

## Automotive and Robotics Engineering

### Introduction

The Automotive Robotics Engineering (ARE) Program provides comprehensive approaches in developing students' excellent abilities within Digital Era; that are implemented in wide spectrum of Automotive Industries and Robotics Industries. ARE program is a front runner in prioritizing both industries' implementations through Artificial Intelligence of Things (AIoT).

Those aforementioned abilities allow students to analyze, design and build smart mechanical and automated electronic systems for smart automotive systems; smart manufacturing processes; and smart home/building/city applications, using design tools used in global industries today. Subsequently, these abilities are indispensable for students to be excellent in professional and/or entrepreneurship, following their graduation from BINUS ASO School of Engineering (BASE). Ultimately, the aforementioned abilities are aligned with current and incoming challenges in Digital Era of Industry 4.0; that include the design and development of mechanical systems within 3D tools, computerized electronic systems, intelligent automotive systems; and intelligent robotic systems for global industries.

### Vision

Becoming the most admired Automotive and Robotics Engineering program, which focus in intelligent automation system for well being, in providing young talented 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 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 excel in methodological and automation technology skills to solve problems creatively within their professional and communities.
2. Our graduates can lead the team and professionally responsible to benefit the organizations, society, and nation.
3. Our graduates sustainably update their knowledge by engaging in life-long learning to adapt rapidly changing work environments and to meet evolving global requirements.

## Student Outcomes

After completing the study, graduates are:

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 judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal context.
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, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

## Prospective Career of the Graduates

- Intelligent Robotics System Engineer
- Factory Automation Engineer
- Industrial Robotics Integration Engineer
- Autonomous Driving Engineer
- Advanced Driver Assistance Systems (ADAS) Engineer
- Quality Control Engineer
- Electric Vehicle Engineer
- Artificial Intelligence of Things (AIoT) Engineer
- Technopreneur

## Curriculum

The Curriculum Core of Automotive Robotics Engineering (ARE) Program is complying with international acknowledged guidelines from the Institute of Electrical and Electronics Engineers (IEEE) and Association for Computing Machinery (ACM). These compliances constitute the competitive advantages of ARE Students toward International Recognition within Students' International Exposures in Professional and/or Entrepreneurship. Furthermore, students conduct their international study exposures in Fukuoka, Japan. During that international study exposures within summer course, students are exposed to comprehensive courses and internships in Japanese companies, through coordination with ASO College of Automotive Engineering and Technology. Ultimately, the aforementioned curriculum is orchestrated to ensure the balance among knowledge and industrial implementations through hands on projects.

This 4-year program covers not only limited to Basic courses and engineering fundamental in the field of mechanical systems, but also intelligent software systems and connected electronic systems. Eventually, the technical and special courses, including internship and final project, support the abilities in developing intelligent automotive and robotics systems.

**Course Structure**

Sem	Code	Course Name	SCU	Total
1	CHAR6016010	Character Building: <i>Pancasila</i>	2	20
	SCIE6058010	Physics I	4/1	
	MATH6170010	Calculus I	4	
	MATH6171010	Linear Algebra	4	
	MATH6172010	Chemistry	2	
	COMP6739010	Physical Computing & Algorithm	3	
2	CHAR6017010	Character Building: <i>Kewarganegaraan</i>	2	20
	SCIE6059010	Physics II	4/1	
	MATH6173010	Calculus II	4	
	MATH6174010	Discrete Mathematics	4	
	CPEN6237010	Circuit & Electronics	4/1	
3	STAT6182010	Probability and Statistics	4	20
	CPEN6238010	Computer Networks & Information Security	4/1	
	CPEN6115010	Digital System	5/1	
	CPEN6118010	Digital Signal Processing	2/1	
	ENTR6589010	Entrepreneurship: Ideation	2	
4	CHAR6018010	Character Building: <i>Agama</i>	2	20
	CPEN6117010	Computer Organization and Architecture	4	
	AREN6028010	Machine Learning	3/1	
	CPEN6239010	IOT Design & Application	5/1	
	CPEN6240010	Mobile Application Development for Engineer	2	
	ENTR6590010	Entrepreneurship: Market Validation	2	
5	AREN6003010	Strength of Materials	2	20
	AREN6029010	Machine Element Design	4	
	<b>Streaming: Intelligent Robotics</b>			
	AREN6030010	Robot Kinematics and Dynamics	2/1	
	AREN6031010	Data Science and Applications	3/1	
	AREN6032010	Control Systems	3/1	
	AREN6033010	Machine Learning for Robotics	2/1	
	<b>Streaming: Intelligent Automotive</b>			
	AREN6034010	Vehicle Propulsion & Energy Storage Systems	4/1	
	AREN6035010	Computer Vision for Vehicle	2/1	
	AREN6036010	Sensor Fusion for Vehicle	2/1	
AREN6037010	Autonomous Driving Systems	2/1		
6	<b>Enrichment Program I</b>		20	20
7	<b>Enrichment Program II</b>		20	20
8	AREN6014010	Final Project	6	6
<b>Total Credits 146 SCU</b>				

**Enrichment Program I (6<sup>th</sup> Semester) & Enrichment Program II (7<sup>th</sup> Semester):**

-) *Enrichment Program* is a compulsory off-campus enrichment program for all students. Students will take one of the enrichment of choice program tracks (off-campus). See the enrichment appendix for the tracks detail.

**Enrichment Track Scheme**

Track	Semester 6								Semester 7							
	IN	FI	RS	EN	CD	SA	PP	etc	IN	FI	RS	EN	CD	SA	PP	etc
1	v									v						
2	v											v				
3	v													v		

**Note:**

IN	: Internship	CD	: Community Development
FI	: Field Project	SA	: Study Abroad
RS	: Research	PP	: Professional Practice
EN	: Entrepreneurship	etc	: Study Program Special Purposes

**Description:**

Student will take one of enrichment program tracks

**Certified Internship Track**

Code	Course Name	SCU	Total
<b>Enrichment Program I</b>			20
AREN6040010	Industrial Practice	8	
AREN6050010	Technical Analysis in Practica Circumtance	6	
AREN6051010	Leadership Practice	6	
<b>Enrichment Program II</b> (is a compulsory one-semester program that is equivalent to 20 credit hours, where students can choose only one out of the following three available tracks:)			
<b>FIELD PROJECT TRACK</b>	Student work in the field such as: internship in a company/institution, community development, teaching in school, academic research, or independent project. This track must be supervised by at least a faculty member assigned by the Program.		
<b>ENTREPRENEURSHIP TRACK</b>	Students develop his/her own business. This track must be supervised by at least a faculty member assigned by the Program.		
<b>STUDY ABROAD TRACK</b>	Students take elective courses in top 200 International Universities with a total of 20 credit hours that support all the Program's Student Outcomes (SO1 - SO7).		

**Certified Entrepreneurship Track**

Code	Course Name	SCU	Total
<b>Enrichment Program II</b>			20
AREN6045010	Idea Generation and Prototyping	8	
AREN6046010	Business Plan Development	6	
AREN6047010	New Knowledge Acquisition and Application	6	

**Certified Field Project Track**

Code	Course Name	SCU	Total
<b>Enrichment Program II</b>			20
AREN6042010	Knowledge and Skills Implementation	8	
AREN6043010	Communication and Teamwork	6	
AREN6044010	New Knowledge Acquisition and Application	6	

**Certified Study Abroad Track**

Code	Course Name	SCU	Total
<b>Elective courses list for study abroad*</b>			
<b>Enrichment Program II</b>			
GLOB6272010	Elective Course for Study Abroad 1	4	20
GLOB6273010	Elective Course for Study Abroad 2	4	
GLOB6274010	Elective Course for Study Abroad 3	4	
GLOB6275010	Elective Course for Study Abroad 4	4	
GLOB6276010	Elective Course for Study Abroad 5	4	
GLOB6277010	Elective Course for Study Abroad 6	2	
GLOB6278010	Elective Course for Study Abroad 7	2	
GLOB6279010	Elective Course for Study Abroad 8	2	
GLOB6280010	Elective Course for Study Abroad 9	2	
GLOB6281010	Elective Course for Study Abroad 10	2	
GLOB6282010	Elective Course for Study Abroad 11	3	
GLOB6283010	Elective Course for Study Abroad 12	3	
GLOB6284010	Elective Course for Study Abroad 13	3	
GLOB6285010	Elective Course for Study Abroad 14	5	

**The Table of Prerequisite for Automotive Robotics Engineering Program**

Course	SCU	Sem.	Prerequisite Course	SCU	Sem.
AREN6014010	6	8	All Core Courses of Computer Engineering Program and Automotive Robotics Engineering Program		

**Student should pass all of these quality controlled courses as listed below:**

No.	Course Code	Course Name	Minimal Grade
1.	CHAR6016010	Character Building: <i>Pancasila</i>	B