Automotive and Robotics Engineering

Introduction

Times Higher Education in 2012 reported that the number of engineering graduates need to double to meet the demand by 2020. Similar alarm has been ringing in Indonesia as the research in 2011 (by Said Didu, ex secretary for Indonesian ministry of state-owned companies) predicted the shortage of 15.500 engineering graduates per year in the period 2015 - 2020, as the demand for engineers nearly doubles from the 2010 - 2015 period. In term of salary, the Forbes magazine in 2014 reported that engineering degrees have been at the top of the chart for the last 20 years, and the top three for 2015 are predicted to be electrical engineering, computer engineering, and mechanical engineering. Knowledge in these three fields are the key to fully produce automation systems, which is the focus of the Automotive and Robotics Engineering (ARE) program. Automation is sought in many areas of the industry to create lean yet agile systems. The graduate of ARE Program will enjoy the huge demand of automation engineers globally and particularly in Indonesia and Asia.

Binus University as one of the prominent universities in Indonesia, together with Aso College Group as one of the top professional training college in Japan with 76 years of history, have laid the first steping stone by establishing Binus Aso School of Engineering (BASE). One of the programs in BASE is the Automotive and Robotics Engineering (ARE) program. The ARE program combines the curriculum, faculty members, teaching quality, industrial links, cultural enrichment, and facilities, between Computer Engineering Department in Binus University and Automotive Engineering and Technology College in Aso College Group, Japan. As one of the oldest department in Binus University, Computer Engineering has obtained the A grade, which is the highest grade from the National Accreditation Board for Higher Education. Aso College of Automotive Engineering and Technology, as one of the 12 colleges in Aso College group, has achieved 100% graduate employment rate for the last 3 years, thanks to the highly qualified lecturers with long industrial experience, and the state-of-the-art equipments.

The ARE program focuses on mechanical and automated electronic systems applied mainly in automotive. Nevertheless, the graduate will be able to design automation not only in automotive but also in many other industries. The ultimate goal is to deliver engineers who are not only competitive but also able to innovate new technology to improve human well being and to engage with solid manner and lifelong learning character. For that reason, ARE program emphasizes not only on knowledge and skill but also on the understanding of human, which is reflected in the resulting products for human well being.

Vision

Becoming the most admired Automotive and Robobotics Engineering program, which focus in intelligent automation system for well being, in providing young talented student with pride.

Mission

To contribute to the global community through the provision of world-class education by :

1. Educating students with the knowledge and skills of science and technology for the design, analysis, and application of automation technologies in a creative and resourceful manner.

2. Preparing graduates to become the future leaders in the global community with dignity, charm and discipline mind, while being sensitive to the social, environmental, and economic context.
3. Conducting high impact applied research in the field of engineering to improve quality of life and to contribute to the society which serves the profession of the faculties and enriches the students with contemporary issues.

Program Objective

The objectives of the program are :

1. Our graduates will be productively involved in identifying and solving engineering problems by creatively applying engineering principles in the broad areas of automotive and robotics engineering.
2. Our graduates will attain successful careers with leadership positions in industry, academia, and public service.
3. Our graduates will adapt to new technologies, tools and methodologies to respond to the rapidly changing world by continuously updating and renewing their knowledge throughout their careers.

Graduate Competencies

At the end of the program, graduates will have these following competencies:

1. An ability to apply knowledge of math, science, and engineering
2. An ability to design and conduct experiments, as well as analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to identify, formulate, and solve engineering problems
5. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
6. An ability to function on multidisciplinary teams
7. An understanding of professional and ethical responsibility
8. An ability to communicate effectively
9. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
10. A recognition of the need for, and an ability to engage in life-long learning
11. A knowledge of contemporary issues

Prospective Career

- Embedded System Developer
- Automation-based Solution Engineer
- Car Automation System Engineer
- Robotics Production Engineer
- Production Automation Engineer
- Technopreneur

Curriculum

Core of the curriculum of Automotive and Robotics Engineering (ARE) program is derived from the internationally acknowledged curriculum guideline developed by the Institute of Electrical and Electronics Engineers (IEEE), and Association for Computing Machinery (ACM). The curriculum is directed toward the design, construction,

implementation, and maintenance of intelligent machine for automation system, particularly in automotive industry, by the adoption of the state-of-the-art curriculum from Aso College of Automotive Engineering and Technology. In general there are three areas of study in ARE program, which are: electronics & embedded system engineering; Intelligent automation system engineering; and mechanical & automotive system engineering.

The electronics and embedded system engineering area will enable the students to design electronics circuits, microcomputer systems, and the interfacing with the world with sensors and actuators.
The intelligent automation system engineering area is where students learn to design algorithms that introduce intelligent into the machine by digital signal processing, automatic control, and other computational algorithms.
The mechanical and automotive system engineering area provides students with the ability to design mechanical system in general, and automotive system and its development in particular, using knowledge in material's strength, object's motion, and using 2D & 3D CAD tools.

The ARE program is a 4-year (8-semester) study program that rewards bachelor degree in engineering for the graduates after completing 146 credit hours of courses. The students will study in Fukuoka, Japan, at the end of the third year to complete some courses in Aso College of Automation Engineering and Technology during the summer course period. The students will do internship and final project in the final year as a culmination of the undergraduate study in ARE program. ARE program curriculum is arranged in a well-ordered progression in order to assure smooth acquisition of knowledge and skills in all three mentioned areas of study. The following table outlines the distribution of courses in four years:

1st year	Basic courses to support electronics, computer, and mechanical systems engineering
2nd year	Fundamental courses for electronic systems, automation systems, and mechanical system engineering
3rd year	Advanced courses in designing intelligent systems, embedded computer systems, mechanical and automotive systems
Summer Course	Advanced courses and training in mechanical engineering (in Japan)
4th year	7th semester: internship and advanced courses in automotive and automation engineering
	8th semester: final project

Course Structure

Sem	Code	Course Name	SCU	Total
1	CHAR6016	Character Building: Pancasila	2	20
	SCIE6031	Physics I	4	
	MATH6097	Chemistry	4	
	MATH6096	Calculus	4	
	AREN6001	Introduction to Automotive & Robotics Engineering	4	
	ENGR6012	Drafting	2	
2	CHAR6017	Character Building: Kewarganegaraan	2	20
	SCIE6036	Physics II	4/2	
	COMP6330	Algorithm and Programming Fundamental	4	
	MATH6101	Engineering Mathematics I	4	
	STAT6107	Probability and Statistics	2	
	AREN6003	Strength of Materials	2	
3	MATH6104	Engineering Mathematics II	4	20
	MATH6105	Discrete Mathematics	2	
	CPEN6113	Electronic Devices	4/1	
	CPEN6088	Circuit and Signals	4/1	
	ENTR6057	Entrepreneurship I	2	
	AREN6002	2D CAD Drafting	2	
4	CPEN6145	Control System	2/1	20
	CPEN6115	Digital System	5/1	
	MATH6106	Numerical Methods	2	
	CPEN6116	Computer Networks	4/1	
	AREN6015	3D CAD Basic	0/2	
	CHAR6018	Character Building: Agama	2	
5	CPEN6117	Computer Organization and Architecture	4	20
	SCIE6037	Biology	2	
	CPEN6118	Digital Signal Processing	2/1	
	CPEN6146	Advanced Control System	2/1	
	AREN6016	Mechanical Engineering	4/1	
	ISYS6330	Database Design & Application	2/1	
6	AREN6017	Operations Engineering	4/1	21
	AREN6018	Automotive Engineering	2/1	
	CPEN6144	Computational Intelligence	4/1	
	CPEN6121	Microcontroller Design and Application	5/1	
	CPEN6120	Computer System Development and Methodology	2	
7	AREN6009	3D CAD Advanced*	4	19
	AREN6010	Manufacture Training*	4	
	AREN6011	Internship	4	
	COMP6169	Operating Systems	2	
	AREN6019	Robotics and Industrial Automation	2/1	
	ENTR6058	Entrepreneurship II	2	
8	AREN6014	Final Project	6	6
			TOTAL CREDIT 146 SCU	

*) Summer courses in Fukuoka – Japan