.10(6)	List of Software in ECPE Department and Downloadable Software
2.10(7)	List of Accidents and Medical Service Requests
2.11(1)	Curriculum Development Committee
2.11(2)	Curriculum Evaluation Committee
2.12(1)	Staff Development Plan
2.12(2)	Development Record
2.12(3)	CPE Workshops
2.12(4)	Training Material or visit www.acad.eng.nu.ac.th
2.13(1)	Employer Satisfaction Survey Report
2.13(2)	Online Class Evaluation System

2.13(3)	After-Graduate Employment Survey Form
2.13(4)	Meeting Minute on Alumni Complaint, 28 February 2012
2.14(1)	Student Statistics 2011
2.14(2)	Senior Project Schedule
2.14(3)	Device Lab Document
2.14(4)	ASSERT Document
2.14(5)	Vision Document
2.15(1)	Student Evaluation
2.15(2)	Summary of Student Evaluation
2.15(3)	Alumni Survey Result 2009
2.15(4)	Alumni Survey Result 2010
2.15(5)	Labor Survey Form
2.15(6)	Labor Survey Result

ANNEX I

Skill Matrix

A Mapping representing the Distribution of Responsibilities from a Curriculum Standard to each Course in a Category of General Courses

The Headers of column in a Table Annex I-a mean

1. Moral and Ethic

1.1 Be responsible

1.2 Be participate

1.3 Has public consciousness

1.4 Has ethical behavior

1.5 Respect in Thai language and tradition

2. Knowledge

2.1 Has multilanguage skills

2.2 Criticize the Global and Asian traditions

2.3 Connect to current situation and life

2.4 learn to understand problems and the solutions using science and mathematics

3. Intellectual Skill

3.1 Analyze problems using logical methods

3.2 Be creative

3.3 Know a method to improve behavior and health

4. Social and Responsible Skills

4.1 Communicate to others using both great speaking and body language and via technology

4.2 Be intelligent to live with other people

5. Numerical, Communicating and Technological Analysis Skills

5.1 Analyze, design and summarize text for presenting in both Thai and other Language

5.2 Apply media and technology for interpreting , communicating and planning life

6. Psychmotor Skill

6.1 Practice to have a good health and mind

6.2 Develop an outstanding behavior and language usage that be approved international society

Table Annex I-a : A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course

General Course Category

● Major responsibility ○ Minor responsibility

Course	1. Moral and Ethic					2. Knowledge				3. Intellectual Skill			4. Social and Responsible Skill		5.Numerical, Communicating and Technological Analysis Skill		6.Psychmotor Skill	
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.1	3.2	3.3	4.1	4.2	5.1	5.2	6.1	6.2
1. General Course Category																		
1.1 Language Courses																		
001201 Thai Language Skills	○			○	●					●			●					
001211 Fundamental English	●	●	●		●	●	●				●		●	●	●	●		●
001212 Developmental English	●	●	●		●	●	●				●		●	●	●	●		●
001213 English for Academic Purposes		○	●		●	●	●				●		●	●	●	●		●
1.2 Humanity Courses																		
001223 Music Appreciation	○	●	○	○	○		○	●		○	●	○	●	○	○	○	●	
001224 Arts in Daily Life	●	●	○		○	○	●	○	●	●	○		●			●		

Table Annex I-a: A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course (Cont.)

General Course Category

● Major responsibility O Minor responsibility X None

Course	1. Moral and Ethic					2. Knowledge				3. Intellectual Skill			4. Social and Responsible Skill		5.Numerical, Communicating and Technological Analysis Skill		6.Psychmotor Skill	
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.1	3.2	3.3	4.1	4.2	5.1	5.2	6.1	6.2
1.3 Social Courses																		
001232 Fundamental Laws for Quality of Life									●	●								
001237 Life Skills	●	●	●	●	O		●	●		●	●	●	●	●	●			
1.4 Science Courses																		
001271 Man and Environment	●	O	O	●	O	●	O	●	O	●	O		●	O	O	O		O
001277 Human Behavior	●	●					O	●		O	O	●	O	O				

A Mapping representing the Distribution of Responsibilities from a Curriculum Standard to each Course in a Category of Special Courses

The Headers of column in a Table Annex I-b mean

1. Moral and Ethic

1.1 Understand and realize Thai tradition, Appreciate the system of moral, ethic, sacrifice and loyalty

1.2 Discipline, be punctual, be responsible for yourself and society, respect to rules of institutes and sociality

1.3 Be both a leader and follower, work in a team, deal with conflicts priorizedly, respect to other rights, be a good listener and respect to the worth and prestige of human

1.4 Analyze and assess consequences from using Engineering knowledge to people, institutes and environments.

1.5 Has both academic and professional ethics, be responsible in a role of profession and understand social roles of each major in Engineering from the past to present

1.6 Has a good vision of careers, show the moral and ethics while working and communicating to other people

2. Knowledge

2.1 Has a knowledge and understanding of basic mathematics, basic science, basic engineering and economics for applying to related engineering application and develop new technological innovations

2.2 Has a knowledge and understanding related to important strategies in a Computer Engineering topics both theories and practices widely, systematically, internationally and modernly

2.3 Integrate Computer Engineering knowledge into other relevant areas

2.4 Analyze and solve problems using appropriate ways and apply to a proper equipment such as computer programs.

2.5 Has knowledge of Computer Engineering professional criteria and apply the knowledge to solve real problems

3. Intellectual Skill

3.1 Has a good thinking and judgment

3.2 Collect, learn, analyze and summarize problems and need

3.3 Think, analyze and solve Engineering problems systematically and using information for making decisions efficiently

3.4 Has an imagination and flexibility for applying knowledge to develop innovations appropriately or extending knowledge creatively

3.5 Search and Seek further knowledge by yourself for a sustainable learning and being ready to knowledge and technology change

3.6 Apply knowledge theories, practices and other areas to perform Engineering work efficiently

4. Social and Responsible Skills

4.1 Communicate to many types of people and speak both Thai and other languages efficiently, represent professional knowledge to society with appropriate topics

4.2 Be a leadership for raising points that can solve both personal and social problems creatively, represent both your point of view and team's point of view appropriately, support and encourage to solve problems in any situations

4.3 plan and response to develop your learning that related to careers continuously

4.4 Understand your role and be responsible to do the work of personal and team mission, adjust and work in a team as a leader and follower efficiently, has appropriate behavior for your responsibilities

4.5 realize and be responsible to securities of working and aware of taking care of environments for society and nation

5. Numerical, Communicating and Technological Analysis Skills

5.1 Has a computer skill for doing work related to careers well

5.2 Analyze Mathematical information or present statistics for solving related problems creatively

5.3 Apply modern communication technology appropriately and efficiently

5.4 Has communication skills both speaking, writing and showing meaningful symbol

5.5 Use calculable devices and Engineering equipments for performing careers related to Engineering work

5.6 Use technology to communicate, select presentation format appropriated to contents and various audiences efficiently

Table Annex I-b: A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course

Special Course Category

● Major responsibility ○ Minor responsibility

Course	1. Moral and Ethic						2. Knowledge					3. Intellectual Skill						4. Social and Responsible Skill					5.Numerical, Communicating and Technological Analysis Skill					
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6
2. Special Subject Category																												
2.1 Major Courses																												
2.1.1 Basic Mathematics and Science																												
252182 Calculus I	○	○	○		○	○	●	●					○	○	○	○	○	○	○	○	●		○	●	○	○		○
252183 Calculus II	○	○	○		○	○	●	●					○	○	○	○	○	○	○	○	●		○	●	○	○		○
252284 Calculus III	○	○	○		○	○	●	●					○	○	○	○	○	○	○	○	●		○	●	○	○		○
256101 Principle of Chemistry	○	○	○		●	●	●	●					●	●	○	●	●	○	●	○	●		○	○	○	○		○
261101 Physics 1	●	●	●				●	●					●	●	●	●	●	○	○	●	○		●	●	●	●		●
261102 Physics 2	●	●	●				●	●					●	●	●	●	●	○	○	●	○		●	●	●	●		●
2.1.2 Basic Engineering																												
301304 Engineering Economics		●					○	●	○	○	○	○	○	●	○	○	○	○		○	○		○	●			●	
302151 Engineering Drawing		●						●		○				●							○						●	
305171 Computer Programming		○						○	○	●			●	○						○			●				○	
2.2 Specific Special Courses																												
2.2.1 Required Courses																												
2.2.1.1 Computer Engineering Required Courses																												

Table Annex I-b: A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course (Cont.)

Special Course Category

● Major responsibility O Minor responsibility

Subject	1. Moral and Ethic						2. Knowledge					3. Intellectual Skill						4. Social and Responsible Skill					5.Numerical, Communicating and Technological Analysis Skill					
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6
2.2.1.1.1 Technology for Applications Courses																												
305453 Artificial Intelligence		O	O				O	●	O	O	O		O	O	●	O	O	O		O	O			●	O		O	
305361 Database		O	O	O			O	●	O				●	O			O	O		O	O			●	O		O	
2.2.1.1.2 Technology and Software Procedure Courses																												
305111 Fundamental Skills for Computer Engineering	O	●	O	O	O	O	O	O	O	O	O	O	●	O	●	●	O	O	O	●	O	O	O	O	O	O	O	O
305172 Computer Programming Laboratory		O						O	O	●			●	O						O			●				O	
305233 Algorithm Analysis and Design			O				●		O	O		O		O		O	O		O				O				O	
305272 Advanced Computer Programming		O					O	O		●		●		O			O			O	O		O	O				
305371 Software Engineering		●	●	●	●	●	O	●	●	●	●		●	●				O				O	●	●	●	●	●	
2.2.1.1.3 Basic Structure of System Courses																												
305131 Computer Mathematics I		O					●	O		O					O	O	●			O				●		O	O	
305132 Computer Mathematics II		O					●	O		O					O	O	●			O				●		O	O	
305214 Data Structures		O					O	●	O	●		O	O	●		O				O	O		O	O	O			
305346 Computer Networks	O							●	O	O			O	●	O		O			O	O				O	●	O	
305351 Computer System Engineering		O		●	●	●	O	●	●	●	O	●	●	●	●		●	O				O	●	●	●	●		●
305383 Operating Systems	O	O				O	O	●		O		O	O	●					O	O					●	O	O	

Table Annex I-b: A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course (Cont.)

Special Course Category

● Major responsibility O Minor responsibility

Course	1. Moral and Ethic						2. Knowledge					3. Intellectual Skill						4. Social and Responsible Skill					5.Numerical, Communicating and Technological Analysis Skill					
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6
2.2.1.1.3 Basic Structure of System Courses																												
305232 Applied Probability for Computer Engineering		O					●	O		O					O	O	●			O				●		O	O	
305331 Theory of Computation		O					●	O		O					O	O	●			O				●		O	O	
2.2.1.1.4 Hardware and Computer Architecture Courses																												
303213 Electrical Circuit Analysis for Computer Engineering		●						●						●							O			O				
303242 Electronics for Computer Engineering		O						●					●							O							●	
305224 Digital Logic							●	O		O			O	●						O	O					O		
305332 Digital Signal Processing		O					O	●	O	●	O	O	O	●		O				O	O		O	O	O			
305381 Microprocessor and Assembly Language			O				O	●		O				O						O	O						●	
305382 Computer Architecture and Organization	O	O				O	O	●						O		O	O		O	O		O	O	O	O	●	O	
305384 Microcontroller and Microcomputer Interfacing		O	O					O	●	O			O	O		O	●			O	O	●	O		●	O	O	O
2.2.1.1.5 Project Courses																												
305491 Computer Engineering Project I	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
305492 Computer Engineering Project II	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Table Annex I-b: A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course (Cont.)

Special Course Category

● Major responsibility O Minor responsibility

Course	1. Moral and Ethic						2. Knowledge					3. Intellectual Skill						4. Social and Responsible Skill					5.Numerical, Communicating and Technological Analysis Skill					
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6
2.2.2 Required Language Courses																												
205200 Communicative English for Specific Purposes	O					O			O				●					●								●		●
205201 Communicative English for Academic Analysis	O					O			O				●					●								●		●
205202 Communicative English for Research Presentation	O				O	O			O				●					●								●		●
2.3.2 Computer Engineering Elective Courses																												
305273 Personal Process for Software Development		●			●	●	O	O	O			O		●			O			●			O	O	O	O		O
305274 Software Process and Quality Assurance		●			●	●					●	●		●			●	●	O		O	O	O	O	O	O		O
305275 Software Design				●				●		●	O	O	O	O	●		●	●	●			O	O	O	O	●		●
305276 Software Verification and Validation				O			O	●	●	●	●	●		O	O							O	O	●	O			
305321 Control Systems for Computer Engineering				O			O	●	●	O			O	●	O	O	O			O	O		●	●	O	O	O	O
305352 Introduction to Human Computer Interaction		O		O			O	●	●	●	O	O	●	●	●	O	●			O	O		O	O	●	O	●	O
305358 Robotics Engineering I		O	O				●	O	●	O	O		O	●	●	O	●			O	●		●	●	O	O	●	O
305362 Computer and Information Security				●	●		O	O	O	O	O	O	●	O							O	●			●	O	●	O
305363 Electronic Commerce	O			O					●	O					O	●			O		O			O				●
305364 Social Network Programming		O	●	●				O	●	●	O	O	●	O	O	O	O	O		O				●	●	O		●
305372 Compiler Construction		O					O	O	O	●				O	●		O			O	●		O	O		O		
305373 Team Process for Software Development		●	●		●	●	O	O	O			O		●			O	●	●		●					●		●

Table Annex I-b: A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course (Cont.)

Special Course Category

● Major responsibility ○ Minor responsibility

Course	1. Moral and Ethic						2. Knowledge					3. Intellectual Skill						4. Social and Responsible Skill					5.Numerical, Communicating and Technological Analysis Skill					
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6
305375 Software Construction and Evolution		○		●				●	○	○			●	○	○				○					●				○
305376 Introduction to Software Architecture		○	●	○			○	●	●	●	●	○	●	●	●	●	●	○	○	○			●	●	●	○	●	●
305391 Special Topic in Computer Engineering		○	●					●		○			○			○			○	○	○				○	●		○
305392 Special Topic in Computer and System		○	●					●		○			○			○			○	○	○				○	●		○
305393 Special Topic in Human Computer Interaction		○	●					●		○			○		●	○			○	○	○				○	●		○
305394 Special Topic in Embedded System		○	●					●		○			○		●	○			○	○	○	○			○	●		○
305395 Special Topic in Robotic		○	●					●		○			○		●	○			○	○	○	○			○	●		○
305396 Special Topic in Software Engineering	○	○	●		●	○		●		○			○			○			○	○	○				○	●		○
305432 Computer Graphics		○					○	●	●	○	○	○	●	●	●	○	●			○	○		●	●	●	○	●	○
305434 Digital Image Processing		○					○	●	○					●					○					●	●			
305438 Multimedia		○					○	●	○					●					○					●	●			
305445 Network System Programming				●	●		○	○	○	○	○	○	●	○							○	●			●	○	●	○
305454 Advanced Artificial Intelligence		○	○				○	●	○	●	●	○	●	○	●	○	○	○		○	○			●	●	○	●	●
305452 Robotics Engineering II		○	○				●	○	●	○	○		○	●	●	○	●			○	●				○	○	●	○
305455 Pattern Recognition		○	○				○	●	○	●	●	○	●	○	●	○	○	○		○	○				●	○	●	●
305456 Computer Vision		○					○	●	●	●	○	○	●	●	●	○	●			○	○			●	○	○	●	○
305463 Management Information Systems				●	○	○	○	●	●	○	●		●				●				●	○			●		●	

Table Annex I-b: A Mapping Representing the Distribution of Responsibilities from a Curriculum Standard to each Course (Cont.)

Special Course Category

● Major responsibility O Minor responsibility

Course	1. Moral and Ethic						2. Knowledge					3. Intellectual Skill						4. Social and Responsible Skill					5.Numerical, Communicating and Technological Analysis Skill					
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6
305464 Distributed Application				●	O	O	O	●	●	O	●		●				●				●	O			●		●	
305465 Data and Application Integration		O	●	O			O	●	●	●	●	O	●	●	O	O	●	O	O	O			●	●	●	O	●	●
305466 Foundation of IT Services				●	O	O	O	●	●	O	●		●				●				●	O			●		●	
305467 Foundation of IT Governance				●	O	O	O	●	●	O	●		●				●				●	O			●		●	
305472 Service Oriented Architecture		O	●	●			O	●	●	●	●	O	●	●	O	●		O	●	●			●	●	●	O	●	●
305481 Embedded System				O		O	O	●	●	●		O	●	●	●	O	●	O	O	O	O	O		O	●	O	O	O
4. Required Courses (none credits)																												
305390 Training in Computer Engineering	O	●	O	O	O	O	O	O	O	O	●	O	O	O	O	O	●	O	O	O	●	O	O	O	O	O	O	O

ANNEX II

Course Handbook

Program Structure

Table Annex II: Computer engineering program structure

Category	Credits			
1. General Education	30			
1.1. Language Skills		12		
1.2. Humanities		6		
1.3. Social Science		6		
1.4. Science		6		
2. Specialized courses				
2.1. Core courses	30			
2.1.1. Fundamental Courses in Mathematics and Science		21		
2.1.2. Fundamental Courses in Engineering		9		
2.2. Major courses	82			
2.2.1. Required Course		70		
2.2.1.1. Major Required Courses			67	
2.2.1.1.1. Application Technology				6
2.2.1.1.2. Software Methods and Technologies				11
2.2.1.1.3. Systems Infrastructure				22
2.2.1.1.4. Computer Hardware and Architecture				22
2.2.1.1.5. Projects				6
2.2.1.2. Required Courses in English Language			3	
2.2.2. Major Electives		12		
3. Free Electives	6			
4. Required Course (no credit)[1]	(6)			
Total	**148**			

Program structure comprises 4 categories which are general education, specialized courses, free electives, and training.

1. General education is provided by the university. General education courses have 30 credits in total which include language skills courses (12 credits), humanities courses (6 credits), social science courses (6 credits), and science courses (6 credits). Language skills courses will increase student ability in language especially English. Students will have an aesthetic sense after taking humanities courses. Social science courses provide students with a greater understanding of their role in society. Science course will enable students to live with Nature wisely.
2. Specialized courses are provided by the Faculty of Science, Faculty of Engineering, and the Department of Electrical and Computer Engineering. Specialized courses have 118 credits in total which include core courses (30 credits) and major courses (82 credits). Core courses are divided into fundamental courses in mathematics and science and fundamental courses in engineering which are provided for students to achieve general knowledge and skill. Major courses are provided for students to achieve specific knowledge and skill.

[1] Condition for graduation: every engineering student must enroll in the course for internship—305390 Training in Computer Engineering (at least 270 hours)—and the student must pass the evaluation.

3. Students can freely select 6 credits of courses offered by the university in total which are called free electives.
4. Training is one of the required courses that students need to take. Students need to work in an outside company or enterprise for at least 270 hours. This industrial training enables students to enhance their knowledge, working experience, and social life skills.

Course listing

1. General Education		**30 credits**
1.1. **Language skills**		**12 credits**
001201	Thai Language Skills	3(2-2-5)
001211	Fundamental English	3(2-2-5)
001212	Developmental English	3(2-2-5)
001213	English for Academic Purposes	3(2-2-5)
1.2. **Humanities**		**6 credits**
001223	Music Appreciation	3(2-2-5)
001224	Arts in Daily Life	3(2-2-5)
1.3. **Social Science**		**6 credits**
001232	Fundamental Laws for Quality of Life	3(3-0-6)
001237	Life Skills	2(1-2-3)
and select from health education courses		**1 credits**
001250	Golf	1(0-2-1)
001251	Games	1(0-2-1)
001252	Body Conditioning	1(0-2-1)
001253	Rhythmic Activities	1(0-2-1)
001254	Swimming	1(0-2-1)
001255	Social Dance	1(0-2-1)
001256	Takraw	1(0-2-1)
001257	Recreation	1(0-2-1)
001258	Softball	1(0-2-1)
001259	Tennis	1(0-2-1)
001260	Table Tennis	1(0-2-1)
001261	Basketball	1(0-2-1)
001262	Badminton	1(0-2-1)
001263	Football	1(0-2-1)
001264	Volleyball	1(0-2-1)
001265	Art of Self–Defense	1(0-2-1)
1.4. **Science courses**		**6 credits**
001271	Man and Environment	3(3-0-6)
001277	Human Behavior	3(3-0-6)
2. Specialized courses		**118 credits**
2.1. Core courses		**30 credits**
2.1.1. **Fundamental Courses in Mathematics and Science**		**21 credits**
252182	Calculus I	3(3-0-6)
252183	Calculus II	3(3-0-6)
252284	Calculus III	3(3-0-6)
256101	Principle of Chemistry	4(3-3-7)
261101	Physics I	4(3-2-7)
261102	Physics II	4(3-2-7)

2.1.2. **Fundamental Courses in Engineering**		**9 credits**
301304	Engineering Economics	3(3-0-6)
302151	Engineering Drawing	3(2-3-5)
305171	Computer Programming	3(3-0-6)
2.2. Major courses		**82 credits**
2.2.1. Required Courses		**70 credits**
2.2.1.1. Major Required Courses		**67 credits**
2.2.1.1.1. **Application Technology**		**6 credits**
305453	Artificial Intelligence	3(2-3-5)
305361	Database	3(2-3-5)
2.2.1.1.2. **Software Methods and Technologies**		**11 credits**
305111	Fundamental skills for Computer Engineering	1(0-3-1)
305172	Computer Programming Laboratory	1(0-3-1)
305233	Algorithm Analysis and Design	3(2-3-5)
305272	Advanced Computer Programming	3(2-3-5)
305471	Software Engineering	3(2-3-5)
2.2.1.1.3. **Systems Infrastructure**		**22 credits**
305131	Computer Mathematics I	1(1-0-2)
305132	Computer Mathematics II	2(2-0-4)
305214	Data Structures	3(2-3-5)
305232	Applied Probability for Computer Engineering	3(2-3-5)
305331	Theory of Computation	3(2-2-5)
305346	Computer Networks	4(3-3-7)
305351	Computer System Engineering	3(2-3-5)
305383	Operating Systems	3(2-3-5)
2.2.1.1.4. **Computer Hardware and Architecture**		**22 credits**
303213	Electrical Circuit Analysis for Computer Engineering	3(2-3-5)
303242	Electronics for Computer	3(2-3-5)
305224	Digital Logic	4(3-3-7)
305322	Digital Signal Processing	3(2-2-5)
305381	Microprocessor and Assembly Language	3(2-3-5)
305382	Computer Architecture and Organization	3(2-3-5)
305384	Microcontroller and Microcomputer Interfacing	3(2-3-5)
2.2.1.1.5. **Projects**		**6 credits**
305491	Computer Engineering Project I	3(0-6-3)
305492	Computer Engineering Project II	3(0-6-3)
2.2.1.2. **Required Courses in English Language**		**3 credits**
205200	Communicative English for Specific Purposes	1(0-2-1)
205201	Communicative English for Academic Analysis	1(0-2-1)
205202	Communicative English for Research Presentation	1(0-2-1)
2.2.2. **Major Electives**		**12 credits**
305273	Personal Process for Software Development	3(2-3-5)
305274	Software Process and Quality Assurance	3(2-3-5)
305275	Software Design	3(2-3-5)
305276	Software Verification and Validation	3(2-3-5)
305321	Control Systems for Computer Engineering	3(2-3-5)
305352	Introduction to Human Computer Interaction	3(2-3-5)
305358	Robotics Engineering I	3(2-3-5)
305362	Computer and Information Security	3(2-3-5)
305363	Electronic Commerce	3(2-3-5)

305364	Social Network Programming	3(2-3-5)
305372	Compiler Construction	3(2-3-5)
305373	Team Process for Software Development	3(2-3-5)
305374	Software Requirements Specification and Management	3(2-3-5)
305375	Software Construction and Evolution	3(2-3-5)
305376	Software Architecture	3(2-3-5)
305391	Special Topic in Computer Engineering	3(2-2-5)
305392	Special Topic in Computer and System	3(2-2-5)
305393	Special Topic in Human Computer Interaction	3(2-2-5)
305394	Special Topic in Embedded System	3(2-2-5)
305395	Special Topic in Robotics	3(2-2-5)
305396	Special Topic in Software Engineering	3(2-2-5)
305432	Computer Graphics	3(2-3-5)
305434	Digital Image Processing	3(2-3-5)
305438	Multimedia	3(2-2-5)
305445	Network System Programming	3(2-2-5)
305454	Advanced Artificial Intelligence	3(2-2-5)
305452	Robotics Engineering II	3(2-2-5)
305455	Pattern Recognition	3(2-2-5)
305456	Computer Vision	3(2-2-5)
305463	Management Information Systems	3(2-2-5)
305464	Distributed Application	3(2-2-5)
305465	Data and Application Integration	3(2-2-5)
305466	Foundation of IT Services	3(2-2-5)
305467	Foundation of IT Governance	3(2-2-5)
305472	Service Oriented Architecture	3(2-2-5)
305481	Embedded System	3(2-2-5)

3. **Free Electives** **6 credits**

   Students can freely select courses offered by the university.

4. **Required Course (no credit)**

   305390 Training in Computer Engineering (at least 270 hours)

First year
Semester 1

Course I.D.	Course name	Credits (lecture-lab-self study)
001211	Fundamental English	3(2-2-5)
001237	Life Skills	2(1-2-3)
0012xx	Health Education	1(0-2-1)
252182	Calculus I	3(3-0-6)
256101	Principle of Chemistry	4(3-3-7)
261101	Physics I	4(3-2-7)
302151	Engineering Drawing	3(2-3-5)
305111	Fundamental skills for Computer Engineering	1(0-3-1)
305131	Computer Mathematics I	1(1-0-2)
	Total	22

First year
Semester 2

Course I.D.	Course name	Credits (lecture-lab-self study)
001212	Developmental English	3(2-2-5)
001223	Music Appreciation	3(2-2-5)
001271	Man and Environment	3(3-0-6)
252183	Calculus II	3(3-0-6)
261102	Physics II	4(3-2-7)
305132	Computer Mathematics II	2(2-0-4)
305171	Computer Programming	3(3-0-6)
305172	Computer Programming Laboratory	1(0-3-1)
	Total	22

Second year
Semester 1

Course I.D.	Course name	Credits (lecture-lab-self study)
001201	Thai Language Skills	3(2-2-5)
001213	English for Academic Purposes	3(2-2-5)
001224	Arts in Daily Life	3(2-2-5)
252284	Calculus III	3(3-0-6)
303213	Electrical Circuit Analysis for Computer Engineering	3(2-3-5)
305214	Data Structures	3(2-3-5)
305272	Advanced Computer Programming	3(2-3-5)
	Total	21

Second year
Semester 2

Course I.D.	Course name	Credits (lecture-lab-self study)
001232	Fundamental Laws for Quality of Life	3(3-0-6)
205200	Communicative English for Specific Purposes	1(0-2-1)
301304	Engineering Economics	3(3-0-6)
303242	Electronics for Computer Engineering	3(2-3-5)
305224	Digital Logic	4(3-3-7)
305232	Applied Probability for Computer Engineering	3(2-3-5)
305233	Algorithm Analysis and Design	3(2-3-5)
	Total	20

Third year
Semester 1

Course I.D.	Course name	Credits (lecture-lab-self study)
001277	Human Behavior	3(3-0-6)
205201	Communicative English for Academic Analysis	1(0-2-1)
305346	Computer Networks	4(3-3-7)
305361	Database	3(2-3-5)
305381	Microprocessor and Assembly Language	3(2-3-5)
305382	Computer Architecture and Organization	3(2-3-5)
xxxxxx	Free Elective	3(x-x-x)
	Total	20

Third year
Semester 2

Course I.D.	Course name	Credits (lecture-lab-self study)
205202	Communicative English for Research Presentation	1(0-2-1)
305322	Digital Signal Processing	3(2-2-5)
305331	Theory of Computation	3(2-2-5)
305351	Computer System Engineering	3(2-3-5)
305383	Operating System	3(2-3-5)
305384	Microcontroller and Microcomputer Interfacing	3(2-3-5)
305xxx	Elective Course	3(x-x-x)
	Total	19

Third year
Semester 3

Course I.D.	Course name	Credits
305390	Training in Computer Engineering	6 (more than 270 hours)
	Total	6

Fourth year
Semester 1

Course I.D.	Course name	Credits (lecture-lab-self study)
305491	Computer Engineering Project I	3(0-6-3)
305xxx	Elective Course	3(x-x-x)
305453	Artificial Intelligence	3(2-3-5)
305471	Software Engineering	3(2-3-5)
	Total	12

Fourth year
Semester 2

Course I.D.	Course name	Credits (lecture-lab-self study)
305492	Computer Engineering Project II	3(0-6-3)
305xxx	Elective Course	3(x-x-x)
305xxx	Elective Course	3(x-x-x)
xxxxxx	Free Elective	3(x-x-x)
	Total	12

Course Description

001201 **Thai Language Skills** 3(2-2-5)

Development of communicative language skills including listening, reading, speaking, and writing with an emphasis on writing skill

001211 **Fundamental English** 3(2-2-5)

Development of fundamental English listening, speaking, reading skills, and grammar for communicative purposes in various contexts

001212 **Developmental English** 3(2-2-5)

Development of English listening, speaking, reading skills, and grammar for communicative purposes in various contexts

001213 **English for Academic Purposes** 3(2-2-5)

Development of English skills with an emphasis on academic reading, writing, and researching

001223 **Music Appreciation** 3(2-2-5)

A study of musical characteristics, importance of music development, musical components, lyrics, music composers, aesthetics of Thai and Western music, the characteristics and repertoire for musical performance, music etiquette, criticism and discussion on the musical performance including the roles of Thai and Western music in Thai society from the past to the present.

001224 **Arts in Daily Life** 3(2-2-5)

Basic knowledge and experience through creative practice of Fine Arts, Literature, Music, Performance Art, Product Design, Photography Art, Visual Communicative Design and Architecture in order to improve the tast3 and aesthetic value which will apply to improve one's daily life and living harmonized within national and international contexts

001232 **Fundamental Laws for Quality of Life** 3(3-0-6)

The evolution of the law and human rights under the constitution including laws concerning the quality of the students' life such as intellectual property law, environmental law, laws concerning local administration, traditional knowledge, and the development of the quality of life.

001237 **Life Skills** 2(1-2-3)

Development of personality both mental and physical characteristics; practice in team working skills focusing on leader and follower roles, along with the development of public consciousness and other desirable personal characteristics.

001250 **Golf** 1(0-2-1)

History, definition, importance, and physical fitness for golf; basic skill training, rules, and etiquette of golf.

001251 **Game** 1(0-2-1)

History, philosophy, definition, and importance of games; type of games, basic game leadership, and games participation.

001252 **Body Conditioning** 1(0-2-1)

History, definition, and importance of body conditioning; principle of exercises, physical fitness activities, and physical fitness test.

001253 **Rhythmic Activities** 1(0-2-1)

History, definition, importance, and basic movements of folk dances and international folk dances.

001254 **Swimming** 1(0-2-1)

History, definition, importance, physical fitness, basic skill training, rules, and etiquette of swimming.

001255 **Social Dance** 1(0-2-1)

History, definition, importance, basic movement, types, and etiquette of social dances.

001256 **Takraw** 1(0-2-1)

History, definition, importance, physical fitness, basic, skill training, rules and etiquette of takraw.

001257 **Recreation** 1(0-2-1)

History, philosophy, definition and importance of recreation; nature of activities and recreation participation.

001258 **Softball** 1(0-2-1)

History, definition, importance, and physical fitness for softball; basic skill training, rules, and etiquette of softball.

001259 **Tennis** 1(0-2-1)

History, definition, importance, and physical fitness for tennis; basic skill training, rules, and etiquette of tennis.

001260 **Table Tennis** 1(0-2-1)

History, definition, importance, and physical fitness for table tennis; basic skill training, rules, and etiquette of table tennis.

001261 **Basketball** 1(0-2-1)

History, definition, importance, and physical fitness for basketball; basic skill training, rules, and etiquette of basketball.

001262 **Badminton** 1(0-2-1)

History, definition, importance, and physical fitness for badminton; basic skill training, rules, and etiquette of badminton.

001263 **Football** 1(0-2-1)

History, definition, importance, and physical fitness for football; basic skill training, rules, and etiquette of football.

001264 **Volleyball** 1(0-2-1)

History, definition, importance, and physical fitness for volleyball; basic skill training, rules, and etiquette of volleyball.

001265 **Art of Self–Defense** 1(0-2-1)

History, definition, importance, and physical fitness for the art of self-defense; basic skill of the art of self-defense, laws for self-defense; rules, and etiquette of the art of self-defense.

001271 **Man and Environment** 3(3-0-6)

The relationship between man and the environment, cause of environmental problems, effects of population change related to environmental problems case studies of global climate change and natural disasters at the global and local scale and the building of environmental awareness and participation in sustainable environmental management.

001277 **Human Behavior** 3(3-0-6)

Concept of human behavior, biology and types of behavior, sensation and perception, state of consciousness, learning and memory, thinking and language, intelligence and intelligence management of emotions and development of motivation, human social behavior, abnormal behavior, analysis of human behavior case studies for application in everyday life.

205200 **Communicative English for Specific Purposes** 1(0-2-1)

Practice listening and speaking English with emphasis on pronunciation, vocabulary, expressions, and sentence structures for academic and professional purposes.

205201 **Communicative English for Academic Analysis** 1(0-2-1)

Practice listening and speaking English with emphasis on summarizing, analyzing, interpreting, and expressing opinions for academic purposes applicable to students' educational fields.

205202 **Communicative English for Research Presentation** 1(0-2-1)

Practice giving oral presentations on academic research related to students' educational fields with effective delivery in English.

252182 **Calculus I** 3(3-0-6)

Mathematical induction, algebraic and transcendental functions, limits and continuity, derivatives and their applications, integrals and their applications, techniques of integration, improper integrals

252183 **Calculus II** 3(3-0-6)

Prerequisite : 252182 Calculus I

Sequences and series, tests of series, power series, Taylor's series, Laurent's series, matrices and determinants, rank of matrices, solutions to systems of linear equations, Cramer's rule, vector spaces, subspaces, bases and dimension, linear transformations, eigenvalues and eigenvectors

252284 **Calculus III** 3(3-0-6)

Prerequisite : 252183 Calculus II

Linear differential equations of first and higher order, analytical and numerical solution, Laplace transforms and their applications, vector fields, divergence, curl differentiation and integration of several variables, line integrals, surface integrals, Green's theorem, Gauss's theorem and Stokes's theorem

256101 **Principle of Chemistry** 4(3-3-7)

Study of Chemical stoichiometry, structure of atom, chemical bonding, gass, liquid and solution, periodic tables and properties of elements, thermodynamics, chemical kinetics, acid-base, electrochemistry, introduction of nuclear chemistry and environmental chemistry

261101 **Physics I** 4(3-2-7)

Vector Motion in One Dimension Motion in Two and Three Dimensions The Law of Motion , Circular Motion and Other Applications of Newton's Law Work and Energy Potential Energy and Conservation of Energy Linear Momentum and collisions Rotation of Rigid Body About Fixed Axis Rolling Motion, Angular Momentum and Torque Oscillatory Motion Wave Motion Sound Waves Superposition and Standing Waves Fluid Mechanics Temperature, Thermal Expansion and ideal Gases Heat and The First and Second Law of Thermodynamics The Kinetic Energy of ideal Gases

261102 **Physics II** 4 (3-2-7)

Statics Electrics, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Current and Resistance, Direct Current Circuits, Magnetic Fields, Sources of the Magnetic Field, Faraday's Law and Inductance, Alternating Current Circuits, Light, Relativity, Introduction to Quantum Physics, Atomic Physics and Nuclear Physics

301304 **Engineering Economics** 3(3-0-6)

Basic concept of economic analysis for engineering project; economic effectiveness; time-value of money; investment evaluation; break event point analysis; depreciation replacement; cost-benefit analysis.

302151 **Engineering Drawing** 3(2-3-5)

Drafting equipment and lettering; geometric construction; orthographic projection; dimensioning and tolerance; pictorial drawing; sectional drawing; auxiliary view; fundamentals of descriptive geometry; intersection; development; working drawing; computer-aided drafting; freehand sketches.

303213 **Electrical Circuit Analysis for Computer Engineering** 3(2-3-5)

Definitions; units and models for electrical circuits; basic element characteristics: resistor, capacitor and inductor; analysis methods for resistive circuits; sinusoidal signals and phasors; alternative circuit steady-state analysis; alternative circuit steady-state power; effective power; reactive power; complex power; resonance circuits

303242 **Electronics for Computer Engineering** 3(2-3-5)

Prerequisite : 303213 Electrical Circuit Analysis for Computer Engineering

Electronic properties of materials; interfacing circuits; diodes and diode circuits; MOS transistors amplifier circuits; circuit modeling and simulation; MOS logic families; data conversion circuits; bipolar transistors; electronic voltage and current sources; parameters and issues for integrated circuit design

305111 **Fundamental Skills for Computer Engineering** 1(0-3-1)

Fundamental knowledge, fundmental skills and attitudes for professional, ethical and responsible computer engineers; time management; work planning; laws related to information technology; ethics for computer engineers

305131 **Computer Mathematics I** 1(1-0-2)

Sets; functions; relations; number systems and codes; two's complement number representation; floating-point number representation

305132 **Computer Mathematics II** 2(2-0-4)

Basic logic; boolean logic; propositional logic; proof techniques; basics of counting; graphs and trees; recursion

305171 **Computer Programming** 3(3-0-6)

Computer concepts; computer components; hardware and software interaction; EDP concepts; program design and development methodology; high-level language programming; programming applications for problem solving in engineering.

305172 **Computer Programming Laboratory** 1(0-3-1)

Using tools related to writing programs; operating systems, editor, compiler, linker, debugger, unit testing

305214 **Data Structures** 3(2-3-5)

Prerequisite : 305171 Computer Programming

Basic data structures: arrays, linked list, queue, stack, binary tree, B-tree, heap

305224 **Digital Logic** 4(3-3-7)

Switching theory; sequential logic circuits; combinational logic circuits; memory elements; modeling and simulation; digital systems design; modular design of combinational circuits; formal verification; fault models and testing; design for testability

305232 **Applied Probability for Computer Engineering** 3(2-3-5)

Discrete probability; continuous probability; expectation; sampling distribution; stochastic processes; estimation; hypothesis tests; correlation and regression

305233 **Algorithm Analysis and Design** 3(2-3-5)

Prerequisite : 305214 Data Structures

Basic computability theory; computing algorithms; algorithmic analysis algorithmic complexity; algorithmic strategies; distributed algorithms

305272 **Advanced Computer Programming** 3(2-3-5)

Prerequisite : 305171 Computer Programming

Object-oriented programming; event driven programming; concurrent programming; using application programming interface

305273 **Personal Process for Software Development** 3(2-3-5)

Software development process at the personal level; collecting data relevant to personal working process (time, size, defect, and schedule); software size estimation; development time estimation; task planning; schedule planning; progress tracking; quality planning; quality tracking; process improvement; performance analysis

305274 **Software Process and Quality Assurance** 3(2-3-5)

Elements of software process, activities, methods, and practices; process improvement life cycle; process analysis; process assessment; process design; process verification and validation; quality control; quality assurance; standards for quality assurance; Capability Maturity Model Integration (CMMI); ISO 29110; ISO 15504

305275 **Software Design** 3(2-3-5)

Designing software using various techniques such as design patterns, design process, design methods, design quality, and design verification

305276 **Software Verification and Validation** 3(2-3-5)

Techniques used to verify, test, and validate software with respect to specification and users; design review; code review; design inspection; code inspection; program trace execution table; control stack

305321 **Control Systems for Computer Engineering** 3(2-3-5)

Prerequisite : 252284 Calculus III

Mathematics models of systems, Laplace transform, control system characteristics, system responses, stability analysis and design, root-locus analysis, compensation, discrete-time systems for digital computers

305322 **Digital Signal Processing** 3(2-2-5)

Theory of digital signal processing with emphasis on the frequency domain description of digital filtering: discrete Fourier transforms, flow-graph and matrix representation of digital filters, digital filter design, fast Fourier transforms and discrete Hilbert transforms

305331 **Theory of Computation** 3(2-2-5)

Set; relations; functions; basic counting techniques; combination and permutation methods; predicate calculus; finite state machine; finite automata; context–free language; push-down automata; regular language; Turing machine; NP-complete problems; statistic for Computer Engineering

305346 **Computer Networks** 4(3-3-7)

Communications network architectures; Wireless and Mobile computing; communications network protocols; performance evaluation; local and wide area networks; data communications; Client-Server system; network management; data security and integrity; compression and decompression

305351 **Computer System Engineering** 3(2-3-5)

Prerequisite : 305172 Computer Programming for Computer Engineering

Life cycle; requirements analysis and elicitation; specification; architectural design; testing; maintenance; project management; concurrent (hardware/software) design; implementation; specialized systems; reliability and fault tolerance

305352 **Introduction to Human Computer Interaction** 3(2-3-5)

Foundations and designs of human-computer interactions; psychological principles of human-computer interactions; evaluation of user interfaces; usability engineering; task analysis; user-centered design and prototyping; conceptual models and metaphors; software design rationale; design of windows, menus, and commands; voice and natural language I/O; response time and feedback, color, icons, and sound; internationalization and localization

305358 **Robotics Engineering I** 3(2-3-5)

Introduction to robotics; application of robots; robot configurations including mobile robot; spatial descriptions and transformations of objects in three-dimensional space; forward and inverse manipulator kinematics; task and trajectory planning; simulation and off-line programming

305361 **Database** 3(2-3-5)

Database Systems; data modeling; relational databases; relational database design; physical database design; transactional processing; distributed databases; database query languages

305362 **Computer and Information Security** 3(2-3-5)

Risk assessment and treatment; security policy; information system security; IT asset security management; human resources security; physical and environmental security; access control; information system acquisition; development; maintenance and compliance

305363 **Electronic Commerce** 3(2-3-5)

Electronic commerce technology; electronic commerce system design and implementation; networking technologies and their future directions; database technologies; database and web connectivity; security-related issues; electronic payment systems; business intelligence; trust management; trading agents; privacy; information products and copy protection; digital divide

305364 **Social Network Programming** 3(2-3-5)

Supporting any sort of social behaviors in or through computer systems; creating social conventions and social contexts through the use of software and technology

305372 **Compiler Construction** 3(2-3-5)

Prerequisite : 305331 Theory of Computation

Programming language structures; translation; loading; execution; storage allocation, compilation of simple expressions and statements; organization of a compiler including compile-time and run-time symbol tables; lexical scan; syntax scan; object code generation; error diagnostics; object code optimization techniques; examples of compiler types

305373 **Team Process for Software Development** 3(2-3-5)

Prerequisite : 305273 Personal Process for Software Development

Using team process to develop software: data collection, planning, tracking, quality management and performance analysis for the team

305374 **Software Requirements Specification and Management** 3(2-3-5)

Eliciting; analyzing; negotiating; specifying; testing and managing requirements; methods; techniques and tools used to define; document and ensure customer satisfaction

305375 **Software Construction and Evolution** 3(2-3-5)

Translating a software design into an implementation language; coding styles and the development and use of program documentation; concepts, methods, processes and techniques that support the ability of software to change and evolve over time; system and process engineering; impact analysis; migration; refactoring; program transformation and reverse engineering

305376 **Introduction to Software Architecture** 3(2-3-5)

Software architecture from both the structural and behavioral viewpoints together with strengths and weaknesses of each; techniques towards how to develop software architecture and how to apply architectural patterns and design patterns to specify software architecture

305381 **Microprocessor and Assembly Language** 3(2-3-5)

Prerequisite : 305224 Digital Logic

Microprocessor structure and function; arithmetic and logic processing unit; register structure; bus system; control unit; memory unit; I/O devices; types of microprocessor architecture; assembly language programming

305382 **Computer Architecture and Organization** 3(2-3-5)

Fundamentals of computer; processor systems design; computer arithmetic; organization of the CPU; memory system organization and architecture; performance analysis; performance enhancements; interfacing and communication; distributed system models; device subsystems

305383 **Operating Systems** 3(2-3-5)

Design principles; memory management; concurrency; device management; scheduling and dispatch; file systems; security and protection; system performance evaluation

305384 **Microcontroller and Microcomputer Interfacing** 3(2-3-5)

Prerequisite : 305381 Microprocessor and Assembly Language

Sensors; signal conversion; automatic control system; microcomputer and microcontroller interfacing techniques; standard of data transmission; assembly language and high level language programming in control system; peripheral device control methods

305390 **Training in Computer Engineering** 6 credits

(at least 270 hours)

Training in computer engineering field in either private sectors or governmental institutions at least 270 hours in order to gain both academic and experience in computer engineering related fields

305391 **Special Topic in Computer Engineering** 3(2-2-5)

Study and research of interesting topics in Computer Engineering

305392 **Special Topic in Computer and System** 3(2-2-5)

Study and research of interesting topics in Computer and System

305393 **Special Topic in Human Computer Interaction** 3(2-2-5)

Study and research of interesting topics in Human Computer Interaction

305394 **Special Topic in Embedded System** 3(2-2-5)

Study and research of interesting topics in Embedded System

305395 **Special Topic in Robotic** 3(2-2-5)

Study and research of interesting topics in Robotic

305396 **Special Topic in Software Engineering** 3(2-2-5)

Study and research of interesting topics in Computer Engineering

305432 **Computer Graphics** 3(2-3-5)

General graphic systems; graphic inputs; graphics display devices; two and three-dimensional transforms; three-dimensional vision; surface model; visual model; animations; computer graphic systems

305434 **Digital Image Processing** 3(2-3-5)

Theory of signals and systems for two dimensions; filtering; 2-D fast Fourier transforms; edge detection; image enhancement

305438 **Multimedia** 3(2-2-5)

Principles of multimedia; media production process; content acquisition and development; creating media for computer, internet and other devices

305445 **Network System Programming** 3(2-2-5)

Prerequisite : 305171 Computer Programming

Design; development and coding of network system programming; process intercommunication properties; network system rules; communications in transport layer; examples of network system programming

305452 **Robotics Engineering II** 3(2-2-5)

Prerequisite : 305358 Robotics Engineering I

Basic knowledge of robotics; dynamic and kinematic of robot manipulators; robot layouts; robot parts control; signal generator circuits in robot; robot vision; robotic control programming language

305453 **Artificial Intelligence** 3(2-3-5)

Prerequisite : 305214 Data Structures

Principles and programming techniques of artificial intelligence; search strategies; knowledge representation and automatic deduction; learning and adaptive systems; applications of artificial intelligence

305454 **Advanced Artificial Intelligence** 3(2-2-5)

Prerequisite : 305453 Aritificial Intelligence

History, techniques and scope of artificial intelligence; knowledge representation; memory structures; reasoning mechanism; probabilistic reasoning and searching techniques; games; planning; machine learning; natural language processing; computer vision; expert systems

305455 **Pattern Recognition** 3(2-2-5)

Introduction to image processing; pre-processing; image segmentation techniques; binary image processing; object property measurement; size measurement; curve fitting; template matching; classification techniques; Bayesian analysis; decision trees; artificial neural networks

305456 **Computer Vision** 3(2-2-5)

An introduction to the concepts and applications in computer vision: cameras and projection models; image processing for computer vision; image segmentation; object recognition and detection; motion estimation and tracking

305463 **Management Information Systems** 3(2-2-5)

Principles of management information systems; structures of management information system; information technologies; decision-making processes; information concepts; human in the role of information processor; system concept; planning and control concept; organization structure and management; planning and decision-making support systems; knowledge-base management systems; requirement specification of information; development, implementation, and resource management in management information system

305464 **Distributed Application** 3(2-2-5)

Using multiple computers to carry out work by the concept of distributed computing; creating N-tier applications supporting server/client paradigm

305465 **Data and Application Integration** 3(2-2-5)

Analysis; design; integration of data and application from various sources; creating application for data extraction, transformation and loading

305466 **Foundation of IT Services** 3(2-2-5)

Fundamental concept of IT services; service strategy; service design; service transition; service operation; service improvement; standard for providing services

305467 **Foundation of IT Governance** 3(2-2-5)

Fundamental concept of IT Governance; strategic planning for IT governance; management of risks, trust and privacy; standard for governing information

305471 **Software Engineering** 3(2-3-5)

Prerequisite : 305272 Advanced Computer Programming

Software processes; software tools and environments; software requirements and specifications; software design; language translation; software project management; software testing and validation; software fault tolerance; software evolution

305472 **Service Oriented Architecture** 3(2-2-5)

Web-based service providing system using Service Oriented Architecture; technologies for communication via internet; standard components for Service Oriented Architecture; applying Service Oriented Architecture for appropriate use in business

305481 **Embedded System** 3(2-2-5)

Embedded microcontrollers; embedded programs; real-time operating systems; low-power computing; reliable system design; design methodologies

305491 **Computer Engineering Project I** 3(0-6-3)

Study for interesting topics in the computer engineering field; performing literature review; study for related theories; making and presenting the project progress reports to the project advisor and committees; establishing objectives and scope of the project

305492 **Computer Engineering Project II** 3(0-6-3)

Prerequisite : 305491 Computer Engineering Project I

Research and development for a project in computer engineering field; study for related theories; making and presenting the project progress reports to the project advisor and committees; oral presentation of the project; project final report

ANNEX III

Information on academic

teaching staff (a short CV)

ANNEX III : Information on Academic Staff (a short CV)

Name

ASST. PROF. DR. AKARAPHUNT VONGKUNGHAE

Qualification

Ph.D (Electrical Engineering), University of Idaho, Moscow, Idaho, USA

M. S. (Electrical Engineering), Vanderbilt University, Nashville, Tennessee, USA

B. Eng.(Electrical Engineering) Chiang Mai University.

List of Teaching Experience

- Radio-Wave Propagation
- Digital Signal Processing
- Digital Signal Processing and Filter Design
- Pulse, Digital and Switching Circuits
- Digital Circuit and Logic Design II
- Research Methodology in Science and Technology
- Data Communication and Network
- Microwave Engineering
- Neural Network and Fuzzy Logic Control
- Seminar
- Power Electronics System Integration
- Advanced Electronic Circuit Design
- Computer Network Analysis and Design
- Electric Drives
- High Voltage Engineering

Name

DR. MUTITA SONGJUN

Qualification

Ph.D. (Automatic Control and Systems Engineering), University of Sheffield, UK

M.Eng (Mechatronics), Asian Institute of Technology (AIT), Thailand

B. Eng. (Electrical Engineering), Kasetsart University, Thailand

List of Teaching Experience

- Digital Circuit and Logic Design
- Control Systems
- Microprocessor

Name

ASST. PROF. DR. SUCHART YAMMEN

Qualification

PhD degree in Electrical Engineering , Vanderbilt University, Tennessee, USA.

MS degree in Electrical Engineering , Vanderbilt University, Tennessee, USA.

B.Eng. (Honors, First Class Rank) degree in Electrical Engineering, Chiang Mai University, Chiang Mai, Thailand.

List of Teaching Experience

- Electrical Machine II
- Digital Signal Processing and Filter Design
- Electrical Circuit Analysis for Computer Engineering
- Optimization Theory
- Mathematics for Digital Signal Processing
- Stochastic Signals and Systems II
- Optimization Techniques and Its Applications
- Electrical Circuit Analysis II
- Optimal Discrete Time Filtering
- Image Processing and Computer Vision
- Optimization and Its Applications in Power Systems
- Electrical Energy Conservation and Management
- Energy and Technology Around Us
- Advanced Biomedical Electronics
- Computer-Aided Power System Analysis
- Digital Signal Processing
- Special Topics in Advanced Electrical Engineering

Name

ASST. PROF. DR. YONGYUT CHONBODEECHALERMROONG

Qualification

Ph.D (Electrical Engineering), the University of New South Wales , Australia

M. Eng. (Electrical Engineering), King Mongkut's Institute of Technology Ladkrabang, Thailand

B. Eng. (Electrical Engineering)(honorary gift), King Mongkut's Institute of Technology Ladkrabang, Thailand

List of Teaching Experience

- Engineering Electronics
- Optical Communications
- Electromagnetic Fields and Waves I
- Fundamental Electronics
- Electronics for Computer Engineering
- Selected Research Project (no more 3 projects)

Name

Mr. RATTAPOOM WARANUSAST

Qualification

M. Eng. in Computer Science, Asian Institute of Technology, Thailand

B. Eng. in Computer Engineering, Chulalongkorn University, Thailand

List of Teaching Experience

- 305171 Computer Programming
- 305456 Machine Vision
- 305432 Principle of Computer Graphics
- 305450 Principle of Artificial Intelligence

Name

ASST. PROF. DR. SOMPORN RUANGSINCHAIWANICH

Qualification

Ph.D (Electrical Engineering), Electrical Machines and Drives Group, The University of Sheffield, UK

B.Eng (Electrical Engineering), Rajamangala University of Technology Isan, Thailand

List of Teaching Experience

- Electrical Power Plants and Substations
- Electrical Machine I
- Electrical Machine II
- Electrical Engineering Laboratory III
- Theory of Electrical Machines
- Alternative Energy Systems
- Electrical Machine Dynamics
- Methods for Energy Analysis

Name

DR. WORALAK KONGDENFHA

Qualification

PhD in Computer Science, 2009University of New South Wales, Sydney, Australia

M. Eng. Asian Institute of Technology, Bangkok, Thailand

B. Eng. King Mongkut's Institute of Technology, Ladkrabang, Bangkok, Thailand

List of Teaching Experience

- Special Topic in Computer Systems
- Principle of Artificial Intelligence
- Computer Engineering Project I
- Special Topics in Electrical Power Engineering
- Fundamental of Database Systems
- Computer Engineering Project II
- Parallel System
- Neural Network and Fuzzy Logic Control
- Computer Architecture and Organization

Name

DR. SUPAWAN PONPITAKCHAI

Qualification

Ph.D. (Automatic Control and Systems Engineering), University of Sheffield, UK

M.Eng. (Microelectronics), Asian Institute of Technology (AIT), Thailand

B.Eng. (Control Systems and Instrumentation Engineering), King Mongkut's University of Technology.

List of Teaching Experience

- Network Theory
- Electrical circuit analysis
- Instrumentation and measurement
- Fundamental electronics
- Electrical engineering mathematics
- Applied electrical engineering mathematics
- Electrical engineering material
- Electrical engineering laboratory 4
- Mathematics for approximation

Name

DR. CHAIRAT PINTHONG

Qualification

Ph.D (Electrical Engineering), New Jersey Institute of Technology, Newark, USA

M.Eng.(Electrical Engineering) Chulalongkorn University, Thailand

B.Eng.(Electrical Engineering) Chiang Mai University, Thailand

List of Teaching Experience

- Telecommunication Engineering Laboratory II
- Radio-Wave Propagation
- Electromagnetic Fields and Waves I
- Electromagnetic Theory
- Mathematics for Approximation
- Antenna Theory
- Communication Network and Transmission Lines
- Finite Element Method for Electrical Engineering
- Telecommunication Engineering Laboratory I
- Special Topics in Communication Engineering
- Finite Element Method for Electrical Engineering

Name

DR. PANUS NATTHARITH

Qualification

Ph.D. (Mechatronics), Newcastle University, UK

M. Eng (Mechatronics), Asian Institute of Technology (AIT), Thailand

B. Eng (Electrical Engineering), Chiang Mai University, Thailand

List of Teaching Experience

- 303594 – Research Methodology in Science and Technology
- 305171 – Computer Programming
- 305281 – Microprocessor and Assembly Language
- 305381 – Microcontroller and Microcomputer Interfacing

Name

Mr. SIRAPOP KHOTCHARRAT

Qualification

M.S. (Computational Science), Chulalongkorn University, Thailand.

B.Eng. (Computer Engineering), Chulalongkorn University, Thailand.

List of Teaching Experience

- Algorithm Analysis and Design
- Discrete Mathematics for Computer Engineering
- Computer Programming

Name

Mr. SETTHA TANGKAWANIT

Qualification

M.Eng.(Electrical Engineering) Naresuan University

B.Eng.(Computer Engineering) Naresuan University

List of Teaching Experience

- Microprocessor and Assembly Language
- Microcontroller and Interfacing
- Compiler Construction
- Computer Programming
- Data Communication and Network
- Computer and Data Communications
- Principle of Computer Networks

Name

Mr. PANUPONG SORNKHOM

Qualification

M.Eng. (Computer Engineering), King Mongkut's University of Technology Thonburi, Thailand

B.Eng. (Computer Engineering), Naresuan University, Thailand

List of Teaching Experience

- Computer Programming
- Computer Architecture and Organization
- Computer Engineering Project I
- Principle of Network System Programming
- Operating Systems
- Digital Circuit and Logic Design I
- Computer Engineering Project II
- Computer Engineering Mathematics
- Fundamental Skills for Computer Engineering

Name

DR. SUWIT KIRAVITTAYA

Qualification

Ph.D (Electrical Engineering), Chulalongkorn University, Bangkok, Thailand

B.Eng (Electrical Engineering), Chulalongkorn University, Bangkok, Thailand

List of Teaching Experience

- 303201 Fundamental of Electrical Engineering
- 303206 Introduction to Electrical Engineering
- 303543 Opto-Electronics

Name

Mr. SANGCHAI MUNGKORNTHONG

Qualification

M.Eng (Telecommunication), Asian Institute of Technology (AIT).

B.Eng. (Electrical Engineering) Mahidol University

List of Teaching Experience

- 303485 Wireless Communications
- 303370 Data Communication and Network
- 305343 Computer and Data Communications
- 303487 Computer Network Analysis and Design
- 305344 Principle of Computer Networks

Name

ASST. PROF. SIRIPORN DACHASILARUK

Qualification

M.Eng. (Electrical Engineering), King Mongkut Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand

B.S. (Material Science), Chiang Mai University, Chiang Mai, Thailand

List of Teaching Experience

- Computer Programming
- Digital Circuit and Logic Design
- Introduction to Electrical Engineering,
- Computer Organization and Architecture
- Device for Digital Circuit
- Image Processing
- Electrical and Computer Engineering Projects
- Seminar for Electrical and Computer Engineering
- Training in Electrical and Computer Engineering

Name

Mr. SARAWUT WATTANAWONGPITAK

Qualification

M.Eng (Electrical Engineering), Asian Institute of Technology (AIT), Thailand

B.Eng (Electrical Engineering), Mahidol University, Thailand

List of Teaching Experience

- Introduction of Electrical Engineering
- Power System Anlysis
- Electrical Machine I
- Electrical Instruments and Measurements
- Electrical Engineering Laboratory III

Name

ASSISTANT PROFESSOR DR. TANIT MALAKORN

Qualification

Ph.D. Virginia Polytechnic Institute and State University, (Virginia Tech)

M.Sc. Virginia Polytechnic Institute and State University, (Virginia Tech)

B.Eng. (Hons) King Mongkut's Institute of Technology Ladkrabang, THAILAND

List of Teaching Experience

- Applied Electrical Engineering Mathematics
- Control Systems for Computer Engineering

Name

DR.PIYADANAI PACHANAPAN

Qualification

Ph.D (Electronic and Electrical Engineering) University of Strathclycle, UK.

M. Eng. (Electrical Engineering) Chiang Mai University.

B. Eng. (Electrical Engineering) Chiang Mai University.

List of Teaching Experience

- 303427 Power System Analysis
- 303424 High Voltage Engineering

Name

DR.NIPHAT JANTHARAMIN

Qualification

Ph.D. (Electronic and Electrical Engineering), University of Leeds, England

M.Sc. (Electrical Engineering), University of Kassel, Germany

B.Eng (Electrical Engineering), King Mongkut's Institute of Technology Ladkrabang

List of Teaching Experience

- 303202 Electrical Engineering Laboratory I
- 303211 Electrical Circuit Analysis I
- 303323 Power and Industrial Electronics
- 303428 Power System Protection
- 303429 Illumination Engineering
- 303437 Photovoltaic Systems Technology

Name

ASST.PROF. DR. PAISARN MUNEESAWANG

Qualification

Ph.D. (Computer Engineering),The University of Sydney, Australia

M.Eng.Sc (Electrical Engineering),The University of New South Wales, Australia

M.Eng. (Telecommunications),Mahanakorn University of Technology

List of Teaching Experience

- Computer and data communication
- Computer networking
- Advanced computer programming
- Image processing
- Pattern recognition

Name

ASST.PROF. DR. PANOMKHAWN RIYAMONGKOL

Qualification

Ph.D (Electrical and Computer Engineering), University of Miami ,USA

M.S.E.CE. (Electrical and Computer Engineering), University of Miami, USA

B.Eng. (Electrical Engineering), Chiang Mai University

List of Teaching Experience

- Digital Image Processing
- Computer Vision
- List of Teaching Experience
- Computer Programming
- Data Structures and Algorithms
- Artificial Intelligence
- Digital Image Processing
- Computer Architecture and Organization

Name

DR. PHONGPHUN KIJSANAYOTHIN

Qualification

Ph.D. in Computer Science, Texas Tech University, USA

M. Eng. (Computer Engineering), Kasetsart University, Thailand

B. Eng. (Computer Engineering) , King Mongkut's Institute of Technology Ladkrabang, Thailand

List of Teaching Experience

- 305492 Automata Theory
- 305331 Discreate Mathematics for Computer Engineering
- 305372 Compiler Construction
- 305331 Discreate Mathematics for Computer Engineering
- 305372 Compiler Construction
- 305331 Discreate Mathematics for Computer Engineering
- 305131 Computer Mathematics I
- 305132 Computer Mathematics II
- 305372 Compiler Construction

Name

DR. PONPISUT WORRAJIRAN

Qualification

Ph.D. (Bioengineering), University of Strathclyde, UK

M.Sc. (Systems Engineering), Cardiff University, UK

B.Eng.(Electronics Engineering), King Mongkut Institute of Technology Ladkrabang, Thailand

List of Teaching Experience

- Electronic Circuits and Systems
- Electrical Networks
- Microprocessors and Microcontrollers
- Electrical Engineering Lab.

Name

DR. SUPANNIKA WATTANA

Qualification

Ph.D. (Energy Planning and Policy), University of Technology, Sydney (UTS), Australia

M.Eng. (Electrical Engineering) KhonKaen University

B.Eng. (Electrical Engineering) KhonKaen University

List of Teaching Experience

- 303621 Energy Policy and Planning Project
- 303622 Methods for Energy Analysis
- 303511 Power System Operation and Control
- 303426 Electrical System Design
- 303427 Power System Analysis
- 303327 Power System Engineering University

Name

ASST. PROF. DR. SURACHET KANPRACHAR

Qualification

Ph.D. (Electrical Engineering), Virginia Polytechnic Institute and State University, USA

M. Sc. (Electrical Engineering), Virginia Polytechnic Institute and State University, USA

B. Eng.(Electrical Engineering) (1st Class Honors), Chulalongkorn University, Thailand

List of Teaching Experience

- Telecommunication Engineering Laboratory II
- Digital Communication
- Satellite Communications
- Principle of Communications
- Stochastic Signals and Systems I
- Coding Theory

Name

DR. SURADET JITPRAPAIKULSARN

Qualification

Ph.D. (Electrical Engineering and Computer Science), Case Western Reserve University, USA

B.S. (Mathematics), Chulalongkorn University, Thailand

List of Teaching Experience

- Algorithm Analysis and Design
- Principle of Software Engineering
- Computer Programming
- Computer Architecture and Organization
- Fundamental Skills for Computer Engineering
- Principle of Software Engineering
- Principle of Software Engineering
- Optimization Theory
- Fundamental of Management Information Systems
- Principle of Computer Networks

Name

Miss JIRAPORN POOKSUK

Qualification

M. S. (Computer Science) AIT, Thailand

B. Eng.(Computer Engineering) Naresuan University , Thailand

List of Teaching Experience

- Advanced Computer Programming
- Operating Systems
- Computer Programming
- Computer Programming Laboratory
- Computer Engineering Project I
- Computer Engineering Project II
- Control Systems
- Control Systems for Computer Engineering
- Digital Image Processing

ANNEX IV

Examination Regulation

Annex IV(1) **Summary Translation for AUNQA only**

Criteria:		
Summary of :	Naresuan University Regulation for Student Exam 2548 BE	
Translator:	Akaraphunt Vongkunghae	Aug 07,2556 BE

Naresuan University Regulation for Student Exam (2548 BE)

This Exam Regulation is given by Naresuan University Council on August 10, 2548 BE. To have the same exam regulation for all students and programs in Naresuan university and for being orderly.

R1. This regulation is called "Naresuan University Regulation for Student Exam 2548 BE."

R2. This regulation must be complied since the date of announcement.

R3. The Naresuan University Regulation for Student 2537 BE is canceled.

R4. The definitions in this Regulation are:

"university"	is	Naresuan university
"president"	is	Naresuan university president
"student"	is	Naresuan university student
"dean"	is	The dean of each faculty in Naresuan university

R5. At the exam taking place, students must dress themselves following the dressing regulation announcing on 25478 BE.

R6. The student must take exam on the date and at the place which are assigned by faculty, department, or lecturer.

R7. If the student is not able to follow the R5, the student missed the exam is that the result but that may except by the permission of dean in the case of emergency or necessary.

R8. The student must keep quieted himself and the student must not make any perturbation or noise to others.

R9. 15-minute-late student must not allow to entering the exam room.
30-minute after the exam is started, the student must not allow to leaving the exam room.

R10. No other objects, excepting the rulers, pens, pencils, rubbers, dividers, and ink. If other than these items, the student shall be informed before exam.

R11. In every exam, the student must use the paper sheets that provided by the lecture or by department, and must not bring the anything to outside the exam room. If student want to have something other than the provided ones, he must ask the exam controller.

R12. After the time of exam is out and announced by the exam controller, the student must hand in the answer sheet to the exam controller and leave the exam room immediately.

R13. If the student does not follow or does behave violate to this exam regulation, the exam controller shall inform the student. If the student do not complied, the exam controller shall order the student to leave the examination are and report to the dean for more considering the penalty.

R14. When there is perfidious to the exam, the exam controller must collect the evidences, record the falsity action of student into the student answer sheet, and report to the dean for more investigation. The university shall call for an investigation committee and shall conduct and finish the investigation within 30 days.

R15. If the investigation result reveals that the student is dishonest. The dishonest student must be failed the class.

R16. If there is some evidence to prove that the some exam problem or content is exposed to student before exam time with any method, the president shall cancel the exam result and order to arrange the new exam.

R17. The president shall hold and abide to all of this student exam regulation.

Announced on August 10, 2548 BE,

_____

(Hon. Prof. Kaisree Sree-a-roon)

Chairman of Naresuan University Council

Annex IV(2) **Summary Translation for AUNQA only**

Criteria:		
Summary of :	Naresuan University Regulation for Student Exam (Additional) 2nd Edition 2549 BE	
Translator:	Akaraphunt Vongkunghae	Aug 07, 2556 BE

Naresuan University Regulation for Student Exam (Additional) 2nd Edition 2549 BE

Naresuan University Council agrees to make improvement on the Naresuan Regulation for Student Exam 2548 BE. Be authorized by the Code 14(2) of the Naresuan University constitution (2533 BE), in the meeting 125(4/2549BE) on July 22, 2549, the issue of improvement is the following:

R1. This regulation is called "Naresuan University Regulation for Student Exam (Additional) 2nd Edition 2549 BE."

R2. This regulation must be complied since the date of announcement.

R3. Cancel the sentence of R11 of the Naresuan Regulation for Student Exam 2548 BE and use following the sentence instead:

R11. In every exam, the student must use the paper sheets or the materials that provided by the lecturer or by department. All of the materials including the contents of examination must not be taken to outside of the exam room. If the student needs to bring something to outside of the exam room, he must ask for permission from the exam controller.

Announced on July 25, 2548 BE,

_____

(Hon. Prof. Kaisree Sree-a-roon)

Chairman of Naresuan University Council

ข้อบังคับมหาวิทยาลัยนเรศวร
ว่าด้วย การสอบของนิสิต พ.ศ.2548

โดยที่เห็นเป็นการสมควรออกข้อบังคับว่าด้วย การสอบของนิสิตขึ้น เพื่อให้การดำเนินการสอบของนิสิตในทุกระดับการศึกษาและทุกประเภทของการสอบ เป็นไปด้วยความเรียบร้อย

ฉะนั้น อาศัยอำนาจตามความในมาตรา 14(2) แห่งพระราชบัญญัติมหาวิทยาลัยนเรศวร พ.ศ. 2533 โดยมติสภามหาวิทยาลัย ในคราวประชุมครั้งที่ 119 (3/2548) เมื่อวันที่ 30 กรกฎาคม พ.ศ. 2548 จึงให้ออกข้อบังคับไว้ดังต่อไปนี้

ข้อ 1 ข้อบังคับนี้เรียกว่า "ข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ. 2548"

ข้อ 2 ข้อบังคับนี้ให้ใช้บังคับตั้งแต่วันถัดจากวันประกาศเป็นต้นไป

ข้อ 3 ให้ยกเลิกข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ.2537

บรรดากฎ ระเบียบ ข้อบังคับ คำสั่ง ประกาศ หรือข้อตกลง อื่นใดที่ขัดหรือแย้งกับข้อบังคับนี้ให้ใช้ข้อบังคับนี้แทน

ข้อ 4 ในข้อบังคับนี้

"มหาวิทยาลัย"	หมายความว่า	มหาวิทยาลัยนเรศวร
"อธิการบดี"	หมายความว่า	อธิการบดีมหาวิทยาลัยนเรศวร
"นิสิต"	หมายความว่า	นิสิตมหาวิทยาลัยนเรศวร
"คณบดี"	หมายความว่า	คณบดีเจ้าสังกัดของรายวิชา

ข้อ 5 นิสิตที่เข้าสอบจะต้องแต่งกายตามข้อบังคับมหาวิทยาลัยนเรศวรว่าด้วย เครื่องแต่งกายนิสิตขั้นปริญญาตรี พ.ศ. 2548

ข้อ 6 ในการสอบทุกครั้งนิสิตจะต้องเข้าสอบตามวัน เวลา และสถานที่ที่มหาวิทยาลัยหรือคณะ หรือภาควิชา หรืออาจารย์ประจำรายวิชากำหนดไว้

ข้อ 7 ในกรณีที่นิสิตไม่เข้าสอบตามข้อ 5 ให้ถือเป็นการขาดสอบ ยกเว้นมีเหตุจำเป็น และได้รับอนุมัติจากคณบดี

ข้อ 8 ห้ามนิสิตส่งเสียงดัง หรือทำความรำคาญ หรือแสดงกิริยามารยาทไม่เหมาะสมในห้องสอบและบริเวณใกล้เคียง

ข้อ 9 ห้ามนิสิตเข้าห้องสอบหลังจากเริ่มสอบไปแล้ว 15 นาที หรือออกจากห้องสอบภายใน 30 นาทีหลังจากเริ่มสอบ เว้นแต่จะได้รับอนุญาตจากผู้ควบคุมการสอบหรือคณบดี

ข้อ 10 ห้ามมิให้นิสิตนำสิ่งหนึ่งสิ่งใดเข้าห้องสอบ เว้นแต่ไม้บรรทัด ปากกา ดินสอ หมึก ยางลบ วงเวียน และที่ประกาศให้ทราบล่วงหน้า

ข้อ 11 ในการสอบทุกครั้ง นิสิตจะต้องใช้กระดาษคำตอบ หรือกระดาษสอบที่อาจารย์ประจำวิชา หรือภาควิชาจัดให้และจะนำออกจากห้องสอบมิได้เมื่อต้องการสิ่งหนึ่งสิ่งใดในระหว่างการสอบ ให้แจ้งความประสงค์ให้ผู้ควบคุมการสอบทราบ

ข้อ 12 เมื่อผู้ควบคุมการสอบแจ้งให้ทราบว่าหมดเวลาสอบแล้ว ให้ส่งกระดาษคำตอบและกระดาษสอบทันที พร้อมกับออกจากห้องสอบ

ข้อ 13 นิสิตผู้ใดไม่ปฏิบัติ หรือมีพฤติกรรมส่อแสดงว่าไม่ปฏิบัติตามข้อบังคับนี้ ให้ผู้ควบคุมการสอบตักเตือน หากไม่เชื่อฟัง ให้ผู้ควบคุมการสอบสั่งให้นิสิตผู้นั้นออกจากห้องสอบ แล้วรายงานคณบดี เพื่อพิจารณาดำเนินการลงโทษต่อไป

ข้อ 14 เมื่อปรากฏว่ามีกรณีทุจริตในการสอบ ให้ผู้ควบคุมการสอบรวบรวมพยานหลักฐานและบันทึกลักษณะความผิดไว้ในกระดาษคำตอบ พร้อมกับลงลายมือชื่อรับรอง แล้วให้รีบรายงานคณบดี เพื่อนำเสนอมหาวิทยาลัยพิจารณาลงโทษต่อไป

เมื่อมหาวิทยาลัยได้รับเรื่องจากคณบดีแล้ว ให้แต่งตั้งคณะกรรมการขึ้น เพื่อทำการสอบสวนให้แล้วเสร็จภายใน 30 วัน ทั้งนี้ ให้นำข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย วินัยนิสิต พ.ศ. 2547 มาใช้บังคับโดยอนุโลม

ข้อ 15 หากผลการสอบสวน ปรากฏว่านิสิตได้ทุจริต หรือส่อทุจริต ให้ถือว่าสอบตกในรายวิชานั้น

ข้อ 16 ในการสอบครั้งใด ถ้ามีหลักฐานแสดงว่ามีข้อสอบรายวิชาใดล่วงรู้ไปยังผู้เข้าสอบไม่ว่าจะด้วยวิธีใด ๆ ก่อนเข้าสอบ หรือหลังสอบรายวิชานั้น ให้อธิการบดีมีอำนาจสั่งยกเลิก และให้มีการสอบใหม่

ข้อ 17 ให้อธิการบดีรักษาการให้เป็นไปตามข้อบังคับนี้

ประกาศ ณ วันที่ 10 สิงหาคม พ.ศ.2548

ไชศรี ศรีอรุณ

(ศาสตราจารย์เกียรติคุณ คุณหญิงไชศรี ศรีอรุณ)

นายกสภามหาวิทยาลัยนเรศวร

ข้อบังคับมหาวิทยาลัยนเรศวร
ว่าด้วย การสอบของนิสิต พ.ศ. 2548
(แก้ไขเพิ่มเติม) ฉบับที่ 2 พ.ศ. 2549

โดยที่เห็นเป็นการสมควรปรับปรุงข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ.2548 เพื่อให้ครอบคลุมยิ่งขึ้น

ฉะนั้น อาศัยอำนาจตามความในมาตรา 14 (2) แห่งพระราชบัญญัติมหาวิทยาลัยนเรศวร พ.ศ. 2533 โดยมติสภามหาวิทยาลัย ในคราวประชุมครั้งที่ 125 (4/2549) เมื่อวันที่ 22 กรกฎาคม พ.ศ. 2549 จึงให้ออกข้อบังคับไว้ดังต่อไปนี้

ข้อ 1 ข้อบังคับนี้เรียกว่า "ข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ. 2548 (แก้ไขเพิ่มเติม) ฉบับที่ 2 พ.ศ. 2549"

ข้อ 2 ข้อบังคับนี้ให้ใช้บังคับตั้งแต่วันถัดจากวันประกาศนี้เป็นต้นไป

ข้อ 3 ให้ยกเลิกความในข้อ 11 แห่งข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ. 2548 ลงวันที่ 10 สิงหาคม 2548 และให้ใช้ความดังต่อไปนี้แทน

"ข้อ 11 ในการสอบทุกครั้ง นิสิตจะต้องใช้กระดาษคำตอบ หรือกระดาษสอบที่อาจารย์ประจำวิชา หรือภาควิชาจัดให้ และจะนำออกนอกห้องสอบมิได้ การนำออกนอกห้องสอบ ให้หมายความรวมถึง การนำเอาเนื้อหาของข้อสอบหรือคำตอบด้วย เมื่อต้องการสิ่งหนึ่งสิ่งใดในระหว่างการสอบ ให้แจ้งความประสงค์ให้ผู้ควบคุมการสอบทราบ"

ประกาศ ณ วันที่ 25 กรกฎาคม พ.ศ. 2549

ไขศรี ศรีอรุณ
(ศาสตราจารย์เกียรติคุณ คุณหญิงไขศรี ศรีอรุณ)
นายกสภามหาวิทยาลัยนเรศวร

ข้อบังคับมหาวิทยาลัยนเรศวร
ว่าด้วย การสอบของนิสิต พ.ศ.2548
(แก้ไขเพิ่มเติม) ฉบับที่ 2 พ.ศ.2549

.....

โดยที่เห็นเป็นการสมควรปรับปรุงข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ.2548 เพื่อให้ครอบคลุมยิ่งขึ้น

ฉะนั้น อาศัยอำนาจตามความในมาตรา 14 (2) แห่งพระราชบัญญัติมหาวิทยาลัยนเรศวร พ.ศ.2533 โดยมติสภามหาวิทยาลัย ในคราวประชุมครั้งที่ 125 (4/2549) เมื่อวันที่ 22 กรกฎาคม พ.ศ. 2549 จึงให้ออกข้อบังคับไว้ดังต่อไปนี้

ข้อ 1 ข้อบังคับนี้เรียกว่า "ข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ.2548 (แก้ไขเพิ่มเติม) ฉบับที่ 2 พ.ศ. 2549"

ข้อ 2 ข้อบังคับนี้ให้ใช้บังคับตั้งแต่วันถัดจากวันประกาศนี้เป็นต้นไป

ข้อ 3 ให้ยกเลิกความในข้อ 11 แห่งข้อบังคับมหาวิทยาลัยนเรศวร ว่าด้วย การสอบของนิสิต พ.ศ.2548 ลงวันที่ 10 สิงหาคม 2548 และให้ใช้ความดังต่อไปนี้แทน

"ข้อ 11 ในการสอบทุกครั้ง นิสิตจะต้องใช้กระดาษคำตอบ หรือกระดาษสอบที่อาจารย์ประจำวิชาหรือภาควิชาจัดให้ และจะนำออกนอกห้องสอบมิได้ การนำออกนอกห้องสอบ ให้หมายความรวมถึง การนำเอาเนื้อหาของข้อสอบหรือคำตอบด้วย เมื่อต้องการสิ่งหนึ่งสิ่งใดในระหว่างการสอบ ให้แจ้งความประสงค์ให้ผู้ควบคุมการสอบทราบ"

ประกาศ ณ วันที่ 25 กรกฎาคม พ.ศ.2549

(ศาสตราจารย์เกียรติคุณ คุณหญิงไขศรี ศรีอรุณ)
นายกสภามหาวิทยาลัยนเรศวร

ANNEX V

Admission Regulation

Annex V **Summary Translation for AUNQA only**

Criteria:		
Summary of :	Admission Regulation for Naresuan University	
Translator:	Akaraphunt Vongkunghae	Aug 07,2556 BE

Summary of Naresuan University Admission Regulation

Background

Some background has to provide for understanding the university admission in Thailand. The first of all, Naresuan University is a member of Association of University Presidents of Thailand (AUPT). The AUPT manages the university admission process for most universities in Thailand. The system for university admission management is called Central University Admissions System (CUAS) http://www.cuas.or.th/index.php. Thai high school students (Grade 12) need to take examinations arranged by the National Institute of Educational Testing Service (NIETS) Public Organization http://www.niets.or.th/index.php. NIETS manages 3 types of national testing as the following:

- O-NET Ordinary National Education Test
  - Consists of the subjects that students learn at high school level,
    - O-NET 01 Thai Language
    - O-NET 02 Social Science, Religion and Culture
    - O-NET 03 English Language
    - O-NET 04 Mathematics
    - O-NET 05 Science
    - O-NET 06 Health and Physical Education
    - O-NET 07 Vocational Study and Technology.
    - O-NET 08 Art

- GAT General Aptitude Test
  - To measure the potentials of study abilities in university.
    Consists of
    - Ability to read, write, think critically, and solve problems.
    - Ability to communicate in English.

- PAT Professional and Academic Aptitude Test
  - To measure the fundamental knowledge of interested professional.
    - PAT 1 Math aptitude
    - PAT 2 Scientific aptitude
    - PAT 3 Engineering aptitude
    - PAT 4 Architecture aptitude
    - PAT 5 Teacher aptitude
    - PAT 6 Fine Arts aptitude
    - PAT 7 Foreign Language aptitude.

The AUPT uses the results of these tests also including the grade point average of high school level (called GPAX) for admission process for all of its university members.

Central University Admissions System

Process

1. All Grade-12 students need to take O-NET, GAT, and PAT examinations on the date announced by the NIETS.

   To calculate the total performance of each candidate in the scope of Computer Engineering Program, the percent weights are used as the following:

- GPAX	High School Level Grade Point Average	20%
- O-NET	Ordinary National Education Test	30%
- GAT	General Aptitude Test	15%
- PAT 2	Professional and Academic Aptitude Test Scientific aptitude	15%
- PAT 3	Professional and Academic Aptitude Test Engineering aptitude	20%

2. All Grade-12 students must apply for university admission on the date announced by the AUPT and submit the NIETS test results required as above to the Central University Admissions System http://www.cuas.or.th/index.php. The students must provide the list of their preferring programs and their program priority requests to the CUAS.
3. After all students have done the application and submitted the test results and their program priority requests.
4. The CUAS shall do the processing calculation to arrange the candidate into his program request corresponding to his priority request. The candidate will be selected into his request program or not, based on higher total performance, higher chance to be selected.
5. The CUAS announces the result of the admission calculation to the public and the universities.
6. The universities arrange the interview examination to all candidates that report and declare themselves to their universities.
7. End of the admission process. The admission process will take place every once a year for undergraduate programs.

Note:

(1) The CUAS is a dynamics system. The percent weights for the calculation of total performance may be changed and varied year by year. The AUPT may develop new selective criteria for the year coming. The CUAS process is based on the competitive performance. There is no minimum threshold, the better performance, the better program that you request. The chance of admission rejection is based on the seat limitation in the list of application's request programs.

(2) By the Thai National policy, Naresuan University is assigned to serve and develop the people around the northern area. Therefore, Naresuan University has a direct admission process for students, aiming to have 70% of its students from the northern area of Thailand. The Naresuan direct admission process is similar to the CUAS process. The only difference is no submitted O-NET result. The weights for total performance calculation are GPAX 20%, GAT 30%, PAT2 20% and PAT3 30% for all engineering programs. These weights for each program are given by the Naresuan University Administrative Committee.