ABET

Self-Study Report

for the

Electrical Engineering Study Program

at

Universitas Hasanuddin

Makassar, Indonesia

July 2019

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BACKGROUND INFORMATION

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B Program History

The Electrical Engineering Study Program (EESP) at Universitas Hasanuddin, Makassar, Indonesia was founded in 1963 as a part of the Faculty of Engineering established a few years earlier. The campus was originally located at Baraya, near the downtown of Ujung Pandang which was the old name of the city of Makassar. In early 1980s, the university campus was relocated to Tamalanrea, about 10 km north-east of downtown Makassar. More than 30 years later, the Faculty of Engineering was relocated again to its new campus at Gowa, 20 km south of Tamalanrea, and the EESP - under the Department of Electrical Engineering- officially settled at its new facilities in the new campus at Gowain 2017.

During the first years after its establishment in mid 1960s, most EESP students of Universitas Hasanuddincontinued and completed their undergraduate degrees in 2 (two) major universities in Indonesia, namely Gadjah Mada University (UGM) in Yogyakarta and Bandung Institute of Technology (ITB) in Bandung. The majority of the graduates from this period made their careers as academicians, or as engineers at the state-owned power company (PLN) and telecommunication (TELKOM), or started their own private companies related to electricity and telephone businesses.

A major change of curriculum was implemented in 1980. The EESP was split into 2 (two) sub-study programs or concentrations, namely: (1) The Electrical Power Engineering and (2) The Telecommunication and Electronic Engineering. It was an 8 (eight)

TABLE 1: SUMMARY OF MAJOR CHANGES IN THE HISTORY OF UNIVERSITAS HASANUDDIN.

Year	Events
1963	The Electrical Engineering Study Program (EESP) founded
1980	Split into 2 (two) sub-study programs: (1) Electrical Power Engineering Sub-Study Program (2) Telecommunication and Electronic Engineering Sub-Study Program
1984	Relocated from Baraya Campus to Tamalanrea Campus
1995	Split into 3 (three) concentrations: (1) Electrical Power Engineering (2) Telecommunication Engineering (3) Computer, Control and Electronic Engineering
2000	Minor Revisions of Curriculum
2005	Minor Revisions of Curriculum, competency-based curriculum (KBK)
2010	Minor Revisions of Curriculum, competency-based curriculum (KBK)
2012	Focus Group Discussion (FGD) on Curriculum 2015 established
2015	Relocated to the Faculty of Engineering Campus at Gowa Commencement of the Laboratory-based Education System (LBE)
2016	Implementation of the R&D-based Curriculum 2015
2017	Focus Group Discussion (FGD) on Curriculum 2015 dismissed

semester undergraduate engineering study program provided in 4 (four) academic years. In the first three semesters, the students took common courses on the fundamentals of Electrical Engineering and the required mathematics, physics and chemistry. Beginning at the fourth semester, the students voluntarily selected their preferences of concentration, and took different required and elective courses accordingly.

The next stage of curriculum development was started in 1995. A new concentration was established by divided the Telecommunication and Electronic Engineering sub-study program into 2 (two), i.e. (1) The Telecommunication Engineering and Information Systems, and (2) The Computer, Control and Electronic Engineering sub-study programs. Common courses for both new concentrations were listed until the fourth semester. The basis of the curriculum establishment was the nationally decreed higher education curriculum development in Indonesia: Competency-Based Curriculum (KBK).

Most recently, a major change in the EESP curriculum was made related to the campus relocation to Gowain 2015. The new campus is designed to support the Laboratory-based Education (LBE) system adopted by the Faculty of Engineering. By this time the EESP has established its Masters and Doctoral Degree programs supported by no less than 20 research laboratories and working groups. The process of curriculum development was managed by a Focus Group Discussion (FGD) on Curriculum 2015 in a 5 (five) year working period from 2012 to 2017, with a tagline: "From Competency To Contribution".

The main idea of the recent curriculum change is to extend the competency-based curriculum previously implemented to a brand new curriculum called the "R&D-(research and development)-based curriculum". The existing (since 1995) three concentrations were discontinued and all merged back to only one EESP. The curriculum structure is now composed of 4 (four) semesters of fundamentals and 2 (two) semesters of (elective) course packages to develop the competency, and the final laboratory-based, or R&D-based, 2 (two) semesters to make the contribution.

The timeline of the EESP 55 year history is summarized in Table 1. After 1995, in

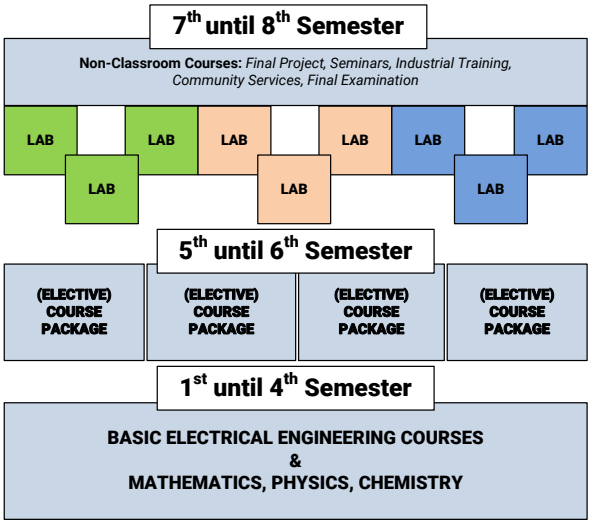

Figure 1: The Curriculum Structure.

fact the EESP curriculum has been revised every 5 (five) years, in 2000, 2005 and 2010 consecutively, but only with minor revisions.

Most recently, a major change in the EESP curriculum was made related to the campus relocation to Gowain 2015. The new campus is designed to support the Laboratory-based Education (LBE) system adopted by the Faculty of Engineering. By this time the EESP has established its Masters and Doctoral Degree programs supported by no less than 20 research laboratories and working groups (see Table 2 in the next section). The process of curriculum development was managed by a Focus Group Discussion (FGD) on Curriculum 2015 in a 5 (five) year working period from 2012 to 2017, with a tagline: "From Competency To Contribution".

The main idea of the recent curriculum change is to extend the competency-based curriculum previously implemented to a brand new curriculum called the "R&D (research and development)-based curriculum". The existing (since 1995) three concentrations were discontinued and all merged back to only one EESP. The curriculum structure is now composed of 4 (four) semesters of fundamentals and 2 (two) semesters of (elective) course packages to develop the competency, and the final laboratory-based, or R&D-based, 2 (two) semesters to make the contribution (see Figure 1 in the next section).

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C Options

The main structure of the curriculum is shown by Figure 1. In the first 4 (four) semesters, freshmen and sophomores spend most of their time in classrooms and supporting teaching laboratories to develop their knowledge on required mathematics and basic sciences (physics and chemistry), and the Electrical Engineering fundamentals, especially the 4 (four) basics namely1: (1) Electric Circuits, (2) Electro-magnetics, (3)

Solid-state Electronics and (4) Digital Logic Circuits. They also begin to develop their skills to conduct simple experiments, to analyse, interpret and present data, to enhance their knowledge on the required subjects.

After completing all basic and fundamental courses, in the third year the students are supposed to take at least one elective-course package per semester consisting of 3 to 4 courses in a specific area of electrical engineering that will - but not necessarily - lead to one of the research laboratories or working groups in the fourth year that they are interested to apply. Roughly 6 to 8 elective-course packages are offered each semester to juniors, covering the total of more than 50 elective-courses.

Beginning in the fifth semester, a junior should make a decision to choose **at least one** of the following 5 (five) options by solicitedly selecting the related package of elective courses:
Option 1: Electrical Power Engineering and Electricity
Option 2: Telecommunication Engineering and Information Systems
Option 3: Computer Engineering and Robotics
Option 4: Control Systems and Instrumentation
Option 5: Electronic Engineering

The ultimate learning process is at the final fourth year. Seniors are required to apply to one of the research laboratories or working groups. When a senior is admitted to a research laboratory or working group then he or she becomes a member of the laboratory or group by signing an annual contract with the head of the laboratory or the chairman of the group. The seniors will work together with professors and their associates and assistants, their fellows graduate and undergraduate students, to develop their ability to apply their knowledge and to design experiments, systems, processes and/or components to meet desired needs. They also learn how to work effectively not only as individuals but also in teams, either as leaders or members.

After completing all basic and fundamental courses, in the third year the students are supposed to take at least one elective-course package per semester consisting of 3 to 4 courses in a specific area of electrical engineering that will - but not necessarily – lead to one of the research laboratories or working groups in the fourth year that they are interested to apply. Roughly 6 to 8 elective-course packages are offered each semester to juniors, covering the total of more than 50 elective-courses.

In the seventh semester, the students are expected to learn how to identify and formulate a problem, present it and propose a final project in a seminar to solve it. They should be able to define the scope of the problem so that they could complete the solution within months in the next eighth semester.

The final examination at the end of eighth semester is a special occasion to give an opportunity for graduating students to show their in-depth technical competence in at least one area of Electrical Engineering and to prove their academic contributions by demonstrating and defending their final undergraduate projects.

D Program Delivery Modes

The Faculty of Engineering officially runs all academic activities in working hours 07:00 AM to 05:00 PM Monday to Friday, 2 (two) semesters per academic year, 16 weeks per semester. Traditional or regular lecture courses are delivered during these working

Table 2: List of Available Research Laboratories and Working Groups in the Academic Year of 2018-2019.

Area	Laboratory (Lab) and Research Group (RG)
Electrical Power Engineering and Electricity	Electric Machines and Power Drives Power System Stability, Control and Protection Power Electronics High Voltage and Insulation Power System Distribution and Installation Renewable Energy and Intelligent Systems Energy and Power Systems Electricity Infrastructures Distributed Power Generation Electricity Market and Power Systems
Telecommunication Engineering	Antenna and Wave Propagation Radio Telecommunications and Microwave Wireless Communication Technology Transmission and Telecommunication Network Radio Engineering Multimedia Telecommunication and Artificial Intelligence Telematics, Radar and Satellite
Computer Engineering	Computer Engineering and Network (Lab)
Control Systems and Instrumentation	Control Systems and Instrumentation (Lab) RG: Cognitive, Social and Intelligent Robotics
Electronic Engineering	Electronics and Devices (Lab) RG: Industrial Electronics and Embedded Systems

hours, while other activities, including non-lecture activities, may be delivered in these working hours or in the other time.

An EESP graduate must complete at least 145 credit hours of courses, a total of 28 credits hours equivalent of those are non-lecture courses, including:

(a) The Undergraduate Final Project Report (called "*Skripsi*"), presented and defended in a Final Examination, 4 credit hours

(b) Seminar on the Undergraduate Final Project Results, 2 credit hours

(c) Seminar on the Undergraduate Final Project Proposal, 2 credit hours

(d) Community Services (called "*Kuliah Kerja Nyata*" or KKN), an off-campus 1 month activity run by the university, usually in a remote area or a village, 4 credit hours

(e) Practical (Industrial or "On Job") Training, an off-campus 1 to 2 month activity, typically in an industrial site, 2 credit hours

(f) Laboratory 1, an intra-laboratory or working-group R&D activity, semester 7, 8 credit hours, to develop an undergraduate final project proposal

(g) Laboratory 2, an intra-laboratory or working-group R&D activity, semester 8, 8 credit hours, to produce a contribution from the undergraduate final project

The remaining 117 credit hours are delivered as regular lecture courses in classrooms supported by prescribed syllabi and text books, and/or by conducting experiments in the teaching laboratories: *Basic Physics Laboratory, Basic Electrical Engineering Laboratory and Computer Software Laboratory.*

E Program Locations

All academic teaching and learning processes are located in the new Faculty of Engineering campus at Gowa, about 20 km to the south from the old campus at Tamalanrea, Makassar. The new campus is designed to accommodate the concept of Laboratory-based Education (LBE) adopted by the Faculty of Engineering. Common facilities such as classrooms, the central library and the Faculty of Engineering administrative offices, are located in the main area of campus. A three-story building as seen in Fig. 7.2 is functioned as the Classroom Building to house classrooms with the capacity of 20 to 100 students. Lecture theatres for an audience of hundreds of students are also available for general lectures. For smaller classes, less than 20 students, the seminar and meeting rooms in laboratories at the Electrical Engineering Building can be used, as shown in Figure2.

F Public Disclosure

The information regarding the PEOs, SOs, annual student enrolment and graduation data, etc. is posted both on the standing banners in front of the Department's admin-

(a) Outdoor Front View

(b) Outdoor Back View

(c) Indoor Floor View

(d) Entrance

Figure 2: The EE Department Building

(a) Front View

(b) Side View

Figure 3: The Standing Banners Around the Department's Administrative Office

FIGURE 4: THE SCREEN-SHOT OF THE FRONT PAGE OF THE EESP OFFICIAL WEBSITE

istrative office (see Fig. 3) and in the official website of the EESP (Please see Fig. 4): http://eng.unhas.ac.id/electrical/ .

G Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

Not yet applicable for Readiness Review.

CRITERION 1

STUDENTS

1.1 Student Admissions

All student candidates have to graduate from high school and should pass the National Exam (UN). Process for accepting new students into the Civil Engineering Study Program (CESP) is conducted during academic year from May to June. Student admission is carried out by Universitas Hasanuddin for the entire program. Prospective students are assessed for their academic performance in science, i.e. math and physics as basic capabilities for civil engineering student. Admission is carried out in several schemes as described as follows:

1. SNMPTN, a special invitation for high school potential graduates which has an excellent academic performance.
2. SBMPTN, National Admission Selection for Public University which is managed by Ministry of Research and Higher Education.
3. POSK, Local/Universitas Hasanuddin entrance test for those having exceptional achievement in arts, sports and sciences.

1.2 Evaluating Student Performance

Not yet submitted submit for Readiness Review.

1.3 Transfer Students and Transfer Courses

No transfer students and transfer courses.

1.4 Advising and Career Guidance

Faculties are served as Academic Advisor (AA) who counsels the selection of courses prior to registering for the following semester. This counselling activity is in the form

of recommendations for strategy to select courses in relation to prospective job after graduation.

EESP carry out academic dialogue regularly to obtain input and find solutions for student's obstacles in the study process. Moreover, this academic dialogue discusses employment opportunities for graduated student. EESP also invites alumni association (IATEL) to provide job information.

At the college level (deputy dean for student and alumni affairs) and at the university level (Directorate of Alumni and Career Preparation) regularly conduct job affair for students and alumni.

1.5 Work in Lieu of Courses

The EESP does not implement the requirements and process for awarding credit for work in lieu of courses.

1.6 Graduation Requirements

An EESP graduate must complete at least 145 credit hours of courses, a total of 28 credits hours equivalent of those are non-lecture courses. In the final year, a student must present and defend his/her undergraduate Final Project Report, called "*Skripsi*", having 4 credit hours. In the last semester, before the Final Project Report, a student must also present in a seminar his/her the Undergraduate Final Project Results, having 2 credit hours, undertake a Community Service, called "*Kuliah Kerja Nyata*" or KKN, one-month off-campus activity run by the university, usually in a remote area or a village, 4 credit hours, and undertake a Practical (Industrial or "On Job") Training, one-/two-month off-campus activity, typically in an industrial site, having 2 credit hours.

In the last year, a student must also do a research activity termed as Laboratory Work 1 (for Semester 7) and Laboratory Work 2 (for Semester 8). The Laboratory Work 1 is an intra-laboratory or working-group R&D activity, having 8 credit hours, to develop an undergraduate final project proposal. The Laboratory Work 2 is an intra-laboratory or working-group R&D activity, having 8 credit hours, to produce a contribution from the undergraduate final project.

1.7 Transcripts of Recent Graduates

An example of a recent graduate can be found in the attachments.

CRITERION 2

PROGRAM EDUCATIONAL OBJECTIVES

2.1 Mission Statement

Not yet submitted for Readiness Review.

2.2 Program Educational Objectives

The program educational objectives of the EESP are as follows:

1. The EESP graduates have a mastery in basic sciences and mathematics relevant to the basic competency in the field of electrical engineering (Basic Science Skills).

2. The EESP graduates have an ability to anticipate, to formulate and to solve problems related to the field of electrical engineering (Professional Skills).

3. The EESP graduates have the spirit of leadership and entrepreneurship, the academic attitude, and have an ability to compete to work in various sectors all over the world, especially in Indonesia and Asia-Pacific region (Entrepreneur Skills).

4. The EESP graduates have capability to continue their study to higher degree of education all over the world (Research Skills).

These Program Educational Objectives are posted in the official website of the Department and also shown to visitors on standing banners in front of the Department's administrative office.

2.3 Consistency of the Program Educational Objectives with the Mission of the Institution

Not yet submitted for Readiness Review.

2.4 Program Constituencies

At the time of what so called the era of "disruption", the era of the emergence of entirely new kinds of business like Uber and Airbnb, it is almost impossible to predict, who or what will be the EESP's main constituencies in the future when the graduates start to enter the job market. Therefore, it is important to strengthen the basics, especially mathematics, basic sciences and basic electrical engineering, and the spirit of entrepreneurship that will give the graduates a strong self-confidence to face the new challenging world, and then successfully create jobs at least for themselves, and also for others.

Relying merely on the traditional constituencies such as the state-owned enterprises in electrical power systems and electricity, telecommunication, general contractors and consultants, etc., has a potential to leave the graduates irrelevant in the future which is more dangerous than becoming out of job. The issue of relevance is the most important factor to be considered when stating the Program Educational Objectives above.

2.5 Process for Review of the Program Educational Objectives

The EESP curriculum is subject to be reviewed periodically every five years since 1995. The process for review usually begins with a tracer study by surveying the alumnus's well-being and their views on the curriculum after they leave campus all that long. The alumnus's points of view are the most important consideration in the development of new curriculum. In the last tracer study in 2013, the alumni were asked what courses that they still remember after graduation. The alumnus's strong memory on specific courses indicates how important the courses are for them now, or how good the courses were delivered during their tenure as students in previous years.

CRITERION 3

STUDENT OUTCOMES

3.1 Student Outcomes

By participating in various academic programs in EESP, the students will attain the basic competency in the field of electrical engineering, and at least one of the following options:

Option 1: Electricity and Electrical Power Engineering

1. An ability to design and to analyse electricity systems both technically and economically
2. A mastery in power system generation, installation, transmission and distribution, and power station operation
3. A mastery in electric machines applications, maintenance, control and operation

Option 2: Telecommunication and Information System

1. A mastery in system management and control of network, hardware and multimedia software applications in telecommunication and information systems
2. An ability to anticipate, to formulate and to solve problems related to the network, hardware and multimedia software applications in telecommunication and information systems
3. An ability to participate in the science and technology development, especially in the area of telecommunication and information systems, and always being adaptive to the advancement of science and technology in this area

Option 3: Computer Engineering

1. An ability to utilize the computer software packages for modelling and simulation of various electrical engineering problems, and

2. A mastery in concepts, design and application of the digital computer hardware

Option 4: Control Engineering

1. A mastery in the basic control theory, both classical and modern control theory, and its application in the control systems analysis and design

Option 5: Electronic Engineering

1. A mastery on the know-how of design and application of electronic devices, circuits and systems, and microelectronics, including the utilization of software packages for integrated circuit layout design

In addition to the specific student outcomes above, the following ABET criteria are also made as references:

General Engineering Criteria (ABET)

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgement to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Electrical Engineering Criteria (ABET)

1. Broad knowledge over all areas within electrical engineering (power engineering, telecommunication, control engineering, electronics and computer engineering)
2. Depth of knowledge in at least one area
3. Knowledge of probability and statistics, including applications to electrical and computer systems

4. Knowledge of mathematics through differential and integral calculus
5. Knowledge of basic sciences, computer science, and engineering sciences necessary to analyse and design complex electrical and electronic devices, software, and systems containing hardware and software components
6. Knowledge of advanced mathematics, linear algebra, complex variables
7. Sufficient background for graduate study

As summary, the EESP uses ABET Engineering and Electrical Engineering Criteria as well as at least one of the aforementioned Criteria of each options in the EESP.

3.2 Relationship of Student Outcomes to Program Educational Objectives

Not yet submitted for Readiness Review.

CRITERION 4

CONTINUOUS IMPROVEMENT

The EESP assesses regularly and evaluate the extent to which the student outcomes have been attained. The assessment of the student outcome is generally divided into two methods, i.e. direct and indirect assessment method. The descriptions of the methods are given as follows.

Direct Assessment.

In general the direct assessment method is made during study period, which is divided into two main parts, i.e.:

1. Examinations, which are divided into:
   (a) Course exams. These exams are part of grading systems of student's works in each course.
   (b) Lab exams, These exams are part of grading systems of student's work in each lab work.
   (c) Final examination bundled in an Undergraduate Final project presentations.
2. Student's Outcomes Portfolios. Besides the student's grades for all courses, which are presented in student's transcript after finishing their study, every student is also encourage to enrich his/her portfolio. The student's portfolio is described concretely in a single or multiple papers. Different with student's transcript that gives student performance in quantitative grading points, the student portfolio describes the student skills achievement qualitative description. The student portfolio states the student experiences in design contests or competitions, in national and/or international conferences as presenter or passive participant, including their achievements in those events, obtained awards or honours, etc.

In the first semester, each student is given a skill map (single paper), presenting some skills that the student wish or expect to master after completing his/her BSEE degree. Each student can select until 3-5 skills with a given priority number. The given skills are stated for example that "he/she will be able to design a component of an electric vehicle". It is not necessary that the given skills sound similar with the student outcomes, but they can implicitly represent or reflect at least one of the student

outcomes. The EESP collects then the skill map signed by the student, and let the student keep a copy for his/her archive. In the last Semester, this skills map is opened again and the student expectations shown in the skills map are cross checked with the student portfolio that he/she will have made upon completing his/her BSEE study.

During their study-period, the student outcomes will be assessed. Four skills are given to students in accordance with the program educational objectives of the EESP (Criterion 3, i.e. basic science skills, professional skills, entrepreneur skills and research skills. The student outcomes related to their technical knowledge (professional skills) to solve an engineering problem can be achieved after Semester 6 (third year). Therefore, the professional skills can be measured after the third year. The research skills of a student can be assessed in the last semester (Semester 8) during completing his/her undergraduate final project. Extensive advising is given by the project supervisor including the scientific writing.

At least once a year or once per semester, the EESP opens a local student conference and exhibition (SCE). In the SCE, some students will have chance to demonstrate their communication or presentation skill, to show their scientific writing skill, and to expose their undergraduate projects. All students, teaching staff, government representatives and the parents and/or family members of the student will be invited to attend the SCE.

Indirect Assessment.

The EESP indirect assessment is divided into three methods, i.e.:

(a) Senior Exit Surveys

(b) Alumni Surveys using google form or an existing social media (LinkedIn as our preference)

(c) Employer Surveys through a purpose sampling industrial advisory committee meetings

The indirect method is made to know the extent to which: 1) a fresh graduate satisfies with the EESP curriculum, through the Senior Exit Surveys, 2) the employers satisfies with the performance of our alumni, through the purpose sampling industrial advisory committee meeting, and 3) the existences of our alumni that have established their own company. Point 2) above is related to both, the Alumni and Employer Surveys, while Point 3) is related to the Alumni Surveys.

To gather the data of our alumni, every fresh graduate is asked to register on a social media. In this case, we select LinkedIn as our preference. The fresh graduated alumni is asked to link his/her account to the EESP alumni account and continuously update their last employment status. The EESP will then collect the alumni data from the social media and put them in the EESP alumni database.

At least once a year, the EESP selects or samples an employer to host an industrial advisory committee meeting. The industrial advisory committee are the EESP staff and staff from industries or employers in which the EESP Alumni are employed. The committee will discuss about the industrial needs and how the EESP Alumni can meet the requirements.

4.1 Student Outcomes

Table 4.1 presents a Skill-Assessment Map or listing of skills related to the program education objectives, which are assessed with the direct and indirect assessment methods. The complete student outcomes have been presented in Criterion 3, Section 3.1. The EESP uses the ABET's Engineering and Electrical Engineering Criteria as well as at least of the options study in the EESP.

The student outcomes are the reflection of four program educational objectives of the EESP, presented in Criterion 2 Section 2.2. The program educational objectives are termed as Competency Skills, Professional Skills, Entrepreneur Skills and Research Skills. The assessed skills of each student is reported in the student outcome portfolio.

4.2 Continuous Improvement

As inputs in the continuous improvement of the EESP student's outcomes, the EESP will collect data from the direct and indirect assessments explained in Section A. The collected data are analysed and used as the references to evaluate the EESP curriculum and to improve the student outcome achievements. The students outcomes of each graduate reflected in the student portfolios are documented in a database.

4.3 Additional Information

Not yet submitted submit for Readiness Review.

Ver. 1.0	Assessment/Evaluation Methods															
	Indirect			Direct												
EESP Program Outcome	Senior Exit Surveys	Alumni Surveys	Employer Surveys	Math, Physics exams	Advanced Math, Physisc, Linear Systems exams	Numerical methods, comp. progr. exams	Basic electronics, telec, power eng. Exams	Env. sciences, Princ. of Maritime science exams	Dig. Sys, Electric, Electronics Labs	Integrated Electronics, Microprocessors Labs	Selected Elective course exams	Engineering Economics, Entrepreneurship exams	Concepts of Sci, Techn. & Arts, maritime cult.exams	Lab Works exams, Practical (on-ob) training	Research Method and Scientific Writing exams	Final Examination
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Competency Skills																
Math., science skills	x	x	x	x												
Problem Modeling	x	x	x		x	x										
Analytical Skills	x	x	x			x	x									
Critical thinking	x	x	x					x								
Professional Skills																
Software Tools	x	x	x				x		x	x	x					
Design Skills	x	x	x						x	x	x					
Experiment Skills	x	x	x						x	x	x					
Engineering Knowhow	x	x	x						x	x	x					
Entrepreneur Skills																
Innovations	x	x	x								x					
Leadership	x	x	x									x				
Entrepreneurship	x	x	x									x				
Global Insights	x	x	x										x			
Research Skills																
Teamwork skills	x	x	x											x		
Scientific Writing	x	x	x												x	
Presentation Skiils	x	x	x													x

TABLE 4.1: THE SKILL-ASSESSMENT MAP.

CRITERION 5

CURRICULUM

5.1 Program Curriculum

The Program Curriculum of the EESP is designed to meet the program educational objectives. The EESP requires that all educational programs must have a freshman year that consists of mathematics and basic science, a set of general education, and engineering topics. With these constraints, the implementation of the EESP curriculum consists of three elements and with a total minimum of 145 credits hours as shown in the Figure 5.1.

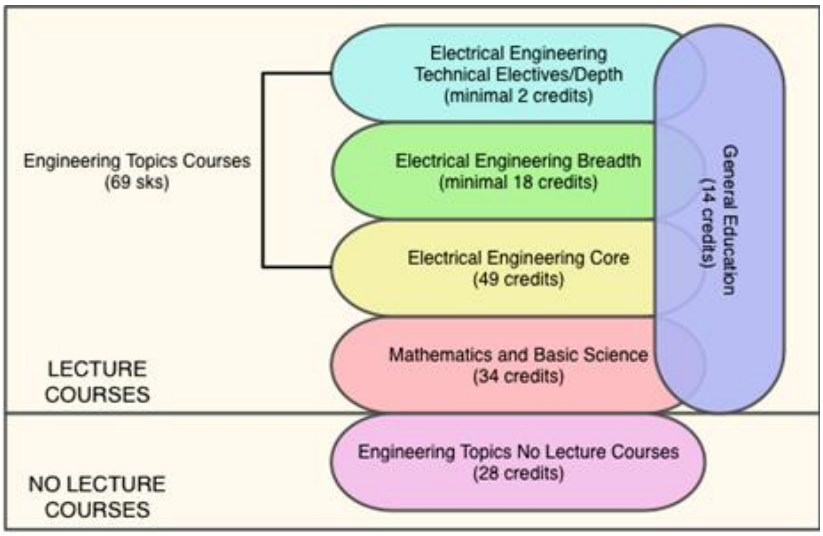

Figure 5.1: Overview of EESP curriculum.

Table 5.1 describes the plan of study for students in this program including information on course offerings in the form of a recommended schedule by year and term along with maximum section enrolments for all courses in the program.

The flowchart or worksheet that illustrates the prerequisite structure of the program's required courses is shown in Figure 5.2.

5.2 Course Syllabi

The Course Syllabi can be found in Appendix A of this Readiness Review Report.

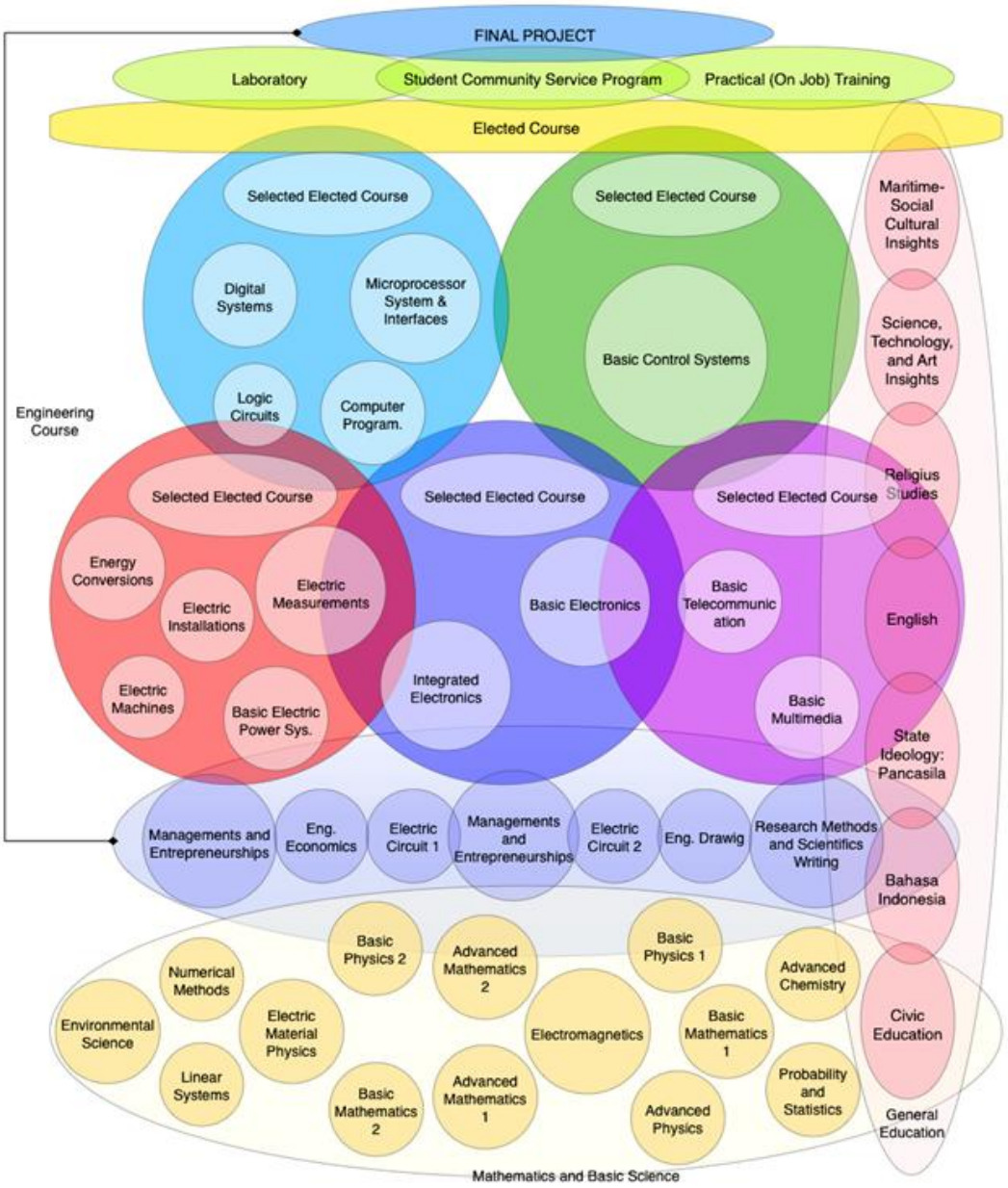

FIGURE 5.2: FLOWCHART OR WORKSHEET THAT ILLUSTRATES THE PREREQUISITE STRUCTURE OF THE PROGRAM.

TABLE 5.1: CURRICULUM

Course ***Electrical Engineering***	***Required, Elective, or a Selected Elective***	***Subject Area (Credit Hours)***				***Last Two Terms the Course was Offered: Year and Semester or Quarter***	***Maximum Section Enrollment for The Last Two Terms the Course was Offered***
		Math & Basic Sciences	***Engineering Topics Check If Contains Significant Design ()***	***General Education***	***Other***		
Lecture Courses							
011U0032 Citizenship Education	R			2		I; 1	84
009U0032 Bahasa Indonesia	R			2		I; 1	84
016U0033 Basic Mathematics 1	R	3				I; 1	100
020U0033 Basic Physics 1	R	3				I; 1	100
101D4113 Electrical Circuits 1	R		3			I; 1	100
102D4112 Logic Circuits	R		2			I; 1	100
103D4112 Engineering Drawing	R		2			I; 1	100
104D4112 Advanced Chemistry	R	2				I; 1	100
001U0032 Religious Studies (Islam, Catholic, etc)	R			2		I; 2	84
012U0032 State Ideology: Pancasila	R			2		I; 2	84
010U0032 English	R			2		I; 2	84
017U0033 Basic Mathematics 2	R	3				I; 2	100
022U0033 Basic Physics 2	R	3				I; 2	90
105D4123 Electric Circuits 2	R		3			I; 2	90
106D4122 Digital Systems	R		2			I; 2	100
107D4122 Computer Programming	R		2			I; 2	95

Table 5.2: Curriculum (Continued)

Course Electrical Engineering	***Required, Elective, or a Selected Elective***	***Subject Area (Credit Hours)***				***Last Two Terms the Course was Offered: Year and Semester or Quarter***	***Maximum Section Enrollment for The Last Two Terms the Course was Offered***
		Math & Basic Sciences	***Engineering Topics Check If Contains Significant Design ()***	***General Education***	***Other***		
108D4121 Electric Circuits Laboratory	R		1			I; 2	100
109D4121 Digital Systems Laboratory	R		1			I; 2	95
008U0032 Principle of Science, Technology, and Art	R			2		II;3	70
201D4113 Advanced Mathematics 1	R	3				II;3	85
202D4112 Basic Electric Power (Systems)	R		2			II;3	70
203D4112 Basic Telecommunication (Systems)	R		2			II;3	85
204D4112 Basic Electronics	R		2			II;3	85
205D4112 Electric Material Physics	R	2				II;3	70
206D4112 Advanced Physics	R	2				II;3	85
207D4111 Basic Electric Power laboratory	R		1			II;3	85
208D4111 Basic Telecommunication Laboratory	R		1			II;3	85
209D4111 Basic Electronics Laboratory	R		1			II;3	85
007U0032 Principle of Maritime Science	R			2		II;4	70
210D4123 Advanced Mathematics 2	R	3				II;4	85
211D4122 Linear Systems	R	2				II;4	85
212D4122 Electric Machines	R		2			II;4	70
213D4122 Basic Multimedia	R		2			II;4	70
214D4122 Integrated Electronics	R		2			II;4	85
215D4122 Microprocessor Systems and Interfaces	R		2			II;4	85
216D4122 Basic Control Systems	R		2			II;4	70
217D4122 Electric Installation and Laboratory	R		2			II;4	85

TABLE 5.3: CURRICULUM (CONTINUED)

Course ***Electrical Engineering***	***Required, Elective, or a Selected Elective***	***Subject Area (Credit Hours)***				***Last Two Terms the Course was Offered: Year and Semester or Quarter***	***Maximum Section Enrollment for The Last Two Terms the Course was Offered***
		Math & Basic Sciences	***Engineering Topics Check If Contains Significant Design ()***	***General Education***	***Other***		
218D4121 Integrated Electronics Laboratory	R		1			II;4	85
219D4121 Microprocessor Systems and Interfaces Laboratory	R		1			II;4	85
301D4112 Engineering Economics	R		2			III;5	
302D4112 Probability and Statistics	R	2				III;5	
303D4112 Electric Measurement	R		2			III;5	
304D4112 Electromagnetics	R	2				III;5	
*Selected Elective Course (1 Package)**	SE		9			III;5	
342D4122 Numerical Methods	R	2				III;6	
343D4122 Energy Conversion	R		2			III;6	
344D4122 Environmental Science	R	2				III;6	
345D4122 Management and Entrepreneurship	R		2			III;6	
*Selected Elective Course (1 Package)**	SE		9			III;6	
402D4112 Research Methods and Scientific Writing	R		2			IV;7	
*Elective Course***	E		2			IV;7	
Total Required Minimum Lecture Courses		34	69	14	0		
Total-ABET Basic Level Requirements							
Total Credit Hours for Lecture Courses	117						
Percent of Total		29,1%	59,0%	12,0%	0,0%		
Total Must Satisfy Either Credit Hours of Percentage	Minimum Semester Credit Hours	32 Hours	48 Hours				

Table 5.4: Curriculum (Continued)

Course ***Electrical Engineering***	***Required, Elective, or a Selected Elective***	***Subject Area (Credit Hours)***				***Last Two Terms the Course was Offered: Year and Semester or Quarter***	***Maximum Section Enrollment for The Last Two Terms the Course was Offered***
		Math & Basic Sciences	***Engineering Topics Check If Contains Significant Design ()***	***General Education***	***Other***		
	Minimum Percentage	25,0%	37,5%				
Non-Lecture Courses							
401D4112 Practical (On Job) Training	R		2			IV;7	
403D4112 Final Project Proposal	R		2			IV;7	
Laboratory 1	R		8			IV;7	
491D4124 Student Community Service Programs	R		4			IV;8	
492D4122 Final Project Results	R		2			IV;8	
Laboratory 2	R		8			IV;8	
493D4122 Final Project Report	R		2			IV;8	
Total Credit Hours for Non-Lecture Courses	28						
Overall Minimum Total Credit Hours For Completion of The Program	145						

TABLE 5.5: NOTES

Percentages of	Lecturer Course Only (117 credits)	Total Courses (145 credits)
Math & Basic Science	34 (29%)	34 (23.4%)
Engineering Topics	69 (59%)	93 (64.2%)
General Education	14 (12%)	18 (12.4%)

TABLE 5.6: GENERAL EDUCATION COMPONENT.

Code	General Education	Credit	Course (%)	Lab (%)	Other (%)
011U0032	Citizenship Education	2	100		
009U0032	Indonesian Language	2	100		
001U0032	Religion	2	100		
012U0032	State Ideology: Pancasila	2	100		
010U0032	English	2	100		
008U0032	Concept of Science and Technology	2	100		
007U0032	Social Science of Maritime Culture	2	100		

The proportion of Mathematics and Basic Sciences is only 23.4% of the total 145 credit hours minimum requirement for graduation. However, 28 credit hours out of those 145 credit hours are non-lecturer courses, such as Final Undergraduate Projects (Final Project, Seminars, and Laboratories) and Student Community Services, which may have Mathematics and Basic Sciences contents and are not comparable ("apple to apple") to the regular lecture courses. Based on argument above, the non-lecture courses may be excluded so that the proportion of Mathematics and Basic Science is now 29.0% of the total of 117 credit hours of regular lecturer courses.

The following information provides the components of the EESP curriculum.

General Education

The general education consists of 7 courses (total 14 credit hours). The general educations are listed in Table 5.6 General Education Component below. These fourteen credit hours satisfy all the requirements of the Universitas Hasanuddingeneral education curriculum, which is design to accomplish the goals of Universitas Hasanuddinas defined by its mission statements.

Mathematics and Basic Science

The mathematics and basic science consist of 34 (thirty-four) credit hours. It divides to 18 (eighteen) credit hours of mathematics as shown in the Table 5.7 and 16 (sixteen) credit hours of basic science as shown in The Table 5.8.

Engineering Topics

The engineering topics component divides to 69 (minimum) credit hours of lecture course as shown in the Table 5.9 and 28 credit hours of no lecture course as shown in the Table 5.10.

The major design experience that prepares students for engineering prac-

Table 5.7: Mathematics Component.

Code	General Education	Credit	Course (%)	Lab (%)	Other (%)
016U0033	Basic Mathematics 1	3	100		
017U0033	Basic Mathematics 2	3	100		
201D4113	Advanced Mathematics 1	3	100		
210D4123	Advanced Mathematics 1	3	100		
211D4122	Linear Systems	2	100		
302D4112	Probability and Statistics	2	100		
342D4122	Numerical Methods	2	100		

Table 5.8: Basic Science Component.

Code	General Education	Credit	Course (%)	Lab (%)	Other (%)
020U0033	Basic Physics 1	3	75	25	
022U0033	Basic Physics 2	3	75	25	
206D4112	Advanced Physics	2	100		
104D4112	Advanced Chemistry	2	100		
205D4112	Electric Material Physics	2	100		
304D4112	Electromagnetics	2	100		
344D4122	Environmental Science	2	100		

tice.

In the EESP curriculum, there are some courses credits allocated to give students experience in project design. In the first semester, students take the Engineering Drawing course (103D4112), in which the students learn how to use CAD (Computer-Aided Design) software to design for example electric and electronic circuits.

In Digital Systems course (106D4122) and Digital Systems Lab (109D4121), the students learn to design logic circuits using a CAD Software Tools. In the last lab meeting, the students are divided into several groups and given a design project with any specifications. The students will then solve the problem given in the project, design digital circuit, implement it on a programmable logic device (in this case, we use Field Programmable Gate Array or FPGA device), and then test their functional and performance behaviours.

In Integrated Electronics Course (214D4122) and Integrated Electronics Lab (218D4121), the EESP students will learn how to design integrated circuits using educational CAD tools. The students learn how to design layout topographies of NMOS and PMOS transistors and CMOS logic circuits, simulate the circuit behaviours and analyse their performance.

In the Microprocessor Systems and Interfaces course (205D4121) and Microprocessor Systems and Interfaces Lab (205D4121), the students learn design techniques to implement a simple microcontroller-based project. The students learn Assembly and C/C++ Programming language and use them to interface the microcontroller with

some I/O units such as sensors and actuators through standard interfaces.

The EESP cooperative education to satisfy curricular requirements

The EESP allows students to gather experience in industries and in society by taking the Practical (On Job) Training course (401D4112) and the Student Community Service course (491D4124) proposed in the last semester.

In the Practical (On Job) Training course, the students will work part-time in industries. Two supervisors are assigned to assess the students work, one from industry and one from the EESP faculty member. The student make a report and presents his/her work in a small meeting with his/her supervisor. Both supervisors give then the grade of the student work according the student performance in industry.

In the Student Community Service course, a groups of students from the EESP and other disciplines will work and learn in a village. A few groups could be sent to rural areas. In the village, the students will analyse any problem in the society and then they will try to find the solution. Student supervisors, normally faculty staff from university, are assigned to assess the student work and will evaluate them and give a grade according to student performance.

Final Examination and Scientific Writing

In the 7th semester, the EESP students take the course of Research Methods and Scientific Writing (402D4112). In first 8 course meetings, the students learn research methodology, and then in the second 8 course meetings, students learn to write a scientific article. This scientific article is also presented in the Final examination in the last semester.

Table 5.9: Lecture Courses.

Code	General Education	Credit	Course (%)	Lab (%)	Other (%)
101D4113	Electric Circuit 1	3	100		
102D4112	Logic Circuits	2	100		
103D4112	Engineering Drawing	2	100		
121D4123	Electric Circuit 2	3	100		
106D4122	Digital Systems	2	100		
107D4122	Computer Programming	2	50	50	
101D4121	Electric Circuit Laboratory	2		100	
109D4121	Digital Systems Laboratory	1		100	
202D4112	Basic Electrical Power (Systems)	2	100		
203D4112	Basic Telecommunication (Systems)	2	100		
233D4102	Basic Electronics	2	100		
207D4111	Basic Electric Power Laboratory	1		100	
208D4111	Basic Telecommunication Laboratory	1		100	
209D4112	Basic Electronics Laboratory	1		100	
212D4122	Electric Machines	2	100		
213D4122	Basic Multimedia	2	100		
214D4122	Integrated Electronics	2	100		
205D4121	Microprocessor Systems and Interfaces	2	100		
246D4102	Basic Control Systems	2	100		
217D4122	Electrical Installation Laboratory	2	75	25	
218D4121	Integrated Electronics Laboratory	1		100	
205D4121	Microprocessor Systems and Interface Laboratory	1		100	
301D4112	Engineering Economics	2	100		
303D4112	Electric Measurements	2	100		
343D4122	Energy Conversion	2	100		
345D4122	Management and Entrepreneurship	2	100		
402D4112	Research Methods and Scientific Writing	2	100		
	Selected Elective Course (2 package)	18			

TABLE 5.10: NON-LECTURE COURSES.

Code	General Education	Credit	Course (%)	Lab (%)	Other (%)
401D4112	Practical (On Job) Training	2			100
491D4124	Student Community Service Programs	4			100
	Laboratory 1	2	100		100
	Laboratory 2	3	100		100
403D4112	Final Project Proposal	2			100
492D4122	Final Project Results	2			100
493D4122	Final project Report	2			100

CRITERION 6

FACULTY

6.1 Faculty Qualifications

The EESP faculty member consists of 31 core members, 5 of them are professors. The faculties come from a wide variety of graduated domestic and overseas institutions. They are dedicated persons who have competence and expertise that support the achievement of learning in EESP. Their expertise includes Telecommunications and Information Engineering, Electric Power Engineering, and Computer, Control and Electronic Engineering.

In Telecommunication and Information Engineering, the EESP has 9 faculties. They have many years of experience in design and planning of telecommunication system related to wireless, satellite, fiber optic, antenna, traffic engineering, and switching. In Electric Power Engineering, the EESP has 17 faculty members. They have expertise in Stability, Control and Power System Protection, Power Electronics, High Voltage and Isolation, Distribution of Power Systems and Electrical Installations, Power Systems and Electricity, Electricity Infrastructure. In Computer, Control and Electronic Engineering, the EESP has 5 faculty, excluding a visiting lecture from Germany. The name of Faculty Core Members is presented in Table 6-4.

Most of the faculty conduct highly research activities and manage the research groups in their each field of expertise. They are also very active in writing some articles for some conferences and reputable international journals.

6.2 Faculty Workload

The EESP full-time faculty members requires to fulfil 12-16 credits hours in each semester which covering the area of teaching, research, community service, and others. Teaching and research typically accounts for minimum 9 credits hours of workload, where teaching for minimum 6 credit hours. The teaching activities include thesis supervisor, examiner for proposal seminar and final year report, and academic advisor. The faculty members engage in minimum 3 hours of community service and other activities. Table 6-2 presents the Faculty Workload Summary and describes this information in terms of workload expectations or requirements.

6.3 Faculty Size

The faculty members are sufficient to cover all of the courses both required engineering courses and elective courses, with at least two faculty members competent of teaching the courses. All of the courses are presented at once a year, and some of the elective courses are offered for every semester.

Interactions with students: Several ways are conducted to interact between faculty and students. The faculty interacts closely with the students by face-to-face meeting in classroom or meeting in the faculty room. Interaction can also be done through online media such as e-mail, Learning Management System (LMS), social media, and special social media application groups. The interactions are usually done in relation to the assignment of the course, faculty as academic advisor, as a supervisor: undergraduate research and field study, student activities i.e. robotic contest.

University service activities: The service activities carried out by the faculty are extensive, both on campus and off campus. Some faculty members become members of the university division. Also some faculty members participate in various committees for university or faculty activities, participate in coaching student activities such as robot contests, student creativity programs, and others. In addition, participation is also conducted outside the campus to serve the community. Community service in the form of: Procurement and counselling on how to obtain clean water for people in areas that are difficult to get clean water. Engaged in electricity-saving education programs and the use of solar panels for locations that have not installed electricity services by the government.

Professional development: Professional development for faculty members is regularly carried out. A faculty is required to take apart in the course design and pedagogical techniques training such as Instructional Technique for Basic Skills Improvement Training and Applied Approach Training. Some of the trainings are also attended by faculty members such as training on: the research proposal preparation, the strategy to penetrate international scientific journal publications, and the research output utilization with potential for patents. In addition to professional developments, the faculty members also build effective network with others lecturer in both domestic and abroad through post graduated program in foreign universities, national and international conferences, the program of scheme for academic mobility and exchange (SAME) in foreign universities.

Interactions with industrial and professional practitioners including employers of students: Some of the faculty members are actively involved in solving industrial problems, and conducting collaborative research such as with electric utility and cement companies. The EESP is regularly invited representatives from industry as guest lecturers in undergraduate classes to give public lectures to broaden the students understanding of current industrial context.

6.4 Professional Development

The summary of professional development activities for each faculty member is presented Table 6.3.

6.5 Authority and Responsibility of Faculty

Faculty members at the EESP have responsibility related to academic program in electrical engineering which is approved by faculty. Besides semester evaluation, every five years, faculty members evaluate/ review the implementation of academic program as a whole including such us program goals, curriculum, student ratings, and equipment resources. The review is intended to know the implementation level of the academic program so it can be used as a reference in designing the next academic program. If there are big changes such as deleting or adding new course, then it is proposed to department and forwarded to faculty for final approval. Faculty members have authority for course modifications.

CRITERION 7

FACILITIES

7.1 Administrative Office

In the administrative office of the Electrical Engineering (EE) Department there is rooms for the EE Department Chair, also in charge of the EESP Chair, and Secretary, as well as rooms for EE Master Program Chair, EE PhD Program Chair, and a department meeting room. The EESP Chair's and Secretary offices have a conference table and chairs, phones, printers, bookshelf or cabinet and computer with internet access.

In the front side of the administrative staff, there are administrative staff rooms and head of administration staff (See Figure 7.1). The EESP administrative office is equipped with phones, printers, computers with internet access, and office supplies. In addition, the EE Department has tablet and laptop computers, projectors and wireless audio/speaker amplifier available for use by faculty and students.

(a) Front/Entrance View (b) Indoor administrative staff room

Figure 7.1: Administrative Office

7.2 Classrooms

Most of the EESP basic courses are taught in the Classroom Building. The building and its indoor views are shown in Figure 7.2. All the classrooms are equipped with a white board, chairs and markers. Internet can be accessed in the majority of rooms

in the Classroom building. Projectors are also available in a equipment room on the ground floor.

(a) Outdoor side view

(b) Entrance

(c) Indoor View

(d) Classroom Indoor view

FIGURE 7.2: CLASSROOM BUILDING.

7.3 Lecture Theaters

7.4 Library and Computer Rooms

7.5 Laboratories

The laboratory facilities and equipment in the EE Department support the EESP to meet its program educational objectives. Rooms are provided in the laboratories for each faculty member. The rooms are equipped with tables, chairs, phones, storage bookshelves and/or cabinets with internet access. Teaching assistants share office spaces in the laboratories, which are also equipped with phones, and internet access. In the EE Department, there are XXXX laboratories, where XXX research groups are deployed in the laboratories.

(a) Lecture Theatres 1

(b) Lecture Theatre 2

(c) Lecture Theatre 3

(d) Lecture Theatre 4

FIGURE 7.3: LECTURE THEATRE

(a) Front View

(b) Back View

FIGURE 7.4: LIBRARY

(a) Front View

(b) Back View

FIGURE 7.5: COMPUTER ROOM

7.5.1 Electronics and Devices Laboratory

The Electronics and Devices Laboratory houses equipment, electronic development kits and to support analog and digital circuit design. In the Electronics and Devices Laboratory, there some electronic equipment such as analog, digital and mixed-signal oscilloscopes, function generators, multimeters, power supplies, electronic circuit boards, electronic breadboards, active and passive electronic components as well as PCB manufacture equipment set, which are utilized to complete laboratory assignments. All the facilities in the Electronics and Devices Laboratory are used for the following BE assessment courses.

- 233D4102–Basic Electronics
- 209D4112–Basic Electronics Laboratory
- 106D4122–Digital Systems
- 109D4121–Digital Systems Laboratory
- 214D4122–Integrated Electronics
- 218D4121–Integrated Electronics Laboratory
- 335D4113–Digital Systems Design
- 380D4123–Embedded Systems Design

In the Electronics and Devices Laboratory, there are also some software tools used to support teaching methodology and to improve student's capabilities to comprehend the teaching materials. The available software tools and development kits in the Electronics and Devices Laboratory, their functionality and related courses that use them are summarized in Table 7.1.

Table 7.1: Software Tools and Development Kits available in the Electronics and Devices Laboratory

No.	Software tools / Development kits	Function	Course Related
1	Altera Quartus II software & Altera FPGA development kits	for rapid prototyping of digital circuits on FPGA devices	106D4122–Digital Systems, 335D4113–Digital Systems Design, 380D4123–Embedded Systems Design
2	MentorGraphics Modelsim	for digital circuit simulation based on HDL (VHDL/SystemVerilog) circuit modeling	106D4122–Digital Systems, 335D4113–Digital Systems Design, 380D4123–Embedded Systems Design
3	Altium Designer	for circuit schematic and layout design of PCB manufacture	209D4112–Basic Electronics Laboratory
4	OrCAD PSpice	for electric and electronic circuit simulation	233D4102–Basic Electronics, 209D4112–Basic Electronics Laboratory
5	Microwind and DSch CAD software	for integrated circuit topography design	214D4122–Integrated Electronics, 218D4121–Integrated Electronics Laboratory

Electronic circuit boards, electronic breadboards, active and passive electronic components and devices are used in 209D4112–Basic Electronics Laboratory course. In the course, the students are divided into some groups to analyze some simple electronic

circuit in practice. The students in 209D4112 are given a final project to design and implement a simple example of electronic circuit applications such as audio/speaker amplifier, LED driver and/or USB voltage regulator. The students use PSpice Software for circuit modeling and simulation and use Altium Designer to design the printed circuit board (PCB) of the electronic circuit.

Altera FPGA (Field Programmable Gate Array) Kits together with the Altera Quartus II IDE (Integrated Development Environment) software are used in 106D4122–Digital Systems, 335D4113–Digital Systems Design, 380D4123–Embedded Systems Design courses. The students use Modelsim software for circuit design and simulation of digital circuits in the 335D4113–Digital Systems Design and 380D4123–Embedded Systems Design courses. The analog/digital/mixed-signal oscilloscopes are used to test the circuit performance or circuit behaviors of the designed digital circuit.

The Microwind and DSch CAD software are used in the 214D4122–Integrated Electronics, 218D4121–Integrated Electronics Laboratory courses. The students design integrated circuit topology and do physical-level simulation of the integrated circuit using Microwind CAD, and do gate-level simulation of digital integrated circuits using DSch CAD.

7.5.2 Electric Machines Laboratory

7.5.3 Control Systems and Instrumentation Laboratory

The Control Systems and Instrumentation Laboratory's main hall is divided into 4 (four) laboratory sections, namely: (1) Laboratory Section for Instrumentation Systems, (2) Laboratory Section for Process Control Systems, (3) Laboratory Section for Robotics and (4) Workspace for Laboratory Courses. One corner of the main hall is assigned as a room for undergraduate students who take research and development courses for their final projects. At the other corner accross the hall are small rooms for professors' and technician's offices, a meeting room, a room for graduate students and a storage room for laboratory equipment.

For the undergraduate teaching and learning process, our laboratory provides supporting facilities for the research and development activities related to the students' undergraduate final projects and also - more importantly - supports the delivery of the following courses:

- 375D4103–Electronic Instrumentation Systems
- 330D4112–Process Control Technology
- 329D4113–Control Systems + Laboratory
- 374D4122–Control System Design
- 371D4123–Digital Control Systems + Laboratory
- 331D4112–Industrial Robotics
- XXXD412X–Microprocessor-based Systems

The laboratory's main purpose is to facilitate students to learn how to build mathematical and physical models of several types of control systems. The models help the students to understand, define and formulate the control problems usually found in

the real industrial world. A miniaturized boiler drum plant is available to give insights on a process control system and technology in the real industrial plants with liquid materials, while another miniaturized plant is built as a physical model of industrial processes involving solid materials.

To emphasize the importance of understanding the models of control system's plants, modular sets of a standard servo motor training system and a miniaturized room temperature control system's plants are also available.

Sensors and transducers are essential to enable feedback in automatic control systems. Modular instrumentation training sets are available to give the students hands-on experience with real sensors and transducers and know-how to converts physical quantities into electrical signals, both analog and digital.

The ultimate engineering work in the area of control system studies is to design the controller part. A microcontroller-based universal digital controller module is provided for students to practice with programming control algorithms for control systems.

7.5.4 High Voltage Laboratory

7.5.5 Electrical Installation Laboratory

7.5.6 Power System Laboratory

7.5.7 Basic Electric Laboratory

7.5.8 Relay and Measurement Laboratory

7.5.9 Power Electronics Laboratory

7.5.10 Computer Hardware, Networking and Software Engineering Laboratory

7.5.11 Telematics Laboratory

7.5.12 Antenna and Propagation Laboratory

7.5.13 Telecommunication, Radio, and Microwave Laboratory

7.6 Workshop

CRITERION 8

INSTITUTIONAL SUPPORT

PROGRAM CRITERIA

The EESP evaluates the aforementioned outcomes regularly using two types of student performance assessments, i.e. direct and indirect assessments. In the direct assessments, each student's is evaluated for certain performance criteria. These assessments are part of the grading of student works in the EESP courses. The direct assessment method includes also the student portfolios enrichment.

The indirect measurements are done through surveys. Upon completing their course, students are asked to take the surveys through the EESP and UNHAS webpages. Graduating students are also asked to take the senior exit survey which is a self-assessments for the student's outcomes. The indirect assessments are also made through Alumni and Employers Surveys.

Both the direct and indirect assessment methods have been described in Criterion 4 (Continuous Improvement), and is illustrated in Figure 8.1. The EESP collects data from the assessment methods and use them to evaluate the expected and the measured (real) student outcomes. The improvements are then made according to the evaluation results. The improvement actions can be made using the following:

1. Improve the quality of course materials
2. Invite international visiting lecturers
3. Organize staff's professional development and/or
4. Reform the curriculum structure

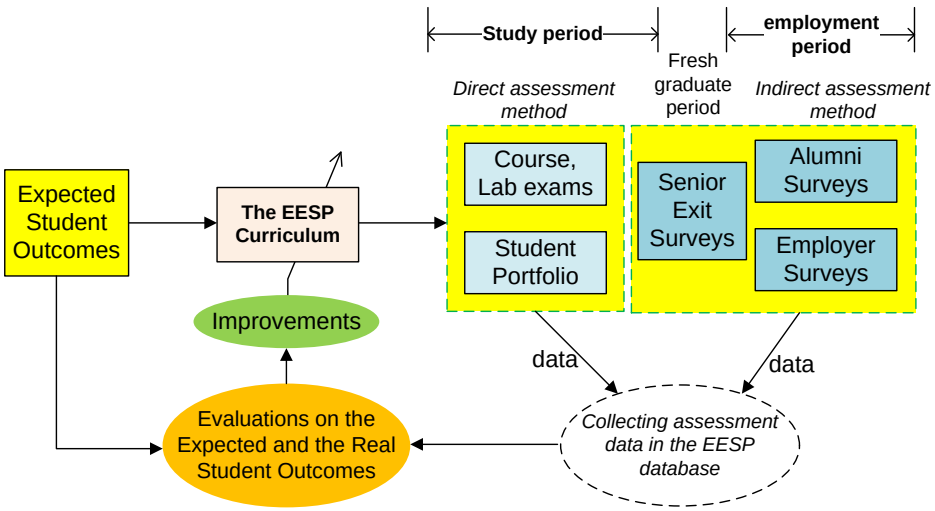

FIGURE 8.1: CONTINUOUS IMPROVEMENT DIAGRAM.

APPENDIX A

COURSE SYLLABI

Contents

A.1 Electric Circuit 1

1. Course number: 101D4113
   Course name: Electric Circuit 1
2. Credits: 3
   Contact hours: 42 hours
3. Instructors:
   (a) Zaenab Muslimin
   (b) Sri Mawar Said
   (c) Hasniaty A.
4. Text book, title, author, publisher and year:
   (a) Introductory Circuit Analysis, 12th edition, Robert L. Boylestad, Publisher: Prentice Hall, Pearson Education International, 2014.
   (b) Principles of Electrical Circuits Electron Flow Version, Thomas L. Floyd, 6th edition, Publisher: Prentice Hall, Pearson Education International, 2003.
5. Specific course information:
   (a) This course discusses about Basic understanding of electrical circuits, Series-Parallel Network, Source Conversions, Methods of Analysis, Circuit of Equation, Complex Numbers, Sinusoidal Alternating Waveforms, Phasor and Resonance
   (b) Pre-requisite: Calculus I, Calculus II, Basic Physics I, Basic Physics II
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will able to understand the basic understanding of DC electric power circuits and the basic law of electricity
   (b) The student will able to analyse series and parallel circuits
   (c) The student will able to analyse circuits with one source or two sources and are able to convert voltage sources into current sources and vice versa
   (d) The student will able to understand the notion of AC electricity and are able to apply complex numbers to basic analysis of AC electrical circuits
   (e) The student will able to understand the meaning of phasor and are able to analyse resonance circuits
7. Brief list of topics to be covered:
   (a) Basic understanding of electrical circuits
   (b) Series-Parallel Network
   (c) Source Conversions
   (d) Methods of Analysis
   (e) Circuit of Equation
   (f) Complex Numbers
   (g) Sinusoidal Alternating Waveforms
   (h) Phasor
   (i) Resonance

A.2 Logic Circuits

1. Course number: 102D4112
   Course name: Logic Circuits
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Andani Achmad
   (b) Faizal Arya Samman
   (c) Ida Rachmaniar Sahali
   (d) Andini Dani Achmad
4. Text book, title, author, publisher and year:
   (a) Digital System Principle and Application, W. Tocci, Publisher: Prentice Hall International Edition, 1995.
   (b) Digital Principles and Application, Leach Malvino, Publisher: McGraw Hill, 1990.
   (c) Switching Theory and Logical, F.J. Hill, G.R. Paterson, Publisher: John Willy & Sons, 1981.
   (d) Digital Engineering Design, Richard F. Tinder, Publisher: Prentice Hall International Edition, 1991.
5. Specific course information:
   (a) This course discusses about Boolean Algebra, de Morgan Theory, Binary Codes, Basic Logic Gates, Simplification of Circuits, Designing Combinational Digital Circuits
   (b) Pre-requisites: N/A
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will able to understand about Binary Codes
   (b) The student will able to understand about Boolean Algebra and de Morgan Theory
   (c) The student will able to design simple logic circuit
   (d) The student will able to understand working principle of several combination circuits
7. Brief list of topics to be covered:
   (a) Introduction: Logic Circuits and Digital Systems
   (b) Digital Number System
   (c) Logic Gates
   (d) Boolean Algebra
   (e) Simplification of Boolean
   (f) Combinational Circuit

A.3 Electric Circuit 2

1. Course number: 121D4123
   Course name: Electric Circuit 2
2. Credits: 3
   Contact hours: 42 hours
3. Instructors:
   (a) Sri Mawar Said
   (b) Zaenab Muslimin
   (c) Hasniaty A.
4. Text book, title, author, publisher and year:
   (a) Introductory Circuit Analysis, Robert L. Boylestad, 12th Edition, Publisher: Prentice Hall, Pearson Education International, 2014.
   (b) Principles of Electrical Circuits Electron Flow Version, Thomas L. Floyd, 6th Edition, Publisher: Prentice Hall, Pearson Education International, 2003.
5. Specific course information:
   (a) This course discusses about real and reactive power of an electrical circuit, Thevenin's and Norton's theorem, analysis transient in electrical circuit using differential equation, using transformation Laplace, and three phase circuits
   (b) Pre-requisites: Calculus I, Calculus II, Basic Physics I, Basic Physics II, Electric Circuit I
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will able to calculate real and reactive power of an electrical circuit
   (b) The student will able to using Thevenin's and Norton's theorem of an electrical circuit
   (c) The student will able to analyse transient in electrical circuit using differential equation, and using transformation Laplace
   (d) The student will able to use three phase circuits
7. Brief list of topics to be covered:
   (a) Real and reactive power
   (b) Thevenin's and Norton's theorem
   (c) Analyse transient
   (d) Three phase circuits

A.4 Advanced Mathematics 1

1. Course number: 201D4113
   Course name: Advanced Mathematics 1
2. Credits: 3
   Contact hours: 42 hours
3. Instructors:
   (a) Ingrid Nurtanio
   (b) Intan Sari Areni
   (c) Dewiani Djamaluddin
   (d) Andini Dani Achmad
4. Text books, title, author, publisher and year:
   (a) Advanced Engineering Mathematics, 10th edition, Kreyszig Erwin, Publisher: John Wiley & Sons, Inc, 2011.
   (b) Matematika Teknik, 5th edition, K.A. Stroud, Publisher: Erlangga, 2004.
5. Specific course information:
   (a) This course discusses about Differential Equations (1st, 2nd and higher order), Phasa Plane, Laplace Transformation, Vector and Vector Algebra, Matrix, and Linear Equation
   (b) Pre-requisite: Calculus I, Calculus II
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to understand and apply the theory of ordinary differential equations, differential equation systems, Laplace transforms, matrices, linear systems, vector differential calculus, eigenvalue problems, integral vector calculus
   (b) The student will be able to use mathematics as a basis for analysing, formulating and solving problems in the electrical engineering field
7. Brief list of topics to be covered:
   (a) First Order Differential Equations
   (b) Second Order Differential Equations
   (c) Higher Order Differential Equations
   (d) Differential Equation System–Phase Plane
   (e) Laplace Transforms
   (f) Matrices, Linear Systems
   (g) Eigenvalue problems
   (h) Vector Differential Calculus
   (i) Vector Integral Calculus

A.5 Basic Electrical Power

1. Course number: 202D4112
   Course name: Basic Electrical Power
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Sri Mawar Said
4. Text books, title, author, publisher and year:
   (a) Introduction to Electrical Power Systems, Mohamed E. El-Hawary, Pubisher: IEEE Press, 2008.
   (b) Dasar Teknik Tenaga Listrik dan Elektronika Daya, Zuhal, Publisher: PT Gramedia, 2000.
5. Specific course information:
   (a) This courses material discusses about the principles and basics of electrical power system in general including basic theory of electric energy system, structure of power systems, power generation, transformer, transmission, distribution system, and electricity load/ electricity energy consumption
   (b) Pre-requisite: -
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will understand the basic theory of electric energy system and structure of power systems
   (b) The student will be able to distinguish the principle process of electricity generation from thermal power plants and power plants based renewable energy (RE)
   (c) The student will understand the working principle of transformer and its connection
   (d) The student will understand the importance of transmission network, line parameters, transmission voltages and line models
   (e) The student will understand the purpose of distribution system, distribution network, distribution equipments and protection system
   (f) The student will understand the working principle and characteristics of electric machines (DC and AC generators; and DC and AC motors)
   (g) The student will understand types of electricity loads, characteristics, and load drivers
   (h) The student will be able to calculate electricity energy consumption
   (i) The student will understand the general theory/ basic concept and working principle of the components in an electric power system
7. Brief list of topics to be covered:
   (a) Introduction: basic theory for electric energy system, components of a power system
   (b) Power generation: working principles of electricity generation (thermal power plants and electricity production based renewable energy sources)
   (c) Transformer: principle of transformer operation, transformer connections
   (d) Electric power transmission: purpose of transmission network, standard transmission voltages, line parameters, transmission line models

(e) Electric distribution system: purpose of distribution system, distribution network, distribution systems (overhead and underground), distribution equipments, distribution system protection

(f) Generator: types of generators, working principles and characteristics of DC and AC generators

(g) Electric motor: types of motors, working principle and characteristics of DC and AC motors

(h) Electrical load: types of electrical loads (residential, commercial, industrial), load characteristics, load drivers, electricity energy usage

A.6 Basic Electronics

1. Course number: 233D4102
   Course name: Basic Electronics
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Andani Achmad
   (b) Faizal Arya Samman
   (c) Wardi Djuaeni
   (d) Andi Ejah Umraeni Salam
   (e) Muhammad Anshar
4. Text books, title, author, publisher and year:
   (a) Electronic Devices and Circuit Theory, 11th edition, Robert C. Boylestad, Publisher: Pearson Education, 2013.
   (b) Principles of Electronics, 8th edition, Albert Paul Malvino, David Bates, Publisher: McGraw-Hill Education, 2016.
   (c) Microelectronic Circuit Design, 4th edition, Richard C. Jaeger, Travis N. Blalock, Publisher: McGraw-Hill, 2011.
5. Specific course information:
   (a) The course material discusses about the characteristics of electronic devices such as diode, bipolar junction transistor (BJT) and field effect transistor (FET), as well as their applications in basic electronic circuits
   (b) Pre-requisite: Electric Circuit 1, Electric Circuit 2
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to explain the use of electronic circuits in many embedded and consumer electronic applications
   (b) The student will be able to explain the voltage-current characteristics of diode, bipolar junction transistor (BJT) and field effect transistor (FET), especially metal-oxide silicon field effect transistor (MOSFET)
   (c) The student will be able to explain the basic applications of diode such in rectifier, clamping and clipping circuits
   (d) The student will be able to analyses a simple electronic circuit with a DC bias voltage configuration, such fixed-bias, collector feedback bias, voltage-divider bias, etc.
   (e) The student outcomes listed in 3 are addressed by the course
7. Brief list of topics to be covered:
   (a) Electronic devices overviews: diode (PN junction, zener, schottky, LED, photodiode), bipolar junction transistor (BJT) and field effect transistor (FET), especially metal oxide silicon FET or MOSFET
   (b) Diode characteristics and applications in rectifier, clipping and clamping circuits
   (c) BJT's VI characteristics: NPN and PNP types

(d) BJT circuit biasing techniques: DC load curves, DC operating points

(e) MOSFET's VI characteristics: N-channel MOS (NMOS) and P-channel MOS (PMOS)

(f) MOSFET circuit DC biasing techniques: DC load curves, DC operating points

(g) BJT small signal operation: AC and DC signal analysis

(h) BJT applications in power amplifier: class A, class B, class AB and class C power amplifier

(i) BJT applications in simple voltage regulator: shunt regulator, series regulator

(j) Operational amplifier (Op-Amp): basic model and its applications as integrators, inverting and non-inverting amplifier, filter, etc.

(k) Transistors in digital domain: resistor-transistor logic (RTL) and transistor-transistor logic (TTL)

A.7 Basic Electronics Laboratory

1. Course number: 209D4112
   Course name: Basic Electronics Laboratory
2. Credits: 1
   Contact hours: 14 hours
3. Instructors:
   (a) Andani Achmad
   (b) Faizal Arya Samman
   (c) Wardi Djuaeni
   (d) Andi Ejah Umraeni Salam
   (e) Muhammad Anshar
4. Text books, title, author, publisher and year:
   (a) Electronic Devices and Circuit Theory, 11th edition, Robert C. Boylestad, Publisher: Pearson Education, 2013.
   (b) Principles of Electronics, 8th edition, Albert Paul Malvino, David Bates, Publisher: McGraw-Hill Education, 2016.
   (c) Microelectronic Circuit Design, 4th edition, Richard C. Jaeger, Travis N. Blalock, Publisher: McGraw-Hill, 2011.
   (d) SPICE for Power Electronics and Electric Power, 2nd edition, Muhammad H. Rashid, Hasan M. Rashid, Publisher: CRC Taylor & Francis, 2006.
5. Specific course information:
   (a) The course material contains some lab works on how to use measurement instrumentation such as oscilloscope, multi tester, function generator, etc. and how to analyse in practice some basic electronic circuit.
   (b) Pre-requisite: Electric Circuit 1, Electric Circuit 2
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to use instrumentations to measure electric or electronic signals
   (b) The student will be able to design and analyse in practice some basic electronic circuits using electronic devices such as diode, transistor (BJT)
   (c) The student will be able to explain the role of the electronic device in the practised circuit
7. Brief list of topics to be covered:
   (a) The calibration of measurement instrumentations
   (b) The use of measurement instrumentations to measure electronic signals in a basic electronic circuit
   (c) Diode application in rectifier, clamping and clipping circuits
   (d) BJT transistor biasing technique
   (e) Transistor application in a simple power amplification circuit
   (f) Transistor application in a simple DC regulator circuit
   (g) Transistor application as an electronic switch
   (h) Transistor application in digital regime: Resistor-Transistor Logic, Transistor-Transistor Logic (TTL)

A.8 Basic Telecommunication

1. Course number: 203D4112
   Course name: Basic Telecommunication
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Dewiani Djamaluddin
   (b) Wardi Djuaeni
   (c) Andini Dani Achmad
4. Text book, title, author, publisher and year:
   (a) Electronic Communication, Dennis Roddy, John Coolen, Translated by: Kamal Idris,IR, Publisher: Erlangga,1990.
   (b) Electronic Communication, Rodden, Publisher: Prentice Hall, 1985.
   (c) Martin, Telecommunication and Computer.
   (d) Data Network Concept,Theory and Practice, Uyless Black, Publisher: PHI, 1989.
   (e) Sistem Telekomunikasi, PH Smale, Translated by: Chris Timotius, Publisher: Erlangga, 1995.
   (f) Fundamentals of Telecommunications, Roger L. Freeman, Publisher: John Wiley & Sons, Inc, New York, 1999.
   (g) Telecommunications and Networks, K.M. Hussain D.S. Hussan, Publisher: Butterworth-Heinemann, Oxford, 1997.
5. Specific course information:
   (a) The course material discusses about recognize the principles and basics of telecommunication system in general including signals, frequency spectrum, modulation and demodulation systems, quality system, types of telecommunication system, and future telecommunication technology
   (b) Prerequisite: -
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will understand the basic concept of telecommunication
   (b) The student will understand the classification of transmission media of telecommunication and kinds of the transmission media
   (c) The student will understand types of topology telecommunication network
   (d) The student will understand frequency spectrum, antenna working principle, and types of radio propagation
   (e) The student will understand analogue modulation and demodulation techniques
   (f) The student will be able to calculate the quality of telecommunication system
   (g) The student will understand working principle several kinds of system telecommunication
   (h) The student will understand the basic concept of data communication
   (i) The student will understand the future technology of telecommunication
   (j) The student outcomes listed in 3 or any other outcomes are addressed by the course

7. Brief list of topics to be covered:
   (a) Basic Concepts of Telecommunication
   (b) Telecommunication Transmission Media
   (c) Topology Telecommunication Network
   (d) Antenna and Radio Wave Propagation
   (e) Analogue Modulation and Demodulation
   (f) Decibels Concept
   (g) Introduction of Quality Telecommunication System
   (h) Introduction of Cable Network Telecommunication System
   (i) Introduction of Optic Telecommunication System
   (j) Introduction of Radio Telecommunication System
   (k) Introduction of Satellite System
   (l) Basic Concepts of Data Communication and Network Classification
   (m) Future Technology of Telecommunication

A.9 Electric Circuit Laboratory

1. Course number: 101D4121
   Course name: Electric Circuit Laboratory
2. Credits: 1
   Contact hours: 14 hours
3. Instructors:
   (a) Zaenab Muslimin
   (b) Sri Mawar Said
   (c) Hasniaty A.
4. Text book, title, author, publisher, and year:
   (a) Introductory Circuit Analysis, Robert L. Boylestad, 12th edition, Publisher: Prentice Hall, Pearson Education International, 2014.
   (b) Principles of Electrical Circuits Electron Flow Version, Thomas L. Floyd, 6th edition, Publisher: Prentice Hall, Pearson Education International, 2003.
5. Specific course information:
   (a) This course discusses about Electricity Basic Law Laboratory, Laboratory Superposition Theorem, Thevenin-Northon Theorem Laboratory, Star – Delta Equivalent Laboratory
   (b) Pre-requisites: Electric Circuit 1
   (c) Course type: Required course
6. Specific goals for the course:
   (a) The student will able to apply the basic laws of electricity
   (b) The student will able to apply the superposition theorem
   (c) The student will able to apply Thevenin-Northon theorem
   (d) The student will able to apply a series of equivalent stars-Delta
7. Brief list of topics to be covered:
   (a) Electricity Basic Law Laboratory
   (b) Superposition Theorem Laboratory
   (c) Thevenin-Northon Theorem Laboratory
   (d) Star-Delta Equivalent Laboratory

A.10 Advanced Physics

1. Course number: 206D4112
   Course name: Advanced Physics

2. Credits: 2
   Contact hours: 27 hours

3. (a) Indar Chaerah Gunadin

4. Text book, title, author, publisher and year:

   (a) Konsep Fisika Modern (Translated by The Houw Liong), Arthur Beiser, Publisher: Erlangga, 1981.

   (b) Modern Physics, Serway, Moses dan Moyer. Publisher: Saunders College Publishing, 1997.

   (c) Modern Physics from α to Z, William J. Rohlf, Publisher: John Wiley & Sons Inc., 1994.

5. Specific course information:

   (a) This course discusses about the field of physics specifically in themes related to modern physics

   (b) Pre-requisite: N/A

   (c) Course type: Required (R)

6. Specific goals for the course:

   (a) The student will able to understand the basic theory of relativity. Relativity includes special relativity, the principle of light-propagating relativity, experimentation Michelson-Morley, special relativity postulate, the consequences of special relativity: dilated time, long contractions, twin paradoxes; Galileo Galilei's transformation, Lorentz transformation, relativistic momentum, relativistic energy, mass as a measure energy, the law of conservation of relativistic, mass and energy

   (b) The student will able to distinguish the Quantum theory from light includes Hertz experiments, black body radiation, Rayleigh & Jeans lawand Planck's law, quantization of light and photoelectric effects, Compton effects and x-rays, wave complement - particles

   (c) The student will able to understand the atomic model includes atoms as constituent matter, the composition of atoms (the price of elementary charge) the atomic model of Rutherford, atoms Bohr (spectral line, Bohr quantum model of atoms), correspondence principle, experiment Frank Hertz

   (d) The student will able to understand the wave of material includes the de Broglie postulate and explanation de Broglie about quantization in the Bohr model, the Davisson-Germer experiment, group wave and dispersion, Heisenberg's uncertainty principle, material wave function, duality of electron diffraction particle wave descriptions in function terminology wave of matter

   (e) The student will able to understand the atomic structure includes magnetic orbitals and Zeeman effects normal, electron spin, spin orbit interaction and other magnetic effects, symmetry exchange and the exclusion principle, periodic table, x-ray spectrum and Moseley's law

   (f) The student will able to understand the Structure of molecules include bonding mechanisms (ionic, covalent, Hewidinger, Van der Waals), molecular and vibration rotation, molecular spectrum

   (g) The student will able to understand about the solid substances include: bonds in substances solid, classical free electron models, Ohm's Law, energy band theory, and devices semiconductor

(h) The student will able to understand the core structure includes: mass and charge, structure and core size core stability, core spin and magnetic moment, bond energy and core force, core model radioactivity, decay processes (alpha, beta, and gamma), natural radioactivity

(i) The student will able to understand the applications of core physics include: core reactions, cross-sectional reactions, nuclear fission, reactors nuclear, nuclear fusion, particle interaction with matter, and radiation detector

7. Brief list of topics to be covered:

(a) Explanation of descriptions and syllabi, special relativity, the principle of relativity, Michelson-Morley experiment, special relativity postulate the consequences of special relativity

(b) Galileo Galilei's transformation, Lorentz transformation, momentum relativistic, relativistic energy, mass as a measure of energy, law eternity: relativistic, mass, and energy momentum. Transformer: Principle of transformer operation, transformer connections

(c) Quantum Theory of light

(d) Atomic model: atom as the constituent of matter, atomic model Thompson, Rutherford's atomic model, atomic spectrum

(e) Bohr florets model of atoms, correspondence principle, experiment Frank–Hertz

(f) The nature of the wave from the material

(g) Magnetic orbitals and normal Zeeman effect, electron spin, spin orbit interactions and other magnetic effects

(h) Symmetry exchange and the exclusion principle, table periodic, spectrum light x and Moseley's law

(i) Molecular structure: the mechanism of bonding atoms in molecules, levels molecular rotational energy level

(j) Level of molecular vibrational energy level, molecular spectrum

(k) Solid substances: bonds in solids, classical free electron models

(l) Core structure: mass and particle loading of the core, structure and core size, core stability, bond energy and core style

(m) Core model, radioactivity, decay process, natural radioactivity

(n) Core physics application: core reaction, cross section reaction, nuclear fission

(o) Nuclear reactors, nuclear fusion, particle interactions with matter, detectors radiation

A.11 Basic Control Systems

1. Course number: 246D4102
   Course name: Basic Control Systems
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Nadjamuddin Harun (Course Coordinator)
   (b) Rhiza Samsoe'oed Sadjad
   (c) Faizal Arya Samman
   (d) Indar Chaerah Gunadin
4. Text books, title, author, publisher and year:
   (a) Basic Control System, Faizal Arya Samman, Publisher: IESTA, 2016.
   (b) Automatic Control Systems, Benjamin C. Kuo, Publisher: Prentice-Hall, 1995.
   (c) Modern Control Engineering, Katsuhiko Ogata, Publisher: Prentice-Hall, 2010.
5. Specific course information:
   (a) The course material discuss about the basic principles of control system engineering analysis including the introduction of control system components
   (b) Pre-requisite: Advanced Mathematics
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to explain the use of control engineering in many industrial applications
   (b) The student will be able to explain an open loop and closed loop control system, and main components of a control systems
   (c) The student will be able to find the transfer function of a closed loop control system and then analysis it stability, its time domain and frequency domain characteristic as well as its root locus characteristic
   (d) The student outcomes listed in 3 are addressed by the course
7. Brief list of topics to be covered:
   (a) Overview of control engineering applications in manufacture industries, process industries, automotive, aircraft, power system generations, etc.
   (b) Mathematical foundations: Laplace Transform, differential equation and its solution using Laplace Transform
   (c) Control system components introductions: sensor, actuators, control unit, signal conditioner
   (d) Transfer functions and block diagrams
   (e) Closed loop transfer function analysis using block diagram algebra, signal flow graphs and Mason gain formulas
   (f) Control system stability analysis based on characteristic equation of a control system using Routh-Hurwitz method
   (g) Time domain analysis: time domain specification, transient response and steady-state response analysis

(h) Frequency domain analysis: Bode plot and Nyquist plot, relative stability analysis based on gain and phase margins presented on the Bode and/or Nyquist curves of a control system

(i) Root locus analysis

A.12 Integrated Electronics

1. Course number: 214D4122
   Course name: Integrated Electronics
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Faizal Arya Samman(Course Coordinator)
   (b) Andreas Vogel
   (c) Andi Ejah Umraeni Salam
4. Text books, title, author, publisher and year:
   (a) CMOS VLSI Design A Circuits and Systems Perspective, Neil H. E. Weste, David M. Harris, Publisher: Addison-Wesley, 2011.
   (b) Principles of Electronics, 8th edition, Albert Paul Malvino, David Bates, Publisher: McGraw-Hill Education, 2016.
   (c) Microelectronic Circuit Design, 4th edition, Richard C. Jaeger, Travis N. Blalock, Publisher: McGraw-Hill, 2011.
5. Specific course information:
   (a) The course material covers the topics about principles techniques to design, simulate and layout integrated circuit using a Computer-Aided Design (CAD) software
   (b) Pre-requisite: Basic Electronics
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to use a CAD software to design, simulate and layout CMOS analogue and digital integrated circuits
   (b) The student will be able to explain CMOS transistor characteristics
   (c) The student will be able to explain CMOS integrated circuit design methodologies
   (d) The student will be able to design CMOS logic circuit
   (e) The student outcomes listed in 3 are addressed by the course
7. Brief list of topics to be covered:
   (a) CMOS design methodologies: Full-custom and Semi-Custom design (Standard-cell technology)
   (b) Integrated circuit design rules
   (c) NMOS and PMOS transistor layout and their characteristics
   (d) Differential amplifier circuit configuration
   (e) Current mirror circuit
   (f) CMOS operational amplifier circuit
   (g) CMOS logic gates
   (h) Stick diagram and CMOS logic circuit
   (i) Digital integrated circuit design using standard-cell design methodology
   (j) Case study: digital adder, multiplier, etc.
   (k) Case study: memory cell design

A.13 Linear Systems

1. Course number: 241D4102
   Course name: Linear Systems
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Rhiza Samsoe'oed Sadjad
4. Text books, title, author, publisher and year:
   (a) Signals and Systems, Oppenheim, Willsky with Young, Schaum Outline Series: DiStefano III, Joseph J., et.al., "Feedback and Control Systems"
5. Specific course information:
   (a) The Catalog description: Understanding of the System, System Linear and Non-linear Systems, Linearization, Character Transfer Modelling, Modelling of Transfer Function, State Space Modelling, Relationship of Transfer Ratio
   (b) Pre-requisite: Basic Control Systems, Basic Mathematics
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to understanding the meaning of the system, input, output, signal, noise, disturbance
   (b) The student will be able to Understand system representations in a diagram block, diagram block algebraic
   (c) The student will be able to understanding memory/ non-memory system, casual and non-casual system, invertible/ non-invertible system systems, time-varying/ time-invariant system, linear and non linear system and examples
   (d) The student will be able to using the linearisation method to change the non-linear system to linear
   (e) The student will be able to understand the importance of system modelling
   (f) The student will be able to model the system in the transfer character model
   (g) The student will be able to model the system in the transfer function modelling using Laplace transforms for the concept of Impedance
   (h) The student will be able to model the system in state space modelling
   (i) The student will be able to explain the relationship of the transfer function modelling to the state space modelling
7. Brief list of topics to be covered:
   (a) Understanding of systems and signals, representing a system as diagram block, as a differential equation and as a difference equation and System Represents
   (b) System Types: Understand about causal and non-causal systems, invertible and non- invertible, time-varying and time invariant, linear and non-linear and capable of linearizing nonlinear systems, linear and nonlinear systems
   (c) Linearization
   (d) Character Transfer Modelling
   (e) Transfer Function Modelling
   (f) State Space Modelling
   (g) Relationship of Transfer Function

A.14 Microprocessor Systems and Interfaces

1. Course number: 205D4121
   Course name: Microprocessor Systems and Interfaces
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Muhammad Anshar(Course Coordinator)
   (b) Zahir Zainuddin
4. Text book, title, author, publisher and year:
   (a) Mazidi, M.A., McKinlay, R.D., Causey, D. and Microcontroller, P.I.C., 2008. Embedded Systems. Pearson, New Jersey.
   (b) Kumar N. S., Saravanan, M., Jeevananthan, S. and Shah, S.K. 2012. Microprocessors and Interfacing 8086, 8051, 8096, and advanced processors. Oxford University Press, India.
5. Specific course information:
   (a) This course discusses about Early Classes in Microprocessor and Microcontroller, Class of MCS-51, Project Oriented-based MCS-51 Programming
   (b) Pre-requisite: Logic Circuits, Digital System
   (c) Co-requisite: Basic Electronics, Basic Control Systems
   (d) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will able to understand and have the ability to differentiate between General Purpose Microprocessor and Microcontroller
   (b) The student will able to develop the programming for a simple project utilizing microcontroller simulator
   (c) The student will able to utilize microcontroller-based SDK, which covers MCS-51, AVR Class, Arduino and Raspberry Pi
   (d) The student will able to apply knowledge of digital components and processors into applied electronic projects
7. Brief list of topics to be covered:
   (a) History of microprocessor and microcontroller
   (b) Development stage and variety of MCS-51 Class
   (c) Features of MCS-51 and Programming approaches, particularly assembly language
   (d) Simple project using MCS-51 Simulator
   (e) Real project circuit, covering the programming, simulation and integration to chip downloading process
   (f) Features of AVR microcontroller class, and SDK utilization
   (g) Simple project demonstration, demonstrating input, output, interfacing with external sensor
   (h) Integration with electronic loads
   (i) Aduino SDK, program development to circuit applications
   (j) Various basic projects implementation
   (k) Introduction to utilization of Raspberry PI
   (l) Integrating OS into Raspberry PI

A.15 Access Network Technology

1. Course number: 322D4113
   Course name: Access Network Technology
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Merna Baharuddin
   (b) Andini Dani Achmad
4. Text book, title, author, publisher and year:
   (a) Local Access Network Technologies, Paul France, Publisher: The Institution of Engineering and Technology, London, United Kingdom, 2004.
   (b) End-to-End DSL Architectures, Wayne C. Vermillion, Publisher: Cisco Press, 2003.
   (c) WCDMA for UMTS, Harri Holma, Antti Toskala, Publisher: John Wiley and Sons, Ltd., 2004.
   (d) Fundamentals of WiMAX: Understanding Broadband Wireless Networking, Jeffrey G. Andrews, Arunabha Ghosh, Rias Muhamed, Publisher: Pearson Education, 2007.
   (e) Ethernet Passive Optical Networks, Glen Kramer, Publisher: The McGraw-Hill Companies, Inc., 2005.
5. Specific course information:
   (a) This course discusses about access network in telecommunication technology which cover multiple access technology and duplexing technology, Digital Subscriber Line technology, UMTS, WCDMA, Wi-MAX, PON, and HFC
   (b) Pre-requisite: Basic Electronics
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will understand the concept of multiple access technology and duplexing technology
   (b) The student will understand the Digital Subscriber Line Technology and its types
   (c) The student will understand UMTS, WCDMA, and Wi-Max Technology
   (d) The student will understand technology of optic telecommunication: PON and HFC
   (e) The student will understand the technology of network telecommunication
7. Brief list of topics to be covered:
   (a) Concept of Multiple Access Technology and Duplexing Technology
   (b) Digital Subscriber Line
   (c) Universal Mobile Telecommunication System (UMTS) and Wideband Code Division Multiple Access (WCDMA)
   (d) Worldwide Interoperability Microwave Access (WIMAX)
   (e) Passive Optical Network (PON) and Hybrid Fiber Coaxial (HFC)

A.16 Probability and Statistics

1. Course number: 302D4112
   Course name: Probability and Statistics
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Andani Achmad(Course Coordinator)
   (b) Dewiani Djamaluddin
   (c) Zulfajri Basri Hasanuddin
4. Text book, title, author, publisher and year:
   (a) Metode Statistika, Sudhjana, Publisher: Tarsito, 1995.
   (b) Teknik Analisis Regresi dan Korelasi, Sudjana, Publisher: Tarsito, 1988.
   (c) Stastistika untuk Penelitian, Sugiono, Publisher: Alfa Beta, 2001.
   (d) Statistics, M. Spiegel, Publisher: Schoums Outline Series, 1983.
   (e) Statistika Jilid I dan II, Suprian AS., Publisher: FPTK IKIP, 1992.
   (f) Prosedur Penelitian suatu Pendekatan Praktik, Suharsimi Arikunto, Publisher: Rineka Cipta, 1998.
   (g) Statistik Non Parametrik, Sugiyono, Publisher: Tarsito, 1999.
5. Specific course information:
   (a) This course discusses the table of frequency distribution, central symptom size and location size, deviation size, slope moment and kurtosis, opportunity theory, sampling, hypothesis test, regression and correlation analysis and non-parametric statistics
   (b) Pre-requisites: N/A
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to create and calculate the concept of calculation of frequency distribution table
   (b) The student will be able to calculate central symptom and location size
   (c) The student will be able to calculate deviation size
   (d) The student will be able to calculate slope and kurtosis moments
   (e) The student will be able to calculate opportunity theory, sampling, hypothesis testing, regression and correlation analysis
   (f) The student will be able to use non-parametric statistics
7. Brief list of topics to be covered:
   (a) Introduction to statistics and probability
   (b) Table of Frequency Distribution and Graphics
   (c) Size of Central Symptoms
   (d) Size Deviation
   (e) Slopes and Kurtosis

(f) Opportunity Theory
(g) Distribution of Sampling
(h) Testing Hypotheses
(i) Regression Analysis
(j) Correlation Analysis
(k) Non-Parametric Statistics

A.17 Energy Conversion

1. Course number: 343D4122
   Course name: Energy Conversion

2. Credits: 2
   Contact hours: 27 hours

3. Instructors:

   (a) Syafaruddin(Course Coordinator)

4. Text books, title, author, publisher and year:

   (a) Energy Conversion, D. Yogi Goswami, Frank Kreith, Publisher: CRC Press-Taylor & Francis Group, 2017.

5. Specific course information:

   (a) Catalogue description: Solar energy resources, Solar Thermal Energy Conversion: Photovoltaic Fundamentals, Technology and Application, Wind energy resources, Biomass Energy, Biomass Conversion Processes For Energy Recovery, Ocean Energy Technology, Geothermal Energy, Fuel Cells, Direct Energy Conversion

   (b) Prerequisite: Basic Electric Power, C-minimum grade

   (c) Co-requisite: Electric Machines, C-minimum grade

   (d) Course type: Required (R)

   Specific goals for the course:

   (a) The student will understand and be able to explain the classification and types of energy

   (b) The student will be able to explain the principle process of energy conversion of solar energy, wind energy, biomass energy, ocean energy, geothermal energy

   (c) The student will be able to distinguish the principle process of thermionic converters, thermoelectric converters, fuel cells

   (d) The student will be able to do some parameter measurements in solar energy, wind energy, biomass energy, ocean energy, geothermal energy

   (e) The student will be able to quantify some parameter measurements in thermionic converters, thermoelectric converters, fuel cells

   (f) The student will be able to develop hybrid systems of energy conversion in the electrical grid network

   (g) The student outcomes addressed by the course

   (h) The student will have an ability to apply knowledge of mathematics, science and technology related to the energy conversion process

6. Brief list of topics to be covered:

   (a) Solar energy resources: Solar Energy Availability, Earth–Sun Relationships, Solar Time, Solar Radiation on a Surface, Solar Radiation on a Horizontal Surface, Solar Radiation on a Tilted Surface, Solar Radiation Measurements, Solar Radiation Data

   (b) Solar Thermal Energy Conversion: Active Solar Heating Systems, Solar Heat for Industrial Processes, Passive Solar Heating, Cooling, and Daylighting, Solar Cooling

   (c) Photovoltaics Fundamentals, Technology and Application: Photovoltaic, Thin-Film PV Technology, Concentrating PV Technologies

(d) Wind energy resources: Wind Origins, Wind Power, Wind Shear, Wind Energy Resource, Wind Characterization, Wind Energy Potential

(e) Biomass Energy: Biomass Feedstock Technologies, Biomass Conversion Technologies

(f) Biomass Conversion Processes For Energy Recovery: Energy Recovery, Power Generation, Biofuels

(g) Ocean Energy Technology: Ocean Thermal Energy Conversion, Tidal Power, Wave Power

(h) Geothermal Energy: Heat Flow Types of Geothermal Systems, Geothermal Energy Potential, Geothermal Applications, Environmental Constraints, Operating Conditions, Management of the Geothermal Resource for Power Production, Geothermal Steam Supply, Geothermal Power Production-Steam Turbine Technologies

(i) Fuel Cells: Principle of Operation for Fuel Cells, Typical Fuel Cell Systems, Performance of Fuel Cells Fuel Cell Electrode Processes, Cell connection and Stack Design Considerations, Six Major Types of Fuel Cells

(j) Direct Energy Conversion: Thermionic Energy Conversion, Thermoelectric Power Conversion, Magnetohydrodynamic Power Generation

A.18 Numerical Methods

1. Course number:342D4122
   Course name: Numerical Methods

2. Credits: 2
   Contact hours: 27 hours

3. Instructors:

   (a) Syafaruddin

4. Text books, title, author, publisher and year:

   (a) Fundamental Numerical Methods for Electrical Engineering, Stanisław Rosłoniec, Publisher: Springer.

5. Specific course information:

   (a) This courses material discusses about the methods for numerical solution of linear equations, methods for numerical solving the single non-linear equations, methods for numerical solution of non-linear equations, methods for the interpolation and approximation of one variable function, methods for numerical integration of one and two variable functions, methods for numerical integration of ordinary differential equations

   (b) Prerequisite: (Mathematics I, C-minimum grade), (Mathematics II, C-minimum grade)

   (c) Course type: Required (R)

6. Specific goals for the course:

   (a) The student will understand the principle of numerical solution in electrical engineering problem

   (b) The student will be able to solve linear and non-linear equations using numerical methods

   (c) The student will understand the difference between interpolation and approximation techniques in engineering problems

   (d) The student will be able to implement certain interpolation and approximation algorithms in engineering problems

   (e) The student will be able to solve mathematical integration problems based numerical methods

   (f) The student will be able to compute mathematical differentiation cases using numerical methods

   (g) The student will have an ability to apply knowledge of engineering mathematics and calculus to solve problems in engineering process with numerical methods

7. Brief list of topics to be covered:

   (a) Direct Methods: Gauss Elimination Method, Gauss–Jordan Elimination Method, LU Matrix Decomposition Method, Method of Inverse Matrix

   (b) Indirect or Iterative Methods: Direct Iteration Method, Jacobi and Gauss–Seidel Methods

   (c) Determination of the Complex Roots of Polynomial Equations: Lin's Method, Bairstow's Method, Laguerre Method

   (d) Iterative Methods Used for Solving Transcendental Equations: Bisection Method of Bolzano, Secant Method, Method of Tangents (Newton–Raphson), Optimization Methods

(e) Method of Direct Iterations: Iterative Parameter Perturbation Procedure, Newton Iterative Method

(f) Fundamental Interpolation Methods: Piecewise Linear Interpolation, Lagrange Interpolating Polynomial, Aitken Interpolation Method, Newton–Gregory Interpolating Polynomial

(g) Fundamental Approximation Methods for One Variable Functions: Equal Ripple (Chebyshev) Approximation, Maximally Flat (Butterworth) Approximation

(h) Fundamental Methods for Numerical Integration of One Variable Functions: Rectangular and Trapezoidal Methods of Integration, Romberg Integration Rule, Simpson Method of Integration

(i) Calculating the Derivatives of One Variable Function Differentiation of the Corresponding Interpolating Polynomial: Differentiation of the Newton–Gregory Polynomial and Cubic Spline Functions

(j) Methods for Numerical Integration of Ordinary Differential Equations: Euler Method and its Modified Version, Heun Method, Runge–Kutta Method (RK 4), Runge–Kutta–Fehlberg Method (RKF 45)

A.19 Analog and Digital Filters

1. Course number: 388D4102
   Course name: Analog and Digital Filters
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Intan Sari Areni
   (b) Merna Baharuddin
4. Text book, title, author, publisher and year:
   (a) Passive and Active Filters: Theory and Implementation, Wai Kai Chen, Publisher: Wiley and Sons, 1986.
   (b) Analog and Digital Filter Design, 2nd edition, Steve Winder, Publisher: Elsevier Science, 2002.
5. Specific course information:
   (a) This course discusses about examples of filter applications, explanation the importance of filter design, a description of the limitations of filter types (active, passive, and digital), terminology of basic filter, overview design process, description of the frequency response characteristics of filters, both ideal and practical, descriptions on how to design active or passive lowpass, high-pass, bandpass, and band stop filters to meet most desired specifications. Explanation the basic concept of digital filter, FIR and IIR filters. Description on how to design FIR and IIR filters
   (b) Prerequisites: Basic Telecommunication, Advanced Mathematics, Electric Circuit
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will able to understand the examples of filter applications
   (b) The student will able to learn the importance of filter design
   (c) The student will able to describe the limitations of filter types (active, passive, and digital), terminology of basic filter, overview design process
   (d) The student will able to explain frequency response characteristics of filters, both ideal and practical
   (e) The student will able to design active or passive lowpass, high pass bandpass, and band stop filters to meet most desired specifications
   (f) The student will able to understand the basic concept of digital filter
   (g) The student will able to design FIR filter
   (h) The student will able to design IIR filter
   (i) The student will able to have an ability to apply knowledge of mathematics, science, and engineering
7. Brief list of topics to be covered:
   (a) Filter type and specification
   (b) Filter Transfer Function
   (c) Butterworth and Chebyschef Filters
   (d) Active and Passive Filter Design

(e) Basic concept of digital filter
(f) FIR filter
(g) IIR filter

A.20 Power Line Carrier for Communication Transmission

1. Course number: 318D4112
   Course name: Power Line Carrier for Communication Transmission
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Intan Sari Areni
   (b) Syafruddin Syarif
4. Text book, title, author, publisher and year:
   (a) J. Anatory & N. Theethayi, "Broadband Power-line Communication Systems: Theory and Applications", WITPress, 2010.
   (b) H. Hrasnica, A. Haidine, R. Lehnert, "Broadband Power-line Communications: Network", Wiley, 2004.
5. Specific course information:
   (a) This course discusses about the communication system through power lines (PLC), PLC standardization, characteristics of power line channels and PLC applications
   (b) Pre-requisites: Basic Telecommunication
   (c) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will be able to understand about the communication system through power lines (PLC)
   (b) The student will be able to explain PLC standardization
   (c) The student will be able to understand the characteristics of power line channels
   (d) The student will be able to describe the applications of PLC system
7. Brief list of topics to be covered:
   (a) Introduction of power line communication system
   (b) PLC standardization
   (c) Characteristics of power line channel: attenuation and noise
   (d) PLC system architecture
   (e) Types of electric power transmission lines
   (f) PLC applications

A.21 Power System Analysis

1. Course number: 306D4112
   Course name: Power System Analysis
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Ardiaty Arief(Course Coordinator)
4. Specific course information:
   (a) This course discusses about History of electric power systems, power system structure, Per Unit systems, Systems modelling, iterative solutions to algebraic equations, power flow analysis, symmetrical faults, symmetrical components and unsymmetrical faults
   (b) Pre-requisite: Alternating current transmission
   (c) Co-requisite: Engineering Mathematics, Basic of Electric Systems, Electric Circuits
   (d) Course type: Required (R)
5. Specific goals for the course:
   (a) The student will be able to understand the history of electric power systems and power systems structure
   (b) The student will be able to understand the per unit systems
   (c) The student will be able to understand the power systems modelling
   (d) The student will be able to analyse the power flow with iterative solutions
   (e) The student will be able to analyse and calculate the current of symmetrical faults
   (f) The student will be able to understand the symmetrical components
   (g) The student will be able to analyse and calculate the current of asymmetrical faults
6. Brief list of topics to be covered:
   (a) History of electric power systems
   (b) Power systems structure
   (c) Per Unit systems and systems modelling
   (d) Iterative solutions to algebraic equations
      (a) Gauss Elimination
      (b) Jacobi and Gauss–Seidel
      (c) Newton–Raphson
   (e) Power flow analysis
      (a) Power flow solution by Gauss–Seidel
      (b) Power flow solution by Newton–Raphson
      (c) Fast Decoupled Power Flow
   (f) Symmetrical faults
   (g) Symmetrical components
   (h) Asymmetrical faults
      (a) Single line-to-ground fault
      (b) Line-to-line fault
      (c) Double line-to-ground fault
      (d) Sequence bus impedance matrices

A.22 Power Systems Operation

1. Course number: 350D4122
   Course name: Power Systems Operation
2. Credits: 2
   Contact hours: 27 hours
3. Instructors:
   (a) Muhammad Bachtiar Nappu(Course Coordinator)
4. Text book, title, author, publisher and year:
   (a) Allen J. Wood and Bruce F. Wollenberg and Gerald B. Sheble "Power Generation Operation and Control", John Wiley & Sons, Inc., 2014
5. Specific course information:
   (a) This course discusses about Economic importance of power systems operation, new and old problems in economic dispatch, power generation characteristics, economic dispatch and the general economic dispatch problem, thermal unit economic dispatch and methods of solution and optimization with constraints
   (b) Pre-requisite: Power systems analysis
   (c) Co-requisite: Engineering mathematics, Basic of Electric Systems, Electric Circuits, Alternating Current transmission
   (d) Course type: Required (R)
6. Specific goals for the course:
   (a) The student will able to understand the principle of power generations systems
   (b) The student will able to explain the new and old problems in economic dispatch
   (c) The student will able to understand the characteristics for thermal and hydroelectric power generation
   (d) The student will able to solve the economic dispatch problems with mathematical optimization methods
   (e) The student will able to perform systems optimization with constraints
   (f) The student will able to explore the current issue around power systems operation
7. Brief list of topics to be covered:
   (a) Economic importance of power systems operation
   (b) New and old problems in economic dispatch
   (c) Electric power industry as a business
   (d) Power generation characteristics
   (e) Economic dispatch and the general economic dispatch problem
      (a) Economic dispatch by neglecting network losses and generations constraints
      (b) Economic dispatch by considering generations constraints
      (c) Economic dispatch by considering network losses and generations constraints
   (f) Thermal unit economic dispatch and methods of solution
   (g) Optimization with constraints
   (h) Optimal power flow techniques

APPENDIX B

FACULTY VITAE

Contents

B.1 Andani Achmad

1. Name: Andani Achmad
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 1986
   (b) Master degree, Electrical Engineering, Universitas Hasanuddin , 2000
   (c) Doctor degree, Electrical Engineering, Universitas Hasanuddin , 2010
3. Academic experience:
   (a) Secretary of Electrical Engineering Department, Universitas Hasanuddin , (1997-2000)
   (b) Head of Electrical Engineering Department, Universitas Hasanuddin (2011-2016)
   (c) Dean of Engineering Faculty, Universitas Fajar, 2010-now
   (d) Head of Computer and Network Laboratory Electrical Department, Universitas Hasanuddin , 2012-now
4. Non-academic experience: N/A
5. Certifications of professional registrations: Lecturer Certification (2014)
6. Current membership in professional organizations:
   (a) Assessor Team of BAN PT
   (b) Engineer Profession
7. Honors and awards:
   (a) Satyalancana Karya Satya Award of 20 Years
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from past five years:
   (a) “Prototype of Vehicles Potholes Detection Based Blob Detection Method”, Journal of Theoretical and Applied Information Technology, ISSN: 1992-8645., E-ISSN: 1817-3195 Vol. 95 No.1, 15 Januari 2017.
   (b) “Client Server Based of Channel Cable Distribution Information System Case Study of PT. Telkom, Tbk (Persero) Witel NTT”, Prosiding Seminar Nasional Teknik ketenagalistrikan dan Teknologi Informasi (SNTKTI), Agustus 2015.
   (c) “Arduino Uno Microcontroller Based of Housing Security System”, Journal Techno Entrepreneur Acta, Vol. 1 No. 1 Maret 2016, ISSN:2503-1767.
   (d) “Design of Microstrip Antennas for 4G Network Repaters Operating on 1800 MHz Frequency”, Prosiding Smeinar Nasional Teknik Elektro dan Informatika (SNTEI), 2016.
   (e) “Design and Implementation of Outdoor Hotspot Network Using M2 nanostation 2.4GHz Frequency with Voucher System on RT/RW-Net Microtic Network”, Journal Techno Entrepreneur Acta, Vol. 2 No. 2, 2017, ISSN:2503-1767
10. Briefly list the most recent professional development activities: N/A

B.2 Andini Dani Achmad

1. Name: Andini Dani Achmad
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 2009
   (b) Master degree., Electrical Engineering, Universitas Hasanuddin , 2013
3. Academic experience:
   (a) Chairman, Program Study of Electrical Engineering, Universitas Fajar, (2014-2016)
   (b) Lecturer, Electrical Engineering, Universitas Fajar, (2011-2016)
   (c) Lecturer, Electrical Engineering, Universitas Hasanuddin , 2015-now
4. Non-academic experience: N/A
5. Certifications of professional registrations: Lecturer Certification (2014)
6. Current membership in professional organization: N/A
7. Honors and award: N/A
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from past five years:
   (a) "Client Server Based of Channel Cable Distribution Information System Case Study of PT. Telkom, Tbk (Persero) Witel NTT", Prosiding Seminar Nasional Teknik ketenagalistrikan dan Teknologi Informasi (SNTKTI), Agustus 2015.
   (b) "Arduino Uno Microcontroller Based of Housing Security System", Journal Techno Entrepreneur Acta, Vol. 1 No. 1 Maret 2016, ISSN:2503-1767.
   (c) "Design of Microstrip Antennas for 4G Network Repaters Operating on 1800 MHz Frequency", Prosiding Smeinar Nasional Teknik Elektro dan Informatika (SNTEI), 2016.
   (d) "Design and Implementation of Outdoor Hotspot Network Using M2 nanostation 2.4GHz Frequency with Voucher System on RT/RW-Net Microtic Network", Journal Techno Entrepreneur Acta, Vol. 2 No. 2, 2017, ISSN:2503-1767
10. Briefly list the most recent professional development activities: N/A

B.3 Andi Ejah Umraeni Salam

1. Name: Andi Ejah Umraeni Salam
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1996
   (b) Master degree, Electrical Engineering, Institut Teknologi Sepuluh Nopember, 2002
   (c) Doctor degree, Electrical Engineering, Universitas Hasanuddin, 2015
3. Academic experience:
   (a) Lecturer (1997-2002), Assistant Professor (2002-2015), Associate Professor, 2015-now
4. Non-academic experience:
   (a) PT. Oval Plan, Member consultant Electrical Engineering, Electrical Project Installation, 2010-now
5. Certification or professional registration: Lecturer Certification (2011)
6. Current membership in professional organization:
   (a) Member, Electrical Engineering Alumni Association, Universitas Hasanuddin, 1998-now
   (b) Member of ISLT (International Symposium on Lowland Technology), Saga University, Japan, 2014
   (c) Member of IEEE, 2017-now
7. Honors and awards:
   (a) A scholarship for short-term research for the Universitas HasanuddinEngineering Faculty Development Project under JBIC Loan No.IP-541, 2015
   (b) BPPS Scholarship, Doctoral Program from Indonesian Government, (2011-2014)
   (c) BPPS Scholarship, Magister Program from Indonesian Government, (1999-2002)
8. Service activities (within and outside of the institution):
   (a) Local Organizing Commitee, The International Workshop on Modern Research in Electrical Engineering (IWoRMEE 2013), Makassar, Indonesia, 2013.
   (b) Conference Chairs, Electrical Engineering, Computer Science and Informatics (EECSI 2014), Yogyakarta, Indonesia, 2014
   (c) Electrical Engineering (IWoRMEE 2013), Makassar, Indonesia, 2013.
   (d) Conference Chairs, International Conference on Engineering & Science Technology Innovation (ICESTI 2014), Bali, Indonesia, 2014
   (e) Conference Chairs, International Symposium on Lowland Technology (ISLT 2014), di Japan, Tahun 2014
   (f) Conference Chairs Makassar, International Conference On Electrical Engineering And Informatics (MICEEI 2014), Makassar, 2014
   (g) Training Renewable Energy. Power System Laboratory, Sepuluh Nopember Institute of Technology, Surabaya, Indonesia, August, 2016
9. Briefly list the most important publications and presentations from the past five years:

(a) A.Ejah U, Muh.Tola, Mary S, Farouk M, "Application Extreme Learning Machine To Predict Location And Magnitude, International Journal of Innovative, Science, Engineering & Technology, Of Pipe Leak On Water Distribution Network", Published Vol.1 Issue 9, November 2014. ISSN: 2348-7968.

(b) A.Ejah U, Muh.Tola, Mary S, Farouk M,"On-Line Monitoring System Water Leak Detection In Pipe Networks With Artificial Intelligence", ARPN Journal of Engineering and Applied Sciences, Vol.9. No.10.Oktober 2014, ISSN: 1819-6608.

(c) A.Ejah U, Muh.Tola, Mary S, Farouk M,"Application Of ASTAR And RBF-NN To Predict Location And Magnitude Of Pipe Leak On Water Distribution Network", Proceeding International Symposium on Lowland Technology, 9th ISLT 2014 September 29 – October, 2014, Saga Japan, ISSN : 4 -921090-06-8.

(d) A.Ejah U, Muh.Tola, Mary S, Farouk M,"Web Based Real time Water Pressure Monitoring System", Proceeding Electrical Engineering, Computer Science and Informatics, EECSI 2014 Conference, 20 -21 August 2014, Yogyakarta. ISSN : 978-602-70504-0-2.

(e) A.Ejah U, Muh.Tola, Mary S, Farouk M,"Water Leakage Detection System Of Pipe Line Using Radial Basis Function Neural Network", Proceeding International Seminar on Infrastructure Development, 2nd ISID 2014, June 3, 2014, Balikpapan, Indonesia, ISSN : 978-979-530-131-8.

(f) A.Ejah U, Muh.Tola, Mary S, Farouk M,"A Leakage Detection System on the Water Pipe Network through Support Virtual Machine Method", Proceeding Makassar International Conference On Electrical Engineering And Informatics, MICEEI 2014, 26-28 November 2014, Makassar, Indonesia. ISSN : 978-1-4799-6725-4.

10. Briefly list the most recent professional development activities:

(a) A short term Research Program, in Ehime University, October 2015-December 2015, Japan

B.4 Ansar Suyuti

1. Name: Ansar Suyuti
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 1991
   (b) Master degree, Electrical Engineering, Universitas Hasanuddin , 2002
   (c) Doctor degree, Engineering Science/ Environmental Technology, Universitas Hasanuddin , 2013
3. Academic experience:
   (a) Assistant (1992-2000), Lecturer (2000-2013), Professor, 2013-now
   (b) Distribution and Electrical Installation Laboratory, Head, 1997-now
   (c) Department of Electrical Engineering, Chairman, (2003-2006)
   (d) Vice Dean Financial and Administration Affair Faculty of Engineering, Universitas Hasanuddin , (2006 -2010) & (2010-2014)
   (e) Doctoral study Program in Electrical Engineering, Chairman, 2016-now
   (f) Member of Trustee Board, Universitas Hasanuddin , 2014-now
4. Non-academic experience:
   (a) PT Raja Teknik Sejati, Makassar, Electrical Contractor, (1991-1997)
   (b) PT AS Elektrikal Konstruksi, Makassar, Electrical Contractor, 1997-now
   (c) PT Tunggala Prima Teknik, Kendari, Electrical Contractor, 2000-now
5. Certifications or professional registrations:
   (a) Lecturer Certification (2010)
   (b) Lead of expert electrical power engineering, APEI & LPJK, 2000-now
   (c) Main Professional Engineer (IPU), Association of Indonesian Engineers (PII), 2017-now
6. Current membership in professional organization:
   (a) IEEE Computer Society, Member, 2013-now
   (b) International Association of Engineering (IAENG), Member, 2015-now
7. Honors and awards:
   (a) Best Graduate Program (S3) Universitas Hasanuddin on graduation Period III Year 2012/2013.
   (b) Satyalancana Karya satya X Tahun,
   (c) Satyalancana Karya satya XX Tahun
8. Service activities (within and outside of the institution):
   (a) Assessor of Electricity Competency, Ministry of Energy and Mineral Resources (ESDM) of the Republic of Indonesia.
   (b) Assessor of BAN-PT, National Accreditation Board-Higher Education (BAN-PT) Ministry of Ministry of Research, Technology and Higher Education
9. Briefly list the most important publications and presentations from the past five years.

(a) Ansar Suyuti, Muh. Tola, Muh. Saleh Pallu, Nadjamuddin Harun, "Simple and portable Gas Emission Detector Design Using ATmega16", ICIC Express Lettes, Part B: Applications. An International Journal of Research and Surveys, Volume 4, Number 1, February 2013. ISSN 2185-2766.

(b) Ansar Suyuti, "Web-Based Gas Emission Level Monitoring of Diesel Power plant Using Multi-sensors", International Journal of Engineering and Innovative Technology (IJEIT), 2014.

(c) Ansar Suyuti, Zaenab Muslimin, Ikhlas Kitta, Fitriyanti Mayasari. "Smart Electrical Installation for Apartment", International Journal of Engineering and Innovative Technology (IJEIT), Volume 3, Issue 5, November 2013, page 274-276, ISSN: 2277-3754, ISO 9001:2008.

(d) Ansar Suyuti, Sudirman Palaloi. "Analysis of the Use of Electricity in the Installation of Drinking Water Management", Enerlink, Jurnal Energi dan Lingkungan, Vol.10 No.2, Desember 2014, ISSN 0216-9541

(e) Ansar Suyuti, Indar Chaerah G, Nuryahati, "PID Implementation on Real Time 3-phase Induction Motor Controlling and monitoring", Journal of Theoretical and Applied Information Technology, Vol. 89 No.2, 31st July 2016, ISSN: 1992 -8645.

(f) Ansar Suyuti, Indrabayu, Herlina, "DSS for Evaluating Weighting Methodology Using Fuzzy AHP", International Journal of Emerging Research in Management & Technology ISSN: 2278-9359 (Volume-6, Issue-2, February 2017

(g) Ansar Suyuti, Ikhlas Kittaand Yusri Syam Akil, "The Impact of The Operation Planning of Power Plants for Environmental Emissions in South Sulawesi", ARPN Journal of Engineering and Applied Sciences, ISSN 1819-6608, Vol. 12, No. 11, June 2017

10. Briefly list the most recent professional development activities: N/A

B.5 Ardiaty Arief

1. Name: Ardiaty Arief
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 2001
   (b) Master degree, Electrical Engineering, University of New South Wales, 2004
   (c) Doctoral degree, Electrical Engineering, the University of Queensland, 2012
3. Academic experience:
   (a) Lecturer, 2001-now
4. Non-academic experience:
   (a) Internship at Powerlink Queensland, Australia (2009)
5. Certifications or professional registrations: Lecturer Certification
6. Current membership in professional organizations: N/A
7. Honors and awards:
   (a) Maude Walker Award, 2008
   Awarded by the University of Queensland, Australia for the first-year postgraduate research student.
8. Service activities (within and outside of the institution):
   (a) Speaker/ facilitator of Community Services Project for primary school students and teachers in Makassar, "Education for the usage of solar energy as an alternative and environmentally friendly energy for primary school community", Makassar, 28 September 2017
9. Briefly list the most important publications and presentations from the past five years: Journal publications:
   (a) Arief, Z.Y. Dong, M.B. Nappu, and M. Gallagher, "Under Voltage Load Shedding in Power Systems with Wind Turbine-Driven Doubly Fed Induction Generators" Electric Power System Research, ELSEVIER, vol. 96, pp. 91-100, March 2013.
   (b) M.B. Nappu, A. Arief and R.C. Bansal, "Transmission Management for Congested Power System: A Review of Concepts, Technical Challenges and Development of a New Methodology" Renewable and Sustainable Energy Reviews, ELSEVIER, Vol. 38, pp. 572–580, October 2014.
   (c) Arief, Antamil and M.B. Nappu, "Analytical Method for Reactive Power Compensators Allocation", International Journal of Technology, Volume 9(3), pp. 602-612, Scopus indexed, ISSN: 2086-9614, 2018.
   (d) M.B. Nappu, A. Arief and A.S. Duhri, "Economic Emission Dispatch for Thermal Power Plant in Indonesia", accepted for publication in International Journal of Smart Grid and Clean Energy (IJSGCE), ISSN: 2315-4462, Scopus indexed, 2018.
   (e) W.A. Ajami, A. Arief and M.B. Nappu, "Optimal power flow for power system interconnection considering wind power plants intermittency" accepted for publication in International Journal of Smart Grid and Clean Energy (IJSGCE), ISSN: 2315-4462, Scopus indexed, 2018.
   (f) W.S. Alfira, M.B. Nappu and A. Arief, "Under Voltage Load Shedding Simulation for Southern Sulawesi Power System with Integration of Wind Power Plants", accepted for publication in Advance Science Letter, Scopus indexed, ISSN: 1936-6612, 2018.

(g) Arief, Antamil and M.B. Nappu, "An Analytical Method for Optimal Capacitors Placement from the Inversed Reduced Jacobian Matrix", Energy Procedia, ELSEVIER, Volume 100, November 2016, Pages 307-310.

(h) M.B. Nappu and A. Arief, "Network Losses-Based Economic Redispatch for Optimal Energy Pricing in a Congested Power System", Energy Procedia, ELSEVIER, Volume 100, November 2016, Pages 311-314.

10. Conference Presentations:

(a) A. Arief, Antamil and M.B. Nappu, "An Analytical Method for Optimal Capacitors Placement from the Inversed Reduced Jacobian Matrix", presented at the International Conference on Power and Energy Systems Engineering (CPESE 2016), Kitakyushu, Japan, 8 – 12 September 2016.

(b) A. Arief and M. B. Nappu, "Voltage Drop Simulation at Southern Sulawesi Power System Considering Composite Load Model", Proceedings of the 3rd International Conference on Information Technology, Computer and Electrical Engineering (ICITACEE 2016), Semarang, 19-20 October 2016

(c) A. Arief and M.B. Nappu, "Optimum DG Placement and Size with Continuation Power Flow Method", presented at the 5th International Conference on Electrical Engineering and Informatics (ICEEI), Kuta, Bali, Indonesia, 10-11 August 2015.

(d) A. Arief, "Optimal Placement of Distributed Generations with Modified P-V Modal Analysis", presented at the 4th Makassar International Conference on Electrical Engineering and Informatics (MICEEI), Makassar, Indonesia, 26-30 November 2014.

(e) A. Arief, "DG Placement with Modified V-P Modal Analysis for Voltage Stability Improvement", presented at the International Workshop on Modern Research Methods in Electrical Engineering (IWORMEE), Makassar, South Sulawesi, Indonesia, 5 September 2013.

11. Briefly list the most recent professional development activities: N/A

B.6 Dewiani Djamaluddin

1. Name: Andini Dani Achmad
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin ,1993
   (b) Master degree, Electrical Engineering, Institut Teknologi Bandung, 2000
   (c) Doctor degree, Electrical Engineering, Kumamoto University, 2013
3. Academic experience:
   (a) Lecturer (1994-2003), Assistant Professor (2004-2015), Associate Professor, 2016-now
4. Non-Academic Experience: N/A
5. Certification or professional registration: N/A
6. Membership in professional organization:
   (a) Member of IEEE
   (b) Member of PII (Indonesian Engineer Association)
   (c) Member of IATEL (Electrical Engineer Association), Universitas Hasanuddin
   (d) Member of CoT (Center of Technology), Universitas Hasanuddin
7. Honors and awards:
   (a) URGE (University Research for Graduate Education) Scholarships, Directorate General of Higher Education (DIKTI), Ministry of National Education, Indonesia; period 1996-1997
   (b) BPPS Scholarships from Directorate General of Higher Education (DIKTI), Ministry of National Education, Indonesia; period 1997-2000
   (c) TPSDP Grant, Directorate General of Higher Education (DIKTI), Ministry of National Education, Indonesia; period 2007
   (d) Research Grant 2007-2009 awarded by Directorate General of Post and Telecommunication, Ministry of Communication and Information, Republic of Indonesia to develop the Plug and Play Smart Antenna for the Next Wireless Communication System.
   (e) DIKTI Scholarships from Directorate General of Higher Education (DIKTI), Ministry of National Education, Indonesia; period 2009-2013
   (f) Research Grant 2014-2015 awarded by SDPPI, Directorate General of Post and Telecommunication, Ministry of Communication and Information, Republic of Indonesia to develop “Sistem Antena Reconfigurable Beamsteerable dan Friendly Environment Dengan Struktur Stripmikro Untuk Piranti Komputasi Bergerak LTE-Advanced”
   (g) Short Term Research Fellowship Grant from JICA (Japan International Cooperation Agency) as Part of Universitas Hasanuddin Engineering Faculty Development Project. The research fellowship program commenced since the mid of July until mid of October 2013 at Tokyo University of Science (TUS), Tokyo, Japan
   (h) Research Grant 2014-2015 awarded by SDPPI, Directorate General of Post and Telecommunication, Ministry of Communication and Information, Republic of Indonesia to develop “Sistem Antena Reconfigurable Beamsteerable dan Friendly Environment Dengan Struktur Stripmikro Untuk Piranti Komputasi Bergerak LTE-Advanced”

8. Service activities (within and outside of the institution):

   (a) International Committee, 1st Makassar International Conference on Electrical Engineering & Informatics (MICEEI) 4-5 November 2008, Universitas Hasanuddin , Kampus Tamalanrea, Makassar, Indonesia.

   (b) Reviewer of International Conference on MICEEI (Makassar International Conference in Electrical Engineering and Informatics), Makassar Golden Hotel (MGH), 29 November-1 December 2014, Losari Beach, Makassar, Indonesia.

9. Briefly list the most important publications and presentations from the past five years:

   (a) "The Simulation of Vehicle Counting System for Traffic Surveillance using Viola-Jones Method", Proceedings of 4rd MICEEI 26 – 30 November 2014, Makassar Golden Hotel (MGH), Makassar, Indonesia, ISBN: 978-1-4799-6725-4, hal. 237.

   (b) "High Gain CP Antenna for Mobile Satellite Communications Numerically Evaluated under Various Packaging Materials", Proceedings of 4rd MICEEI 26 – 30 November 2014, Makassar Golden Hotel (MGH), Makassar, Indonesia. ISBN: 978-1-4799-6725-4, hal. 139.

   (c) "Movement Effect on Electrical Proporties of UWB Microwave Antenna During Breast Tumor Diagnostic Scanning", Proceeding of 2nd Asia Pasific Conference on Wireless and Mobile (APWiMob) 27 – 29 August 2015, Bandung, Indonesia, ISBN: 978-1-4799-8290-5hal. 188-191

   (d) "Early Stage Cancer Detection Technique Considering the Reflected Power from Breast Tissues", ARPN Journal of Engineering and Applied Sciences, 2015. Vol. 10, No. 17, p. 7361-7367, September 2015, ISSN 1819-6608

   (e) "Vehicles Potholes Detection Based Blob Detection Method and Neural Network Backpropagation Model", Proceedings of the 6th Annual International Conference Syiah Kuala University (AIC Unsyiah) in conjunction with the 12th International Conference on Mathematics, Statistics and Its Application (ICSMA), 4-5 October 2016

   (f) "Cosstalk Reduction for Network Multicore Fiber with Management Core and Spectrum Method", Journal of Theoretical and Applied Information Technology (JATIT), 15th January 2017. Vol.95. No.1, pp 139 -146, SSN: 1992-8645, E-ISSN: 1817-3195

   (g) "Prototype of Vehicles Potholes Detection Based Blob Detection Method", Journal of Theoretical and Applied Information Technology, Vol.95. No 11, 15 June 2017

   (h) "Implementation of RFID based raspberry Pi for user authentication and offline intelligent payment system", 15th International Conference on Quality in Research (QiR): International Symposium on Electrical and Computer Engineering, December 2017, 978-602-50431-1-6/17

10. Briefly list the most recent professional development activities:

    (a) Visiting Researcher in Tokyo University of Science (TUS), Tokyo, July-September 2013, Japan

B.7 Faizal Arya Samman

1. Name: Faizal Arya Samman
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Gadjah Mada, Yogyakarta, 1999
   (b) Master degree, Electrical Engineering, Institut Teknologi Bandung, 2002
   (c) Doctor degree, Electrical Engineering, Technische Universität Darmstadt, 2010
   (d) Professional Engineer degree, Electrical Engineering, Universitas Hasanuddin, 2018
3. Academic experience:
   (a) Head of Electronic and Device Laboratory, Electrical Eng. Dept., Universitas Hasanuddin, 2017-now, full time.
   (b) Principle investigator for research project title: "Multi Processor System-on-Chip for Innovative Smart Gadget Products with Multi Touchscreen" under National Strategic Superior Research Grant funded by Ministry of Research, Technology and Higher Education of the Republic of Indonesia (2017-2018).
   (c) Research fellow at Fraunhofer Institute for Structural Durability and System Reliability (LBF), Darmstadt, Germany, (2010-2012).
   (d) Research fellow for project title: "Maintenance-on-Demand (MODE)" under European Research and Development Program, FP7, funded by European Commission CORDIS, (2011-2012).
   (e) Research fellow for project title: "Facility for Antiproton and Ion Research (FAIR)" coordinated by GSI Helmholtz Center for Heavy-Ion Research, Germany, funded by German Federal Ministry of Education and Research, BMBF, (2011-2012).
   (f) Visiting researcher at the University of Melbourne, Australia, under DAAD/G08 grant with Australian Technology Network (Feb. 2012).
4. Non-academic experience: N/A
5. Certifications or professional registrations:
   (a) Professional Lecturer/Educator Certificate (2012)
6. Current membership in professional organization: N/A
7. Honors and awards:
   (a) The 10-Year National Badge "Satya Lencana Karya Satya", 2018, from the President of the Republic of Indonesia.
   (b) Best paper award in the 2018 International Conference on Applied Electromagnetic Technology (AEMT).
   (c) Best paper award in the 2018 International Conference on Electrical Power, Electronics, Communications, Controls and Informatics Seminar (EECCiS).
   (d) DAAD Scholarship Awardee, 2006-2010, to purse doctoral degree in Germany.
   (e) Post Graduate Program Scholarship Awardee, 2000-2002, to pursue master degree at ITB.
8. Service activities (within and outside of the institution):
   (a) 2016, Design and maintenance of photovoltaic-based electric power generation in Mangepong Village (remote area), Jeneponto Regency.

9. Briefly list the most important publications and presentations from the past five years:

   (a) Faizal A. Samman, "Integrated control and monitoring of hybrid grid-photovoltaic electrical system with extra DC electric installation", Indonesian Patent Office, Grant No. IDP000054426, Nov. 5, 2018.

   (b) Faizal A. Samman, "Arbitration method for data packets with single and multiple priority level in network-on-chip", Indonesian Patent Office, Grant No. IDP000053087, Aug. 30, 2018.

   (c) Faizal A. Samman, "Electronic smart-book design model", Indonesian Patent Office, Filling No. P15201505188, published March 10, 2017.

   (d) Faizal A. Samman, "Network-on-chip with quality-of-service using multiple access method based on dynamic identity label", Indonesian Patent Office, Filling No. P15201505187, published March 10, 2017.

   (e) Faizal A. Samman, "Electric power supply based on renewable energies with DC and AC power terminals", Indonesian Patent Office, Filling No. P15201604471, published Jan. 12, 2018.

   (f) Faizal A. Samman, "Maximum power transfer algorithm using switching method", Indonesian Patent Office, Filling No. P15201500005, published Nov. 11, 2016.

   (g) Faizal A. Samman, "Solar-thermal electric power generation for cooling system of parking vehicles", Indonesian Patent Office, Filling No. P15201500007, published Nov. 11, 2016.

   (h) Faizal A. Samman, Khairul Jihadi, M. Arif Fitrayadi Said and Syafaruddin "Numerical Current Integration with Incident OCV Observation for Battery State-Of-Charge Estimation In Photovoltaic Systems", ICIC Express Letter, Part B: Applications, vol. 10, no. 1, Jan. 2019.

   (i) Faizal A. Samman and Thomas Hollstein, "Design Concept and Microarchitecture of Network-On-Chip With Best-Effort and Guaranteed-Throughput Services", International Journal of Innovative Computing, Information and Control (IJICIC), will be published in vol. 15, no. 1, Feb. 2019.

   (j) Faizal A. Samman, Dea Fatriziah Hamkah, Made Dharma Budy Diatmika and Ida Rahmaniar Sahali, "Voltage Regulator Using a DC-DC Converter Controlled by Interpolated PI Gain Scheduler for Solar Charge Applications", ICIC Express Letters, an International Journal of Research and Surveys, ICIC Express Letters, planning to publish in vol.12, no.11, November 2018.

   (k) Faizal A. Samman, Ma'arif Hasan, Tirza Damayanti. "Side Effects of Damping Element Insertion in LCL Filter for DC/AC Inverter", International Journal of Power Electronics and Drive Systems (IJPEDS), vol. 8, no. 1, March 2018.

   (l) Faizal A. Samman, Abd. Azis Rahmansyah, Syafaruddin. "Peak Bracketing And Decremented Window-Size Scanning-Based MPPT Algorithms For Photovoltaic Systems", International Journal of Innovative Computing, Information and Control (IJICIC), vol. 14, no. 3, June 2018. ISSN: 1349-4198.

   (m) Faizal A. Samman. "Runtime Connection-Oriented Guaranteed-Bandwidth Network-on-Chip with Extra Multicast Communication Service", Elsevier Science Journal, Microprocessors and Microsystems - Embedded Hardware Design, vol. 38, no. 2, March, 2014, pages: 170-181. ISSN: 0141-9331.

   (n) Faizal A. Samman, T. Hollstein, M. Glesner. "Runtime Contention- and Bandwidth-Aware Adaptive Routing Algorithms for Networks-on-Chip", IEEE Transaction on Parallel and Distributed Systems, vol. 24, no. 7, Juli 2013, pages 1411-1421, ISSN: 1045-9219, doi: 10.1109/TPDS.2012.200.

10. Briefly list the most recent professional development activities:

   (a) Patent application training: from invention to patent, TU Darmstadt, Germany, Jan. 2012.

B.8 Hasniaty A.

1. Name: Hasniaty A.
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 1998
   (b) Master degree, Electrical Engineering, Universitas Gadjah Mada, 2002
3. Academic experience:
   (a) Lecturer, 2000-now
   (b) International Publication Capacity Enhancement Committee, Chairman, 2017
   (c) International Publication Capacity Enhancement Committee, Chairman, 2018
4. Non-academic experience: N/A
5. Certifications or professional registrations: N/A
6. Current membership in professional organizations: N/A
7. Honors and awards: N/A
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from the past five years: N/A
10. Briefly list the most recent professional development activities: N/A

B.9 Ida Rachmaniar Sahali

1. Name: Ida Rachmaniar Sahali
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 2005
   (b) Master degree, Electrical Engineering, Institut Teknologi Bandung, 2012
3. Academic experience:
   (a) Assistant Lecturer (2012-2014), Lecturer, 2014-now
4. Non-academic experience:
   (a) Network Element Engineer, PT Indosat, Tbk, Makassar, (2006-2008)
5. Certifications or professional registrations: Lecturer Certification (2016)
6. Current membership in professional organizations: N/A
7. Honors and awards: N/A
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from the past five years:
   (a) Christoforus Yohannes, Ida Rachmaniar Sahali, Wahyu Eko Pribadi, M. Taufan Yusuf – Controlling Temperature, Humidity and Light Intensity in Green House using Microcontroller based – Proceeding of Seminar Ilmiah Nasional Sains dan Teknologi Ke-2 – Makassar, September 7-8th, 2016.
   (b) Mukarramah Yusuf, Arisal Saila and Ida Sahali – pandaisejarah: Toward Implementation of Indonesian History with Teaching Pedagogy – Proceeding of International Seminar on Application for Technology of Information and Communication – Semarang, August 5-6th, 2016.
   (c) Ida Rachmaniar Sahali, Intan Sari Areni, Budianingsih, Dedi Setiawan, Fahmi - Implementation and Realization of Supply Chain Management to Accelerate In-ventory Process in Pervasive Environment Case Study: Purchase of Medicine Online via Mobile Phone – Proceeding of Seminar Nasional Teknik Informatika (SNATIKA), Makassar, September 6th, 2013.
10. Briefly list the most recent professional development activities: N/A

B.10 Indar Chaerah Gunadin

1. Name: Indar Chaerah Gunadin
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 1997
   (b) Master degree, Electrical Engineering, Institut Teknologi Sepuluh Nopember, 2006
   (c) Doctor degree, Electrical Engineering, Institut Teknologi Sepuluh Nopember, 2013
3. Academic experience:
   (a) Relay and Measurement Laboratory, Head of Laboratory, 2013-now
   (b) Associate Professor, 2000-now
   (c) Lecturer, 1998-now
4. Non-academic experience:
   (a) PT. Makassar Power Indonesia, Control Room, Electrical Operator, 1997-1998
5. Certification or professional registration: Lecturer Certification (2014)
6. Current membership in professional organization:
   (a) Member, Indonesian Association of Electricity Engineering Experts
   (b) Caretaker, Electrical Engineering Alumni of Universitas Hasanuddin , 2014-2019
7. Honors and awards: N/A
8. Service activities (within and outside of the institution).
   (a) Reviewers, Makara Journal of Technology, Indonesia University, 2017-now
9. Briefly list the most important publication and presentation from past five years.
   (a) Indar Chaerah Gunadin, Zaenab Muslimin, Yusran: "Steady State Stability Assesment Using Continous Power Flow Based on Load Tap Changer" International Journal of Applied Engineering Research (IJAER), ISSN 0973-4562 Volume 12, Number 24 (2017)
   (b) Indar Chaerah Gunadin, Zaenab Muslimin, Agus Siswanto, "Transient Stability Improvement Using Allocation Power Generation Methode Based on Momen Inertia", 2017 International Conference on Electrical Engineering and Informatics (ICELTICs) ISBN: 978-1-5386-2934-1, October 18-20, 2017 Banda Aceh, Indonesia
   (c) Zaenab Muslimin, Indar Chaerah Gunadin, Muhammad Anshar "Comparative Study of the Effect of Temperature of Miniature Sun with Spotlights on Solar Pond", Proceedings of the National Seminar on Electrical and Informatics Engineering, SBN: 978-602-18168-2-6, pp 247 – 251, November 20, 2017 Makassar, Indonesia
   (d) Indar Chaerah Gunadin, Sri Mawar Said, Muhammad Irsan, "Determination of Stability Index of Electrical Power System Using REI-Dimo Methods", Journal of Theoretical and Applied Information Technology, 15th August 2016. Vol.90. No.1, pp.161-167.
   (e) Ansar Suyuti, Indar Chaerah Gunadin, Nurhayati, "PID Implementation on Real Time 3-Phase Induction Motor Controlling and Monitoring', Journal of Theoretical and Applied Information Technology, 31st July 2016. Vol.89. No.2, pp. 495-501

(f) Steven Humena, Salama Manjang, Indar Chaerah Gunadin, "Optimization Economic Power Generation Using Modified Improved PSO Algorithm Methods", Journal of Theoretical and Applied Information Technology, 30th November 2016. Vol.93. No.2, pp. 522-530

(g) Andi Nurtrimarini, Sri Mawar Said, Indar Chaerah Gunadin, Mustadir Darusman B, "Impact of Penetration Wind Turbines on Transient Stability in Sulbagsel Electrical Interconnection System". Journal of Physics: Conference Series, 2018. 979(1): p. 012028.

(h) Nur Fadliah, B., G. Indar Chaerah, and Yusran, "Solar Pond Potential as A New Renewable Energy in South Sulawesi". Journal of Physics: Conference Series, 2018. 979(1): p. 012039.

10. Recent professional development activities:

(a) Visiting Researcher in Kumamoto University, September-December 2015, Japan

B.11 Intan Sari Areni

1. Name: Intan Sari Areni
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin ,1998
   (b) Master degree, Electrical Engineering, Universitas Gadjah Mada, 2003
   (c) Doctor degree, Electrical Engineering, Ehime University, 2013
3. Academic experience:
   (a) Lecturer, Telecommunication and Electronics Engineering, (2000-2003)
   (b) Assistant Professor, Telecommunication and Information, (2004-2019)
   (c) Associate Professor, Telecommunication and Information, 2010-now
4. Non-Academic Experience: N/A
5. Certification or professional registration:
   (a) Research Reviewer Standards of SNI ISO/IEC 17024: 2012, LSP Quantum HRM International
6. Current membership in professional organization:
   (a) Member, The Institution of Engineers Indonesia, 2016-present
   (b) Member, International Association of Engineers (IAENG), 2018
7. Honors and awards:
   (a) Dean's Commendation for High Achievement, Faculty of Engineering, Universitas Hasanuddin , Indonesia, 1998.
   (b) JBIC Scholarships, from JICA (Japan International Cooperation Agency) as Part of Universitas Hasanuddin , Engineering Faculty Development Project, Japan; Period October 2009-March 2013.
   (c) Short Term Research Program Grant, from JICA (Japan International Cooperation Agency) as Part of Universitas Hasanuddin , Engineering Faculty Development Project, Japan; Period October 2015-January 2016.
   (d) JICA Knowledge Co-Creation Program, JICA, Japan, 8-14 July 2018
8. Service activities (within and outside of the institution):
   (a) Local Organizing Committee, Makassar International Conference on Electrical Engineering and Informatics (MICEEI), 2014.
   (b) Technical Program Chair, International Conference on Computational Intelligence and Cybernetics (Cybernetics.com), 2016.
   (c) Organizing Committee, EPI International Conference on Science and Engineering, 2018.
9. Briefly list the most important publications and presentations from the past five years:
   (a) Intan Sari Areni, Asmah Akhriana, Elyas Palantei, Sukriyah Buwarda: "Utilization of HF Electromagnetic Waves Availability for Charging Mobile Communication Device", Makassar International Conference on Electrical Engineering and Informatics (MICEEI), Makassar Golden Hotel, 26-30 November 2014.
   (b) Elyas Palantei, Ashadi Amir, Dewiani, Intan Sari Areni, Andani: "Early Stage Cancer Detection Technique Considering the Reflected Power from Breast Tissues", ARPN Journal of Engineering and Applied Sciences, Vol. 10, No. 17, 2015.

(c) Elyas Palentei, Intan Sari Areni, Muh.Fahmi Rustan, dan Ardiansyah: "Improvement of UWB Patch Transducer Properties Applicable for Fetal Monitoring System", IEEE Asia Pasific Conference on Wireless and Mobile (ApWiMob), Bandung, 27-29 August 2015.

(d) Indrabayu, Baizul Saman, Amil A. Ilham, Intan Sari Areni: "Prediction of Reagents Needs Using Radial Basis Function in Teaching Hospital", International Journal of Engineering and Technology (IJETIY), Vol. 4, No.17, 2015.

(e) Intan Sari Areni, Elyas Palantei, Ansar Suyuti, Adnan, Weni Sri Yusnita, Heni Susanti: "Attenuation Measurement of Laboratory-Based PLC Implementation", Vol.8, No.1, 2016.

(f) Zahir Zainuddin, Intan Sari Areni, Raden Wirawan: "Augmented Reality Application in Smart Building Information System", Jurnal Nasional Teknik Elektro dan Teknologi Informasi (JNTETI) – Universitas Gadjah Mada, Vol. 5, No. 3, August 2016.

(g) Christoforus Y., Indrabayu, Ingrid Nurtanio, Reza Maulana, Intan Sari Areni, Elly Warni: "Apriori Algorithm for Surgical Consumable Material Standardization", International Organization Of Scientific Research (IOSR),Vol. 18, Issue 6, Ver III, Nov-Dec 2016.

(h) Anugrahyani, Intan Sari Areni, Indrabayu, Novy Nurrahmillah: "Speech to Text for Indonesian Homophone Phrase with Mel Frequency Cepstral Coefficient", International Conference on Computational Intelligence and Cybernetics (Cyberneticscom), SwissBel-Hotel Makassar, 22-23 Nov 2016.

(i) Adnan, Intan Sari Areni, Muh. Iqbal, Yuni Andayani: "Smart Laboratory System Using Raspberry Pi 2", ICIC Express Letters, Part B: Applications, Vol. 8, Number 4, Pp. 763-766, April 2017.

(j) Intan Sari Areni, Anugrahyani, Indrabayu: "Improvement in Speech to Text for Bahasa Indonesia Through Homophone Impairment Training", Journal of Computers (Taiwan), Vol. 28, No. 5, pp. 1-10, 2017.

(k) Intan Sari Areni, Asyraful Insan Asry, Indrabayu: "A hybrid feature extraction method for accuracy improvement in "Aksara Lontara" translation", Journal of Computer Science, Vol.13, Issue 9, pp. 393-399, 2017.

(l) Intan Sari Areni, Sri Wahyuni, Indrabayu: "Solution to Abbreviated Words in Text Messaging for Personal Assistant Application", International Seminar on Application for Technology of Information and Communication (ISEMANTIC), Semarang, 7-8 October 2017.

(m) Indrabayu, Rizki Yusliana Bakti, Intan Sari Areni: "A Modified Pinhole Camera Model for Automatic Speed Detection of Diagonally Moving Vehicle", Journal of Engineering Science and Technology Vol. 13, No. 6 (2018), pp. 1722 – 1734, 2018.

10. Briefly list the most recent professional development activities:

(a) Short Term Research Program, October 2015 – January 2016

B.12 Merna Baharuddin

1. Name: Merna Baharuddin
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin ,1999
   (b) Master degree, Electrical Engineering Monash University, 2002
   (c) Doctor degree, Electrical Engineering, Chiba University, 2010
3. Academic experience:
   (a) Lecturer (2005-2011), Assistant Professor, 2012-now
4. Non-Academic Experience:
   (a) PT. Bukaka SingTel International, Junior Project Engineer, Data Network Analyser, 2000
5. Certification or professional registration: N/A
6. Current membership in professional organization: N/A
7. Honors and awards:
   (a) Australian Development Scholarship (ADS), Australia, 2000-2002
   (b) Monbukagakusho Scholarship, Japan, 2006-2010
8. Service activities (within and outside of the institution).
   (a) Committee Member, The 13th CEReS International Symposium on Remote Sensing: Disaster Monitoring and Mitigation in Asia, 29 October 2007, Chiba, Japan
   (b) Committee Member, The 3rd Indonesia Japan Joint Scientific Symposium (IJJSS 2008), 9-11 September 2008 at Chiba University, Japan
   (c) Committee Member, International Workshop on Synthetic Aperture Radar (IWSAR 2009), February 16, 2009 at Chiba University, Japan.
   (d) Committee Member, The 2nd Makassar International Conference on Electrical Engineering and Informatics (MICEEI) 2010 at Makassar, Indonesia.
9. Briefly list the most important publication and presentation from past five years
   (a) Merna Baharuddin, Zulfajri Basri Hasanuddin, Misdawati, and Khairunnisa Mansur: "A Waterproof Ultrasonic Sensing System for Locating Fish in Underwater Area", International Journal of Engineering and Science Applications, Vol.3, no 2, pp. 201-206, November 2016.
   (b) Merna Baharuddin, "Pengukuran dan Analisis Kualitas Sinyal Satelit untuk Aplikasi Land Mobile Satellite (LMS) terhadap Ketinggian dan Sudut Elevasi Penerima Global Positioning System (GPS)", Seminar Nasional Fisika 2013, Universitas Hasanuddin , Makassar, Nop 2013, Makassar.
   (c) Merna Baharuddin, Elyas Palantei, "A Preliminary experiment on transmitter and receiver of nanosatellite for telemetry application", 4th Makassar International Conference on Electrical Engineering and Informatics (MICEEI), Nop 2014, Makassar.
   (d) Merna Baharuddin, Elyas Palantei, "Prototipe Receiver untuk Charging Perangkat Bergerak via Sinyal Radio Frequency (RF)", Seminar Nasional Teknologi Industri Politeknik ATI Makassar (SNTI IV 2016), November 2016, Makassar.
10. Briefly list the most professional professional development activities
   (a) Visiting Researcher in Chiba University, July-September 2013, Japan

B.13 Muhammad Anshar

1. Name: Muhammad Anshar
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1999
   (b) Master degree, Computer Science by Research, University of Technology Sydney, 2009
   (c) Doctor degree, Computer Systems, University of Technology Sydney, 2017
3. Academic experience:
   (a) Senior Lecturer (2016-now), Lecturer (2005-2016), Assistant (2003-2005)
   (b) Basic Electric Laboratory, Associate Head, (2009-2011)
   (c) Students Affairs, Electrical Engineering Department, Head, (2009-2011)
   (d) Robotics Development Group, Director, (2005-2012)
   (e) Indonesia-Australia Social Robotics Research Collaboration, Director, 2016-now
4. Non-academic experience: part time in a private engineering company
   (a) PT. National Panasonic Gobel Indonesia - Branch Makassar, 1997
   (b) PT. Industri Kapal Indonesia IKI, Makassar, 1997-1998
5. Certifications or professional registrations: Lecturer Certification (2011)
6. Current membership in professional organization: BICA Society, Member (2015 - 2016)
7. Honors and awards:
   (a) Australia Partnership Scholarship - APS Australia Aid, (2006-2009)
   (b) Australia Leadership Award - ALA Australia Aid, (2012 -2016)
8. Service activities (within and outside of the institution):
   (a) Quality Enhancement of Clean Water Supply in Remote Region Maros South Sulawesi (QECeWaS), under the funding of Australian Alumni Grant Scheme (AGS) 2nd Round 2017
9. Briefly list the most important publications and presentations from the past five years:
   (a) Evolving Artificial Pain from Fault Detection Through Pattern Data Analysis, co-author: Mary-Anne Williams, Proceedings of the 2017 IEEE International Conference on Real-time Computing and Robotics (IEEE RCAR 2017) Okinawa, Japan (14-18 July 2017)
   (b) Evolving synthetic pain into an adaptive self-awareness framework for robots, co-author: Mary-Anne Williams, Journal of Biologically Inspired Cognitive Architectures, Vol. 16, Pages 8-18, Elsevier, 2016.
10. Briefly list the most recent professional development activities:
    (a) Leadership Workshop, Canberra, 2012

B.14 Muhammad Bachtiar Nappu

1. Name: Muhammad Bachtiar Nappu
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, (1994-1999)
   (b) Master degree, Electrical Engineering, Institut Teknologi Bandung, (1999-2001)
   (c) M.Phil., Electrical Engineering, the University of Queensland, (2007-2009)
   (d) Doctor degree, Electrical Engineering, University of Queensland, (2009-2013)
3. Academic experience:
   (a) Head of Research and Development Center on Energy and Electricity, Research and Community Services Institute, 2016-now
   (b) Lecturer, 2003-now
4. Non-academic experience: N/A
5. Certifications or professional registrations:
   (a) Lecturer Certification
6. Current membership in professional organizations: N/A
7. Honors and awards: N/A
8. Service activities (within and outside of the institution):
   (a) 2017, Speaker/ facilitator of Community Services Project for primary school students and teachers in Makassar, "Education for the usage of solar energy as an alternative and environmentally friendly energy for primary school community", Makassar.
9. Briefly list the most important publications and presentations from the past five years Journal publications:
   (a) M.B. Nappu, A. Arief and R.C. Bansal, "Transmission Management for Congested Power System: A Review of Concepts, Technical Challenges and Development of a New Methodology" Renewable and Sustainable Energy Reviews, ELSEVIER, Vol. 38, pp. 572–580, October 2014.
   (b) M.B. Nappu, R.C. Bansal, T.K. Saha, "Market Power Implication on Congested Power System: A Case Study of Financial Withheld Strategy", International Journal of Electric Power and Energy Systems (IJEPES), vol. 47, pg. 408-415, ELSEVIER, May 2013.
   (c) A. Arief, Z.Y. Dong, M.B. Nappu, and M. Gallagher, "Under Voltage Load Shedding in Power Systems with Wind Turbine-Driven Doubly Fed Induction Generators", Electric Power System Research, ELSEVIER, vol. 96, pp. 91-100, March 2013.
   (d) A. Arief, Antamil and M.B. Nappu, "Analytical Method for Reactive Power Compensators Allocation", International Journal of Technology, Volume 9(3), pp. 602-612, Scopus indexed, ISSN: 2086-9614, 2018.
   (e) M.B. Nappu, A. Arief and A.S. Duhri, "Economic Emission Dispatch for Thermal Power Plant in Indonesia", accepted for publication in International Journal of Smart Grid and Clean Energy (IJSGCE), ISSN: 2315-4462, Scopus indexed, 2018.

(f) W.A. Ajami, A. Arief and M.B. Nappu, "Optimal power flow for power system interconnection considering wind power plants intermittency" accepted for publication in International Journal of Smart Grid and Clean Energy (IJSGCE), ISSN: 2315-4462, Scopus indexed, 2018.

(g) W.S. Alfira, M.B. Nappu and A.Arief, "Under Voltage Load Shedding Simulation for Southern Sulawesi Power System with Integration of Wind Power Plants", accepted for publication in Advance Science Letter, Scopus indexed, ISSN: 1936-6612, 2018.

(h) M.B. Nappu and A. Arief, "Network Losses-Based Economic Redispatch for Optimal Energy Pricing in a Congested Power System", Energy Procedia, ELSEVIER, Volume 100, November 2016, Pages 311-314.

(i) A. Arief, Antamil and M.B. Nappu, "An Analytical Method for Optimal Capacitors Placement from the Inversed Reduced Jacobian Matrix", Energy Procedia, ELSEVIER, Volume 100, November 2016, Pages 307-310.

10. Conference Presentations:

(a) M.B. Nappu, A. Arief, and M.I. Bachtiar, "Strategic Placement of Capacitor and DG for Voltage Improvement after Large Penetration of Renewable Energy Power Plant: An Indonesian Study", to be presented at the 7th International Conference on Renewable Energy Research and Applications (ICRERA 2018), 14-17 October 2018, Paris, France.

(b) M.B. Nappu, A. Arief and A.S. Duhri, "Economic Emission Dispatch for Thermal Power Plant in Indonesia", to be presented at the 5th International Conference on Power and Energy Systems Engineering (CPESE 2018), 19-21 September 2018, Nagoya University, Nagoya, Japan

(c) M.B. Nappu, A. Arief, "Network Losses-Based Economic Re-dispatch for Optimal Energy Pricing in a Congested Power System", the 3rd International Conference on Power and Energy Systems Engineering (CPESE 2016), 8-10 September 2016, Kitakyushu, Japan.

(d) M.B. Nappu, M.I. Bachtiar, A. Arief, "Network Losses Reduction Due To New Hydro Power Plant Integration", the 3rd International Conference on Information Technology, Computer and Electrical Engineering (ICITACEE 2016), 19 – 21 October 2016, Semarang, Indonesia.

(e) M.B. Nappu, A. Arief, "Economic Re-dispatch Considering Transmission Congestion for Optimal Energy Price in a Deregulated Power System", International Conference on Electrical Engineering and Informatics (ICEEI 2015), Denpasar – Bali, Indonesia, August 10-11, 2015.

11. Briefly list the most recent professional development activities: N/A

B.15 Muhammad Niswar

1. Name: Muhammad Niswar
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1997
   (b) Master degree, Information Technology Computer Engineering, University of Newcastle, 2001
   (c) Doctor degree, Engineering, Information Science Nara Institute of Science and Technology, 2010
3. Academic experience:
   (a) Assistant Lecturer (1999-2003), Lecturer (2005-2009), Assistant Professor (2010-2011), Lecturer (2012-2016), Senior Lecturer, 2017-now
4. Non-Academic Experience:
   (a) Director, Directorate of Information Technology, Universitas Hasanuddin, Indonesia Developing and maintaining ICT services and infrastructures in Campus, 2012-now
   (b) Visiting Researcher, University of Washington, WA, US, ICT for Development, Fall, (2012)
   (c) Instructor, Training Center Japan (TCJ), Conducting training of Cisco Network Academy, (2010-2011)
   (d) Wireless Access Engineer, Lucent Technology, Network System Indonesia, Installation and commissioning test of Wireless Local Loop Infrastructures, (1997-1998)
5. Certifications or professional registrations:
   (a) Cisco Certified Network Associate (CCNA), Cisco ID: CSCO11859357
   (b) Certified Data Center Professional (CDCP), CDCP ID: 5863072.20604917
6. Membership in professional organizations
   (a) Member (#94036635), The Institute of Electrical and Electronics Engineer (IEEE).
   (b) Member, Asosiasi Pendidikan Tinggi Informatika dan Komputer (Association of Higher Education for Informatics and Computer Study).
7. Honors and awards:
   (a) C-BEST JICA Research Grant (2018)
   (b) Fullbright Scholarship Awardee (2012)
   (c) InSiNAS Research Grant from Ministry of Research and Technology, Indonesia (2012-2014)
   (d) Monbukagakusho Scholarship Awardee (2006-2010)
   (e) Australian Development Scholarship (ADS) Awardee (2000-2001)
8. Service activities:
   (a) Member, Center of Technology Organizing Committee, Faculty of Engineering, Universitas Hasanuddin
9. Briefly list the most important publications and presentations from the past five years:

(a) Muhammad Niswar, Zahir Zainuddin, Yushinta Fujaya, Zagita Marna Putra, "An Automated Feeding System for Soft Shell Crab", Indonesian Journal of Electrical Engineering and Computer Science, Vol. 5, No. 3, 2017, pp.564-568

(b) Muhammad Niswar, Aksan S. Wijaya, Muhammad Ridwan, Adnan, Amil A. Ilham, Rhiza S. Sadjad, Andreas Vogel, "The Design of Wearable Medical Device for Triaging Disaster Casualties in Developing Countries", in Proceedings of Digital Information Processing and Communication (ICDIPC 2015), Fifth International Conference on, Sierre, Switzerland, 2015, pp.207-212

(c) Muhammad Niswar, Shigeru Kashihara, Suguru Yamaguchi. "Vertical Handover Management for VoIP session over broadband Wireless Networks", Int'l Journal of Communication, Network and System Sciences, Vol. 6, No. 6, 2013, pp. 289-299.

(d) Muhammad Niswar, et al. "Performance Evaluation of ZigBee-based wireless sensor network for Monitoring Patients' pulse status", In Proceeding of Information Technology and Electrical Engineering (ICITEE), 2013 IEEE International Conference on, pp.291-294, Jogjakarta, Indonesia, 7-3 October 2013

(e) Muhammad Niswar, Sabri AA, Warni E, Musa MN, "Memory Sharing Management on Virtual Private Server", In Proceeding of ICT for Smart Society (ICISS), 2013 IEEE International Conference on, pp.1-4, Jakarta, Indonesia, 13-14 June 2013

10. Briefly list the most recent professional development activities:

(a) Scientific Publication Management Training at LIPI, Jakarta, 2016

(b) Workshop on Developing Online Education (DOED), Universitas Indonesia, 2013

B.16 Rhiza Samsoe'oed Sadjad

1. Name: Rhiza Samsoe'oed Sadjad
2. Education:
   (a) Bachelor degree, Electrical Engineering, Institut Teknologi Bandung, 1981
   (b) Master degree, Electrical Engineering, University of Wisconsin, 1989
   (c) Doctor degree, Ph.D. Electrical Engineering, University of Wisconsin, 1994
3. Academic experience:
   (a) Lecturer (2000-2011), Assistant (1982-2000), Senior Lecturer, 2011-now
   (b) Head of Control Systems and Instrumentation Laboratory (1995)
   (c) Chairman of Computer, Control and Electronic Sub-Study Program (2010-2015)
   (d) Department of Electrical Engineering, Chairman (2003)
   (e) Focus Group Discussion on Curriculum, Chairman (2012-2017)
4. Non-academic experience:
   (a) PT Compact Microwave Indonesia, Bandung, System Engineer (1990-1995)
5. Certifications or professional registrations: Lecturer Certification (2012)
6. Current membership in professional organizations
   (a) IEEE, Student Member (1988-1994), Member, 2016-now
   (b) IEEE Instrumentation and Measurement Society, Member, 2016-now
7. Honors and awards: N/A
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from the past five years: N/A
10. Briefly list the most recent professional development activities: N/A

B.17 Salama Manjang

1. Name: Salama Manjang
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin , 1988
   (b) Master degree, Electrical Engineering, Institut Teknologi Bandung, 1994
   (c) Doctor degree, Electrical High Voltage Insulation Technology, Institut Teknologi Bandung - Sandwich in T.U. Braunschweig University, 2001
3. Academic experience:
   (a) Lecturer (2001-2006), Senior Lecturer (2006-2008), Professor of High Voltage Engineering, 2008-now
   (b) Chair of Department of Electrical Engineering, 2016-now
   (c) Head of Center for Electricity Energy Research and Development at the Institute for Research and Community Service (LP2M) (2014-2016)
   (d) Head of High Voltage Engineering Laboratory Electrical Engineering, 2009-now
   (e) Secretary Head of High Voltage Engineering Laboratory, Makassar (2006-2008)
   (f) Vice Head of Energy and Electricity Assessment Research Center, (2004-2014)
   (g) Chair of Post Graduate Study Program, Post Graduate Program, Universitas Hasanuddin (2004-2014)
4. Non-academic experience:
   (a) Preparation of the Road Map Village Electricity South Sulawesi, Southeast Sulawesi and West Sulawesi 2015-2019, Cooperation of PT. PLN (Persero) Wil. Sulselrabar with LPPM- Universitas Hasanuddin , 2014.
   (b) Field Investigation Study of Steam Power Plant (PLTU 2x50 MW) IPP Sulut3, North Sulawesi, Cooperation of PT. PLN (Persero) PUSENLIS Jakarta with LPPM-Universitas Hasanuddin , 2013.
   (c) Field Investigations Study of Hydropower Project (PLTA) Watunohu 1 Kolaka, Southeast Sulawesi, Cooperation of PT. PLN (Persero) PUSENLIS Jakarta with LPPM-Universitas Hasanuddin , 2013.
   (d) Document Preparation of Management Environmental Impact Analysis (AMDAL) Mini Hydro Power Plant (2x2 MW) Lapai I Southeast Sulawesi. Cooperation of PT. PLN (Persero) UIP XII with LPPM-Universitas Hasanuddin , 2013.
   (e) Optimizing the Use of Renewable Energy for Primary Energy Power Plants in South Sulawesi Scenario-Based National Energy Mix, Compete Grant Project, Higher Education of the Republic of Indonesia, 2013.
5. Certifications or professional registrations:
   (a) Reviewer certificate from the Ministry of Research, Technology and Higher Education, Republic of Indonesia (2017).
   (b) Certificate of Assessor Competency in the Installation of Electric Power, from Ministry of Energy and Mineral Resources of the Republic of Indonesia (2016)
   (c) Certificate for Energy Audit in the Building, by Renewable Energy and Energy Conservation, Ministry of Energy and Mineral Resources of the Republic of Indonesia (2015)
   (d) Certificate of Main Electric Power Engineer, Construction Services Development Board (2015).

(e) Certificate of Up Grading Assessor (IATKI's Assessor). The Indonesian Power Engineers Association (2010)

6. Current membership in professional organizations:

   (a) Electrical Engineer Alumni Association, Vice President, 2006-now.

   (b) Indonesian Engineer Association (PII), Coordinator for South Sulawesi, 2006-now.

   (c) National Consultant Association (INKINDO) South Sulawesi, Head of Expert and Advocacy, (2006-2010)

   (d) Indonesian Electrical Contractor Association (AKLINDO). Advisory Board for South Sulawesi. 2004-now.

   (e) Indonesian Electricity Expert Association (IATKI) South and Southeast Sulawesi. Chairman. 2004-now.

   (f) Indonesia Electricity Society (MKI) South and Southeast Sulawesi, member 2004-now.

   (g) Association of ITB Alumni (IA-ITB) South Sulawesi, member 2003-now.

7. Honors and awards: N/A

8. Service activities (within and outside of the institution): N/A

9. Briefly list the most important publications and presentations from the past five years:

   (a) Design Analyse of Ceramic and Polymer 150 kV Insulators for Tropical Condition Using Quicfield Software, Salama Manjang , Engineering International Conference 6th, 2017, ISSN 2540-7740.

   (b) Evaluating the Effect Placement Capation and Distributed Photovoltaic Generation for Power System Losses Minimization in Radial Distribution System, Salama Manjang , Engineering International Conference 6th, 2017, ISSN: 2540-7740.

   (c) Potential of Renewable Energy from Waste Mitigation of Gas Emissions, Salama Manjang at al, 2017 IEEE International Conference on Smart Grid and Smart Cities, July 2017, ISBN; 978-1-5386-0504-2.

   (d) Settling Basin Modeling to Reduce Fluctuation of Sediment Concentration on MHP Irrigation Channels, Arifin P,Salama Manjang , Nadjamuddi H, Jurnal IJCIET, August 2017, Vol. 8 No. 8, ISSN Online: 0976-6316.

   (e) Analisis sedimentasi pada PLTMH Saluran Irigasi dan Pemodelan Settling Basin, Arifin P, Salama Manjang , Nadjamuddi H, Jurnal Nasional Prodi S3 Teknik Sipil Unhas, January 2017, Vol. XL, Makassar, ISSN: 2087-7986.

   (f) Analysis Effect of Sedimentation at MHP Type Turbine open Flume on Irrigation Channel, Arifin P, Salama Manjang , Nadjamuddi H, Jurnal Ijera, Januari 2017, Vol. 7, No. 1, ISSN: 2248-9622.

   (g) Energy Yield of Photovoltaic (PV) Systems Support Hybrid Power Generation in Bontang City, Indonesia, Sitti Hamnah, Salama Manjang , ICIC Express Letters An International Journal Of Research And Surveys, November 2017, Vol.9, No. ISSN: 1881-803.

10. Briefly list the most recent professional development activities: N/A

B.18 Sri Mawar Said

1. Name: Sri Mawar Said
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1985
   (b) Master degree, Electrical Engineering, Universitas Hasanuddin, 2004
   (c) Doctor degree, Civil Engineering, Universitas Hasanuddin, 2014
3. Academic experience:
   (a) Lecturer, 1986-now
   (b) Head of Basic Electrical Laboratory, (2010-2012)
   (c) Head of Electrical Machines Laboratory, 2016-now
4. Non-academic experience: N/A
5. Certifications or professional registrations:
   (a) Lecturer Certification (2009)
6. Current membership in professional organizations:
   (a) The Institution of Engineers Indonesia, Member, 2010-now
7. Honors and awards:
   (a) The 10-Year National Badge "Satya Lencana Karya Satya", 2017, from the President of the Republic of Indonesia
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from the past five years:
   (a) Sri Mawar Said, Salama Manjang, M.Wihardi Tjaronge, Muh. Arsyad Thaha: "Arima Application as an Alternative Method of Rainfall Forecasts in Watershed of Hydro Power Plant", International Journal of Computational Engineering Research (IJCER), Vol. 3, Issue 3, pp.68-73, 2013.
   (b) Sri Mawar Said, Salama Manjang, M.Wihardi Tjaronge, Muh. Arsyad Thaha: "Electrical Energy Consumption Prediction in South–West Sulawesi Electrical Power System", International Journal of Computational Engineering Research (IJCER), Vol. 3, Issue 3, pp.74-78, 2013.
   (c) Sri Mawar Said, Salama Manjang, M. Wihardi Tjaronge, Muh. Arsyad Thaha: "Modelling of Water Resources in Bakaru Hydropower Plant in Anticipating Load Increment in Sulselbar Power System", International Journal of Computational Engineering Research (IJCER), Vol. 4, Issue 8, pp.1-5, 2014.
   (d) Yusri Syam Akil, Saiful Mangngenre, Sri Mawar Said, Kifayah Amar: "Preliminary Study of Perception and Consumer Behaviour Towards Energy Saving for Household Appliances: A Case of Makassar", Journal of Physics: Conference Se-ries, Vol. 979, pp. 1-6, 2018.
   (e) Andi Nurtrimarini Karim, Sri Mawar Said, Indar Chaerah Gunadin, Mustadir Darusman B.: "Impact of Penetration Wind Turbines on Transient Stability in Sulbagsel Electrical Interconnection System", Journal of Physics: Conference Series, Vol. 979, pp. 1-8, 2018.

(f) Syafaruddin, Muhammad Iqbal Abubakar, Hizkia Glorius Soma, Sri Mawar Said, Satriani Latief: "Determination of Sensorless Input Parameters of Solar Panel with Adaptive Neuro-Fuzzy Inference System (ANFIS) Method", International Journal of Innovative Computing, Information and Control (IJICIC) Vol.14, No.6, December 2018

10. Briefly list the most recent professional development activities: N/A

B.19 Syafaruddin

1. Name: Syafaruddin
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin,1996
   (b) Master degree, Electrical Engineering, University of Queensland, 2003
   (c) Doctor degree, Electrical Engineering, Kumamoto University, 2009
3. Academic experience:
   (a) Lecturer (1999-2002), Assistant Professor (2003-2013), Associate Professor (2014-2016), Professor, 2017-now
4. Non-academic experience:
   (a) PT. Siemens Indonesia Site Planning Engineer Supervising and Network Testing
5. Certification or professional registration:
   (a) National Institute of Construction Services Development, Indonesia
6. Current membership in professional organization:
   (a) Member, Indonesian Association of Electricity Engineering Experts
   (b) Honorary Member, Scientific & Technical Research Association (STRA) of Eurasia Research Group
7. Honors and awards:
   (a) Dean's Commendation for High Achievement, Faculty of Engineering, Hasanuddin University, Indonesia, 1996
   (b) Australian Development Scholarship (ADS), Australia, 2003-2004
   (c) Dean's Commendation for High Achievement, Faculty of Engineering, Physics & Architecture, The University of Queensland, Australia, 2004
   (d) Monbukagakusho Scholarship, Japan, 2006-2009
   (e) Research Funding Program Supported by GRASIUS (Graduate School Action Scheme for Internationalization of University Students) of Kumamoto University, Japan, 2008
8. Service activities (within and outside of the institution):
   (a) Members, International Conference on Innovative Computing, Information and Control (ICICIC), 2017-2018
   (b) Technical Committee Chairs, International Conference on Green Energy (ICOGE), 2017
   (c) Technical Committee, International Conference on Power and Electrical Engineering (ICPEE), 2018
   (d) Conference Chairs, International Conference on Advanced Technologies in Energy and Electrical Engineering (AT3E), 2018
   (e) Conference Chairs, International Symposium on Green Energy and Smart Grid (SGESG), 2018
9. Briefly list the most important publications and presentations from past five years:

(a) Syafaruddin, Ranu Fauzan, Andika S. Amir, Hajime Miyauchi: "Microcontroller ATmega8535 Based Solar Tracker Design for PV System Applications in Equator Regio", International Journal of Control and Automation, Vol.7, No.4, pp.217-234, April 2014

(b) Syafaruddin, Dionisius Galla, Willy A.F.A Ajami: "Design of Boat Powered Photovoltaic Systems", Applied Solar Energy, Vol.50, No.4, pp.207-214, October 2014

(c) Syafaruddin, Nella Chintia Mendeng, Pilipus Master, Zaenab Muslimin: "Real-Time and Continuous Output Power Monitoring of Photovoltaic (PV) Systems", ICIC Express Letters: International Journal of Research and Surveys, Vol.9, No.1, pp.9-16, January 2015

(d) Syafaruddin, H. Narimatsu, Hajime Miyauchi: "Optimal Energy Utilization of Photovoltaic Systems Using the Non-Binary Genetic Algorithm", Energy Technology & Policy, Vol.2, No.1, pp. 10-18, February 2015

(e) Syafaruddin: "Interval Type Two Fuzzy Logic System (IT2FLS) based Short-Term Load Forecasting", ICIC Express Letters: International Journal of Research and Surveys, Vol.9, No.9, pp. 2445-2452, September 2015

(f) Syafaruddin, Faizal Arya Samman, Alfian, Muh. Aksa Idris, Siti Hamnah Ahsan and Satriani Latief: "Characteristics Approach of Thin-Film CIGS PV Cells with Conventional Mono-Crystalline Silicon Model", The International Journal of Innovative Computing, Information and Control (IJICIC), Vol.12, No.1, pp.171-180, February, 2016.

(g) Syafaruddin, Zaenab Muslimin, Fathul Razak, Arnita Tri Ananda, Satriani Latief: "Modeling and Simulation of Wind Power with Permanent Magnet Synchronous Generator (PMSG)", ICIC Express Letters: International Journal of Research and Surveys, Vol.10, No.9, pp. 2121-2127, September 2016.

(h) Syafaruddin, Satriani Latief, Wahyu H. Piarah: "Design of Photovoltaic-Thermal (PV/T) for Building Integrated Photovoltaic Systems", Journal of Clean Energy Technology, Vol.5, No.4, pp.304-309, July, 2017.

(i) Syafaruddin, Faizal Arya Samman, Zaenab Muslimin, Satriani Latief: "Design of Automatic Control for Surface Cleaning Systems of Photovoltaic Panel", ICIC Express Letters, Part B: Applications, Vol.8, No.11, pp. 1457-1464, November 2017

(j) Syafaruddin, Satriani Latief: "A Simple Method for Determination of Electrical Characteristics in Different Photovoltaic (PV) Modules Technologies", ICIC Express Letters, Vol.12, No.9, pp. 871-880, September 2018

(k) Syafaruddin, Muhammad Iqbal Abubakar, Hizkia Glorius Soma, Sri Mawar Said, Satriani Latief: "Determination of Sensorless Input Parameters of Solar Panel with Adaptive Neuro-Fuzzy Inference System (ANFIS) Method", International Journal of Innovative Computing, Information and Control (IJICIC) Vol.14, No.6, December 2018

10. Recent professional development activities:

(a) Visiting Professor at Northern Illinois University, September-December 2018, USA

(b) Visiting Researcher in Kumamoto University, July-September 2013, Japan

(c) Project Assistant Professor in Kumamoto University, October 2009-March 2011, Japan

B.20 Wardi Djuaeni

1. Name: Wardi Djuaeni
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1997
   (b) Master degree, Telecommunication Engineering, University of South Australia, 2006
   (c) Doctor degree, Electrical Engineering and Computer Science, Ehime University, 2012
3. Academic experience:
   (a) Lecturer, (2007), Assistant Professor, 2007-now
4. Non-academic experience:
   (a) Siemens Telecommunication, Junior Engineer, Network Planning and Implementation, 1997-1998.
   (b) Ehime University, Post-Doctoral, Short Term Research, July-October 2013.
5. Certifications or professional registrations:
   (a) MTCNA Mikrotik
6. Current membership in professional organization:
   (a) Indonesian Engineer Association
7. Honors and awards: N/A
8. Service activities (within and outside of the institution):
   (a) Internal Auditor of ISO 9001: 2015 for Universitas Hasanuddin, 2018-now
   (b) Head of Networking and Infrastructure Division in Directorate of System and Information Technology, Universitas Hasanuddin, 2015-now
   (c) Secretary for Student Affair of Electrical Engineering Department, Universitas Hasanuddin, (2003-2004)
9. Briefly list the most important publications and presentations from the past five years:
   (a) Elyas Palantei, Ashadi Amir, Wardi Djuaeni, Intan Sari Areni, Dewiani Djamaluddin, Sukriyah Buwarda, "High Gain CP Antenna for Mobile Satellite Communications Numerically Evaluated under Various Packaging Materials", Makassar International Conference on Electrical Engineering and Informatics (MICEEI), Makassar, Indonesia, November 2014
   (b) Intan Sari Areni, Wardi Djuaeni, Indrabayu, Zaenab Muslimin, Fitriyanti Mayasari, "Pembuatan Modul Perhitungan Control Cost Pembangkit Tenaga Uap", Seminar Nasional Teknik Energi dan Ketenaga Listrikan (SNTEK), Makassar, Indonesia, August 2014
   (c) Jalaluddin, Abdul Rasyid Jalil, Rustan Tarakka, Wardi Djuaeni, "Pemberdayaan Masyarakat dengan Pemanfaatan Sumber Energi Terbarukan pada Tambak Udang", Agrokreatif Jurnal Ilmiah Pengabdian Kepada Masyarakat, Vol.1(2), 2015
   (d) Khairunnisa Mansur, Zulfajri Basri Hasanuddin, Wardi Djuaeni, 'Implementation of NFC for Smart Gate Access Control in Campus Area", Proceedings of the International Conference on Science and Technology (ICOSAT 2017), Jakarta, Indonesia, August 2017.

(e) Syafruddin Syarif, Syafaruddin, Wardi Djuaeni, Shinya Kobayashi, "Quality Analysis and Illegal Logging Image Detection Using SYARITAR Method", International Journal of Innovative Computing, Information and Control (IJICIC), Vol. 11(3), 2015

(f) Wardi Djuaeni, Andani Achmad, Zulfajri Basri Hasanuddin, Darmaji Asrun, Mohammad Syaiful Luthfi, "Portable IP-Based Communication System using Raspberry Pi as Exchange", International Seminar on Application for Technology of Information and Communication, Semarang, Indonesia, October 2017

(g) Wardi Djuaeni, Dewiani Djamaluddin, Andini Dani Achmad, Rima Wahyuningsih, Pebrina Hardianti Tokanu, "Sistem Pengaman dan Pelacak Kendaraan Berbasis Arduino Mega2560", Seminar Nasional Sains dan Teknologi, Makassar, Indonesia, September 2016

(h) Wardi Djuaeni, Indrabayu, Dewiani Djamaluddin, Sri Haryati B, Rida Ariyanti Z, "Performance Evaluation of Personal Computer on Mobile Cloud for Virtual Smartphone Based", Journal Penelitian Enjinering (JPE), Vol. 8(1), 2013

(i) Wardi Djuaeni, Intan Sari Areni, Andani Achmad, Irma Pratiwi Sayuti, "Evaluasi Unjuk Kerja Jaringan Ad Hoc Berbasis Protokol AODV", Seminar Nasional Aplikasi Teknologi Informasi 2014 (SNATi), Yogyakarta, Indonesia, June 2014

(j) Wardi Djuaeni, Zulkifli Tahir, Adnan, "Performance Evaluation OLSR Routing Protocol in a Testbed Environment", International Workshop on Modern Research Methods in Electrical Engineering and Informatics (IWoRMEE), Makassar, Indonesia, September 2013

(k) Zahir Zainuddin, Wardi Djuaeni, Yurika Nantan, "Applying Maritime Wireless Communication to Support Vessel Monitoring", The 4th International Conference on Information Technology, Computer and Electrical Engineering, Semarang, Indonesia, October 2017

10. Briefly list the most recent professional development activities:

(a) JICA Counterpart Training Course, Japan, September 2016

B.21 Yusran

1. Name: Yusran
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1998
   (b) Master degree, Electrical Engineering, Universitas Gadjah Mada, 2002
   (c) Doctor degree, Electrical Engineering, Institut Teknologi Sepuluh November, 2013
3. Academic experience:
   (a) Assistant Lecturer (2002-2004), Lecturer (2004-2008)
   (b) Associate Professor, 2008-now
   (c) Head of Power Electronic Laboratory, 2015-now
   (d) Secretary of Student Affair, 2018-now
4. Non-academic experience:
   (a) Electrical Power Engineer in PT INCO, Sorowako (Co-Ops Program), (2004-2005)
5. Certifications or professional registrations:
   (a) Lecturer Certification (2014)
6. Current membership in professional organization:
   (a) IATKI (2016-now)
7. Honors and awards:
   (a) The 10-Year National Badge "Satya Lencana Karya Satya", 2014, from the President of the Republic of Indonesia
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from the past five years:
   (a) Yusran, Ashari, M., and Soeprijanto, A., "Optimization Scheme of Distributed Generation Installation Growth Considering Network Power Quality", Journal of Theoretical and Applied Information (JATIT), Vol. 53, No.1, 2013, pp. 30-39, ISSN 1992-8645, E-ISSN 1817-3195
   (b) Yusran, "Electrical Network Power Quality Improvement Through Distributed Generation Optimum Placement Based on Breeder Genetic Algorithm Method", The 4th Makassar International Conference on Electrical Engineering and Informatics (MICEEI) 2014, ISBN 978-1-4799-6725-4
10. Briefly list the most recent professional development activities: N/A

B.22 Yusri Syam Akil

1. Name: Yusri Syam Akil
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 2001
   (b) Master degree, Electrical Engineering, Universitas Hasanuddin, 2005
   (c) Doctor degree, Electrical Engineering, Kumamoto University, 2013
3. Academic experience:
   (a) Lecturer, 2005-now
4. Non-academic experience: N/A
5. Certifications or professional registrations:
   (a) Lecturer Certification (2014)
6. Current membership in professional organization:
   (a) International Association of Engineers, Member, 2013-now
7. Honors and awards:
   (a) Netherlands Fellowship Programmes (NFP), The Netherlands, 2015.
   (b) The 10-Year National Badge "Satya Lencana Karya Satya", 2018, from the President of the Republic of Indonesia
8. Service activities (within and outside of the institution):
   (a) International Journal on Advanced Science, Engineering and Information Technology (IJASEIT), Reviewer, 2017-now
   (b) Makara Journal of Technology, Reviewer, 2017-now
   (c) International Journal of Engineering and Technology Innovation (IJETI), Reviewer (2017)
   (d) International Conference on Science and Engineering (ICSE), Scientific Committee (2017)
   (e) International Conference on Electrical, Electronics and Information Engineering (ICEEIE), Technical Committee (2017)
   (f) International Seminar on Intelligent Technology and Its Applications (ISITIA), Reviewer (2015)
9. Briefly list the most important publications and presentations from the past five years:
   (a) Yusri Syam Akil, Saiful Mangngenre, Sri Mawar Said, Kifayah Amar, "Preliminary Study of Perception and Consumer Behaviour Towards Energy Saving for Household Appliances: A Case of Makassar", Journal of Physics: Conference Series, Vol. 979, pp. 1-6, 2018
   (b) Yusri Syam Akil, Yasunori Mitani, "Seasonal Short-Term Electricity Demand Forecasting under Tropical Condition using Fuzzy Approach Model", Journal of Telecommunication, Electronic, and Computer Engineering (JTEC) Special Issue, Vol. 9, No.1-3, pp. 77-82, 2017
   (c) Ansar Suyuti, Ikhlas Kitta, Yusri Syam Akil, "The Impact of the Operation Planning of Power Plants for Environmental Emissions in South Sulawesi", ARPN Journal of Engineering and Applied Sciences, Vol. 12, No.11, pp.3440-3444, 2017

(d) Faizal Arya Samman, Yusri Syam Akil, Nirwan A. Noor, "Design and Testing of Boost Type DC/DC Converter for DC Motor Control Applications", Proc. of the 2nd International Symposium on Smart Material and Mechatronics 2015, pp. 79-83, Gowa, Indonesia, 2015

(e) Salama Manjang, Rizki P. Putra, Yusri Syam Akil, Ikhlas Kitta, "Electrical and Mechanical Properties of Fly Ash Filled Silicone Rubber for High Voltage Insulator", ARPN Journal of Engineering and Applied Sciences, Vol. 10, No.17, pp.7320-7327, 2015

(f) Yusri Syam Akil, Hajime Miyauchi, "Seasonal Peak Characteristic Comparison Analysis by Hourly Electricity Demand Model", International Journal of Energy and Power Engineering, Vol. 3, No. 3, pp. 132–138, 2014

(g) Yusri Syam Akil, Syafaruddin, Tajuddin Waris, A. A. H. Lateko, "The Influence of Meteorological Parameters under Tropical Condition on Electricity Demand Characteristic: Indonesia Case Study", Proc. of the 1st International Conference on Information Technology, Computer, and Electrical Engineering, pp. 381-385, Semarang, Indonesia, 2014

(h) Yusri Syam Akil, Hajime Miyauchi, "Seasonal Regression Models for Electricity Consumption Characteristics Analysis", Engineering, Vol. 5, No. 1B, pp. 108–114, 2013

(i) Yusri Syam Akil, Hajime Miyauchi, "Seasonal Peak Electricity Demand Characteristics: Japan Case Study", International Journal of Energy and Power Engineering, Vol. 2, No. 3, pp. 136–142, 2013

10. Briefly list the most recent professional development activities:

(a) Course on "Competency Development Program and Professional Engineering Certification", The Institution of Engineers Indonesia, 2014, Indonesia

(b) Short Course Program on "Basic Analysis of Environmental Impact Assessment", Centre for Environmental Research and Development, Institute for Research and Community Service, Universitas Hasanuddin, 2015, Indonesia

(c) Short Course in UNESCO-IHE, Institute for Water Education, September 2015, The Netherlands.

(d) Visiting Researcher in Kyushu Institute of Technology, October – December 2015, Japan.

B.23 Zaenab Muslimin

1. Name: Zaenab Muslimin
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1990
   (b) Master degree, Electrical Engineering, Universitas Hasanuddin, 2004
3. Academic experience:
   (a) Lecturer, 1992-now
   (b) Relay and Measurement Laboratory, Secretary, 2002-2012
   (c) Department of Electrical Engineering, Secretary, 2007-2011
4. Non-academic experience:
   (a) CV. Duta Teknik Utama, Person in Charge of Engineering, (1993-2014)
   (b) PT. Andira Jaya Raya, Person in Charge of Engineering, 2014-now
5. Certifications or professional registrations:
   (a) Lecturer Certification (2009)
6. Current membership in professional organization:
   (a) IEEE, Student Member, (2017-2018)
7. Honors and awards: N/A
8. Service activities (within and outside of the institution): N/A
9. Briefly list the most important publications and presentations from the past five years:
   (a) Zaenab Muslimin, Indar Chaerah Gunadin, Muhammad Anshar, "Comparative Study of the Effect of Temperature of Miniature Sun with Spotlights on Solar Pond", Proceedings of the National Seminar on Electrical and Informatics Engineering, SBN: 978-602-18168-2-6, pp 247 – 251, Makassar, Indonesia, November 2017
   (b) Indar Chaerah Gunadin, Zaenab Muslimin, Agus Siswanto, "Transient Stability Improvement Using Allocation Power Generation Methode Based on Momen Inertia", 2017 International Conference on Electrical Engineering and Informatics (ICELTICs) ISBN: 978-1-5386-2934-1, Banda Aceh, Indonesia, October 2017
   (c) Indar Chaerah Gunadin, Zaenab Muslimin, Yusran, "Steady State Stability Assesment Using Continous Power Flow Based on Load Tap Changer", International Journal of Applied Engineering Research (IJAER), ISSN 0973-4562 Volume 12, Number 24 (2017)
   (d) Syafaruddin, Zaenab Muslimin, Fathul Razak, Arnita Tri Ananda, Satriani Latief, "Modeling and Simulation of Wind Power with Permanent Magnet Synchronous Generator (PMSG)", ICIC Express Letters: International Journal of Research and Surveys, Vol.10, No.9, pp. 2121-2127, September 2016
   (e) Syafaruddin, Nella Chintia Mendeng, Pilipus Master, Zaenab Muslimin, "Real-Time and Continuous Output Power Monitoring of Photovoltaic (PV) Systems", ICIC Express Letters: International Journal of Research and Surveys, Vol.9, No.1, pp.9-16, January 2015
10. Briefly list the most recent professional development activities: N/A

B.24 Zulfajri Basri Hasanuddin

1. Name: Zulfajri Basri Hasanuddin
2. Education:
   (a) Bachelor degree, Electrical Engineering, Universitas Hasanuddin, 1992
   (b) Master degree, Computer Science and Communication Engineering, Kyushu University, 1999
   (c) Doctor degree, Computer Science and Communication Engineering, Kyushu University, 2003
3. Academic experience:
   (a) Lecturer, 1993-now
   (b) Telematic Laboratory, Head, 2012-now
   (c) Satellite Communication Laboratory, Head, 2016-now
   (d) ICT Innovation Center, Head, 2018-now
4. Non-academic experience: N/A
5. Certifications or professional registrations:
   (a) Lecturer Certification (2009)
6. Current membership in professional organization:
   (a) The Institution of Engineers Indonesia, Member, 2010-now
   (b) Member of the National Research Council of the Republic of Indonesia, 2012-now
   (c) Persada Jepang, 2012-now
   (d) The Observer in APEC-MMC Think Tank, 2017-now
7. Honors and awards:
   (a) Letter of Appointment as The Observer in APEC-MMC Think Tank in one year from November 1, 2007 to October 31, 2018
   (b) Certificate of Appreciation as Invited Speaker from various Institution
8. Service activities:
   (a) Dean of the Faculty of Engineering, West Sulawesi University, 2017-now
9. Briefly list the most important publications and presentations from the past five years:
   (a) A. E. Multazam, Z. B. Hasanuddin, "Sistem Monitoring Kualitas Air Tambak Udang Vaname", JURNAL IT: Media Informasi STMIK Handayani Makassar 8 (2), 2018
   (b) M. R. Hidayat, A. Charisma, M. Arif, Z. B. Hasanuddin, S. Sambasri, "Empirical Study of Mobile Satellite Channel Characteristics in Indonesian Region", Wireless and Telematics (ICWT), 2017 3rd International Conference on, 191-194
   (c) K. Mansur, Z. B. Hasanuddin, W. Wardi, "Sistem Keamanan Informasi Pada Smart Gate Menggunakan Visual Basic", Jurnal Penelitian Enjiniring (JPE) 21 (1), 48-53
   (d) M. Amin, N. Harun, S. Pallu and Z. B. Hasanuddin, "Sustainable Water Resources Management for Makassar City Using Fuzzy Logic-Based Micro Controller (A Case Study in Jeneberang River)", Asian Academic Research Journal of Multidisciplinary, Vol. 4, Issue 7 (July 2017), ISSN: 2319-2801, pp. 128-136.

(e) L. M. Ambia, F. R. Djumingin, F. A. Samman, Z. B. Hasanuddin, "Design and Built Underwater Vehicle with Wireless Controlling Based on Arduino Microcontroller", MICEEI, Makassar, Indonesia, 26-30 November 2017.

(f) Z. B. Hasanuddin, S. Syarif and D. Inal, "Zakah Management System Using Approach Classification", TELKOMNIKA, Vol. 15, No. 4, December 2017

(g) A Noer, Z. B. Hasanuddin, D Djamaluddin, "Implementation of RFID based Raspberry Pi for User Authentication and Offline Intelligent Payment System", Quality in Research (QiR): International Symposium on Electrical and Computer Engineering, 2017, 15th International Conference

(h) Y.U. Sombolayuk, N. Harun, H. Parung, Z.B. Hasanuddin, "Early Detection System of Fire Hazard in High-Rise Buildings as a Result of Electrical Installation Failure", Asian Academic Research Journal of Multidisciplinary, Vol. 4, Issue 7 (July 2017), - ISSN: 2319-2801, pp. 112-119.

(i) Z. B. Hasanuddin, "Design of Ka-band Satellite Links in Indonesia", The International Conference on Satellite and Space Communication in Paris on August 2014.

(j) A. F. Himawan, Z. B. Hasanuddin, F. A. Samman, "Perancangan Sistem Sensor dan Akuator Nirkabel Untuk Sistem SCADA Berbasis PLC", Jurnal Nasional Teknik Elektro dan Teknologi Informasi, Vol. 3, No. 3, 2014.

(k) Keynote Speaker in "The International Conference on Satellite and Space Communication", Paris, France, 2014 with title *Design of Ka-band Satellite Links in Indonesia*, 2014.

(l) Keynote Speaker in "Makassar International Conference on Electrical Engineering and Informatics (MIICEI) 2014", The Trends of ICT Research in Indonesia, Makassar Golden Hotel, 26 November 2014.

(m) Speaker in "Focal Point SCMIT pada ASEAN COST 72", ICT Programs in Indonesia, Press Conference Hall, ICC, Bandar Seri Begawan, Brunei Darussalam, 22-25, Mey 2017.

(n) Keynote Speaker in "The 10th China-ASEAN Education Cooperation Week" on second panel: The Present Situation and Trend of ICT Industry-Education Integration in Developing Countries, ICT Research and Innovation Activities in Indonesia, Hall Center, Guiyang, Guizhou, China, 29 July 2017.

(o) Keynote Speaker in "The 4th APEC Internet of Vehicles Symposium", IoT for ITS Research Project in Indonesia, Shanghai Automobile Exhibition Center, Shanghai, China, 14-16 September, 2017.

10. Briefly list the most recent professional development activities:

(a) Local Point of ASEAN Sub Committee for Microelectronics and Information Technology, Indonesian Representative, 2016-now

(b) The Observer in APEC-MMS Think Tank, for 2017-2018

APPENDIX C

EQUIPMENT

Contents

C.1 Laboratory Equipment

In the EE Department, there are many equipment, which are available in the laboratories. The available equipment are deployed in each laboratory as follows.

C.1.1 Electric Machines Laboratory

Table C.1: Equipment in Electric Machines Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Figure C.1: PCB Manufacture Equipment.

C.1.2 Electronics and Devices Laboratory

The Electronics and Devices Laboratory houses some manufacture and measurement equipment. The equipment are used in some courses and practical courses, and to support design projects from some course assignment including the final bachelor project. Table C.2 presents some equipment, their functionality and their related courses that use them. In the Electronics and Devices Laboratory, there is a set of PCB manufacture equipment (See Figure C.1).

Beside the equipment presented in Table C.2, in the Electronics and Devices Laboratory there are also electronic breadboards, multimeters, soldering tools, electronic development kits/boards, such as FPGA, microcontroller and embedded microprocessor development kits, passive and active electric/electronic components/devices to complete laboratory assignments.

Table C.2: Equipment in Electronics and Devices Laboratory

No.	Equipment	Qty	Functionality
1	PCB Manufacture Equipment Set	1	to assembly and manufacture PCB
2	3D Printer	2	to make 3D profiles
3	Stereo-lithography 3D Printer	1	to make 3D profiles
4	Mixed-Signal Oscilloscope, 4 channels	1	to measure analog and digital signals
5	Analog Oscilloscope, 2 channels	3	to measure analog signals
6	Digital Storage Oscilloscope, 4 channel	2	to measure analog and digital signals
7	Digital Storage Oscilloscope, 2 channel	1	to measure analog and digital signals
8	Function Generator	3	to generate signal waveform
9	Frequency Generator	1	to generate signal with variable frequency
10	PC Oscilloscope, 2 channel	1	to measure analog and digital signals
11	Small-scale CNC Machine	1	to make alloy-made profile
12	Power Supply	8	to supply power for electronic equipment

Table C.3: Equipment in Electrical Installation Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.4: Equipment in Relay and Measurement Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

C.1.3 Electrical Installation Laboratory

C.1.4 Relay and Measurement Laboratory

C.1.5 Power System Laboratory

C.1.6 Basic Electric Laboratory

C.1.7 Control Systems and Instrumentation Laboratory

C.1.8 High Voltage Laboratory

C.1.9 Power Electronics Laboratory

C.1.10 Computer Hardware, Networking and Software Engineering Laboratory

C.1.11 Telematics Laboratory

C.1.12 Antenna and Propagation Laboratory

C.1.13 Telecommunication, Radio, and Microwave Laboratory

C.2 Other Supporting Equipment

Table C.5: Equipment in Power System Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.6: Equipment in Basic Electric Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.7: Equipment in Control and Instrumentation System Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.8: Equipment in High Voltage Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.9: Equipment in Power Electronics Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.10: Equipment in Computer Hardware & Networking and Software Engineering Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.11: Equipment in Telematics Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.12: Equipment in Antenna and Propagation Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

Table C.13: Equipment in Telecommunication, Radio, and Microwave Laboratory

No.	Equipment	Qty	Function
1			
2			
3			
4			

APPENDIX D

INSTITUTIONAL SUMMARY

D.1 The Institution

(a) Universitas Hasanuddin
Jl. Perintis Kemerdekaan Km. 10 90245
Sulawesi Selatan, Indonesia

(b) The name of Chief Executive Office of the Institution (Rector):
Prof. Dr. Dwia Aries Tina Pulubuhu, MA.

(c) Name and title of the person submitting the Report:
Prastawa Budi, PhD.

(d) Universitas Hasanuddin is accredited by National Accreditation Agency for Higher Education (NAAHE), 2017

The Electrical Engineering Study Program (EESP) is accredited by National Accreditation Agency for Higher Education (NAAHE), 2017.

D.2 Type of Control

The Universitas Hasanuddin is a state university with special status as Autonomous Public University under the Ministry of Research, Technology, and Higher Education (MORTHE or *PTNBH – Perguruan Tinggi Negeri Berbadan Hukum*).

D.3 Educational Unit

The EESP is under the Department of Electrical Engineering (EE Department). The EE Department is under the Faculty of Engineering, and consist of Bachelor, Master and Doctoral study program, The EESP is the Bachelor study program, which is the educational unit that prepares this ABET Readiness Report. The ESSP is led by a chair of study program. The organizational chart of Universitas Hasanuddin showing the departmental educational unit is presented in Figure D.1.

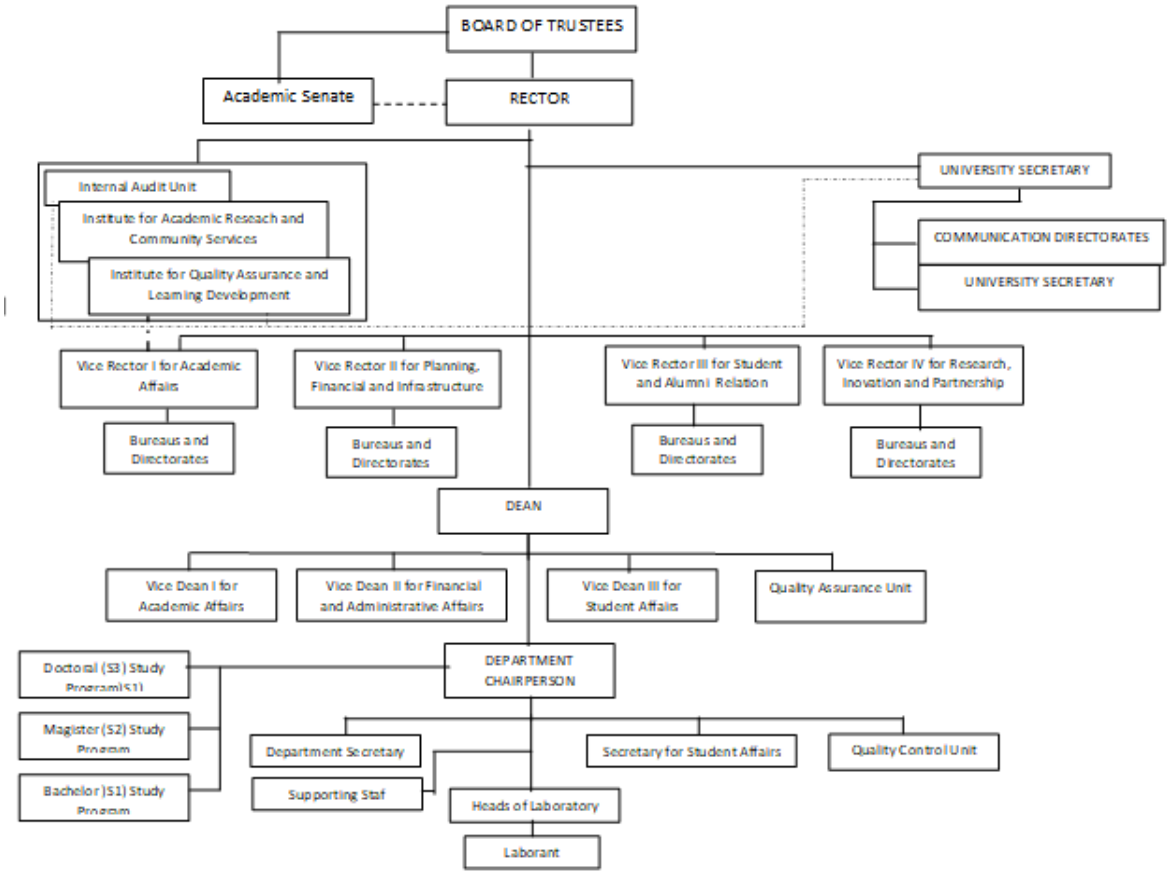

Figure D.1: Organization Chart of Universitas Hasanuddin

D.4 Academic Support Units

The following table lists the names and titles of the individuals responsible for each of the units that teach courses required by the program being evaluated for readiness, e.g., mathematics, physics, etc.

No.	Name of academic staff	Academic Support Courses
1	Dr. Syahruddin Kasim, SSi, MSi	Concept of Science and Technology
2	Dr.Ir, Muhammad Agung MP	Concept of Science and Technology
3	Dr.A.Baharuddin SH	Citizenship Education
4	Abdul Azis STP.M.Si	Citizenship Education
5	Abdur Rahman arif S.Si.,M.Si	Advanced Chemistry
6	Dr. Syahruddin Kasim, SSi, MSi	Advanced Chemistry
7	Dr.Paulus Lobo G M.Sc	Basic Physics
8	Prof.Dr.Syamsir Dewang MS	Basic Physics
9	Dr Munira Hasyim S.S.M.Hun	Bahasa Indonesia
10	Dr.Asriani Abbas m.Hum	Bahasa Indonesia
11	Dr.Firman, S.Si.,M.Si	Basic Mathematics
12	Andi Galsan Mahie, S.Si.,M.Si	Basic Mathematics

D.5 Non-academic Support Units

The names and titles of the individuals responsible for each of the units that provide non-academic support to the program, e.g. library, computing facilities, placement, tutoring are listed below.

No.	Name of Non-academic Staff	Non-academic Support Units
1	Junaid	Head of Administrative Staff
2	Salmiati	Administrative Staff
3	Aris	Administrative Staff
4	Budi	Laborant
5	Mustakim, ST	Laborant
6	Amsal Salim, ST	Laborant
7	Nompo	Laborant
8	Rimba	Office Boy

D.6 Credit Unit

Using the 16-week semester, the semester credit hour, and the 50-minute class hour, Universitas Hasanuddin course offerings are measured under the following guidelines.

Credit Guidelines One semester credit hour is assigned in the following ratio of component hours per week devoted to the course of study:

Non-Laboratory Instruction *Lecture, Recitation* – Normally, one credit hour is associated with a class meeting for 50 minutes per week for an entire semester (or the equivalent 750 semester-minutes, excluding final exams). Another widely repeated standard states that each in-class hour of college work should require two hours of preparation or other outside work.

Presentation – 1/2 credit hour is associated with a class meeting for 50 minutes per week for an entire semester (or the equivalent 750 semester-minutes, excluding final exam).

Laboratory Class Instruction *Laboratory* – Normally, one credit hour is associated with a class meeting for 180 minutes per week for an entire semester (or the equivalent 2700 semester-minutes, excluding final exam, in other meeting formats).

Lab Prep – One semester credit hour is associated with a class meeting 180 minutes per week over the semester.

Studio – One semester credit hour is associated with a class meeting 180 minutes per week over the semester.

Independent Study *Experiential, Research, Individual Study* – Credit hours associated with this type of instruction will be assigned credit depending upon the amount of activity associated with the course, faculty supervision, and students outside work activity.

Non-Directed Study *Practice/Study/Observation* – No credit hours or staff effort are directly associated with these learning situations.

Types of Credit Awarded in the Universitas Hasanuddin System

Regular Credit: Credit earned for regularly offered collegiate courses of instruction that meet the requirements of a degree program.

It is assumed that one semester or quarter credit normally represents one class hour or three laboratory hours per week. One academic year normally represents at least 28 weeks of classes, exclusive of final examinations. If other standards are used for this program, the differences should be indicated.

Thesis Credit: Credit awarded to students for research toward completion of a research project, or a degree thesis or dissertation. This credit allows measure of the expected amount of work and the resources used, while the student actually earns zero-degree credit hours. The benefit obtained is primarily to account for the resources provided, to use in reporting to governments, and in maintaining the students' financial aid position. Example: Senior Research Project, Master's Thesis, Doctoral Dissertation.

Equivalent Credit: Hours are assigned to courses to reflect the value of resources used to provide the class, such as rooms, instructors, equipment, etc. Equivalent hours are used in the registration process but revert to zero when posted to the student's academic history.

Example: A seminar with a visiting professor, over and above existing degree require-

ments. The benefit obtained is primarily to account for the resources provided, to use in reporting to governments, and in maintaining the students' financial aid position.

Procedure for Exceptions Many situations and new developments may cause a given department or faculty member to vary from the guidelines listed above in the assigning of credit.

D.7 Tables

The following tables are completed for the program undergoing the Readiness Review.

D.8 Signature Attesting to Compliance

Not yet applicable for Readiness Review.