Automotive and Robotics Engineering

Introduction

The Automotive Robotics Engineering (ARE) Program provides comprehensive approaches to developing students' excellent abilities within the Digital Era, which are implemented in a 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 abilities above 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 entrepreneurship, posterior their graduation from BINUS ASO School of Engineering (BASE). Ultimately, the aforementioned abilities are aligned with current and incoming challenges in the Digital Era of Industry 4.0, which 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

A world class computer engineering study program that focuses on the development of smart systems and continuously contribute to fostering and empowering society for the benefit of mankind

Mission

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

1. Educating BINUSIAN to meet global standards.
2. Conducting high-impact research to solve nation's problems.
3. Providing a vibrant environment for teaching and research.
4. Fostering BINUSIAN as a lifelong learner in order to adapt to rapid changes.
5. Empowering BINUSIAN to use their knowledge to serve and build the nation.

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Program Objective

The objectives of the program are:

1. Our graduates will excel in methodological and computational skills to solve problems creatively within their professional and communities.
2. Our graduates will lead the team and professionally responsible to benefit the organizations, society, and nation.
3. Our graduates will 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 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, 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

- Advanced Driver Assistance-Systems Engineer
- Autonomous Driving Engineer
- Intelligent Robotics-Systems Engineer
- Artificial Intelligence of Things Engineer
- Data Science Engineer
- Quality Control Engineer
- Electric Vehicle Engineer
- Technopreneur

Curriculum

The Curriculum Core of the Automotive Robotics Engineering (ARE) Program complies with Internationally acknowledged guidelines from the Institute of Electrical and Electronics Engineers (IEEE) and the Association for Computing Machinery (ACM). These compliances constitute the competitive advantages of ARE Students toward International Recognition within Students' International Exposure in Professional and Entrepreneurship. Furthermore, students conduct their international study exposures in Fukuoka, Japan. During that international study exposure within the 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 curriculum above is orchestrated to ensure the balance between knowledge and industrial implementations through hands-on projects.

This 4-year program covers, but is not limited to, basic courses and engineering fundamentals in the field of mechanical systems, intelligent software systems, and connected electronic systems. Eventually, the technical and special courses, including the internship and final project, will support the development of intelligent automotive and robotics systems.

Course Structure

Sem	Code	Course Name	SCU	Total
1	CHAR6016010	Character Building: Pancasila	2	20
	SCIE6058010	Physics I	4/1	
	MATH6170010	Calculus I	4	
	MATH6205010	Linear Algebra	3	
	MATH6172010	Chemistry	2	
	COMP6920010	Physical Computing & Algorithm	4	
2	SCIE6059010	Physics II	4/1	20
	MATH6173010	Calculus II	4	
	STAT6182010	Probability and Statistics	4	
	CPEN6237010	Circuit & Electronics	4/1	
	AREN6062010	Mechanical Strength of Material	2	
3	MATH6174010	Discrete Mathematics	4	20
	CPEN6118010	Digital Signal Processing	2/1	
	CPEN6267010	Microcontroller **(AIE)**	2/1	
	CPEN6269010	IoT Application	2	
	AREN6061010	Machine Learning	4	
	LANG6120010	Indonesian	2	
	COSC6013010	Foundations of Artificial Intelligence	2	
4	CHAR6017010	Character Building: Kewarganegaraan	2	22
	CPEN6238010	Computer Networks & Information Security	4/1	
	CPEN6266010	Digital System	4/1	
	AREN6032010	Control Systems	3/1	
	AREN6029010	Machine Element Design	4	
	ENPR6296010	Entrepreneurship: Prototyping	2	
5	CHAR6018010	Character Building: Agama	2	18
	CPEN6268010	Computer Organization and Architecture	2	
	CPEN6240010	Mobile Application Development for Engineer **(AIE)**	2	
	AREN6063010	Manufacturing Processes	2	
	ENTR6590010	Entrepreneurship: Market Validation	2	
	Streaming: Intelligent Robotics			
	AREN6030010	Robot Kinematics and Dynamics	2/1	
	AREN6064010	Data Science and Applications	2/1	
	AREN6065010	Advanced Robotics	2	
	Streaming: Intelligent Automotive			
	AREN6066010	Vehicle Powertrain Systems	2/1	
	AREN6068010	Vehicle Dynamics	2/1	
	AREN6067010	Autonomous Driving Systems	2	
6	**Enrichment Program I**		20	20
7	**Enrichment Program II**		20	20
8	AREN6014010	Final Project	6	6
			Total Credits 146 SCU	

-) **(AIE)** - *Artificial Intelligence Embedded*

Enrichment Program I (6th Semester) & Enrichment Program II (7th 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	RS	EN	CD	SA	IS	etc	IN	RS	EN	CD	SA	IS	etc
1	v							v						
2	v								v					
3	v									v				
4	v										v			
5	v											v		
6		v						v						
7				v				v						
8					v			v						
9						v		v						
10	v												v	

Notes:

IN : Company Internship
RS : Research Fellowship
EN : Entrepreneurship
CD : Community Impact Internship
SA : Study Abroad
IS : Specific Independent Study
etc : Study Program Special Purposes

Description:

Student will take one of enrichment program tracks

Company Internship Track

Code	Course Name	SCU	Total
Enrichment Program I			20
AREN6040010	Industrial Practice	8	
AREN6050010	Technical Analysis in Practical Circumstance	6	
AREN6051010	Leadership Practice	6	
Enrichment Program II			20
AREN6042010	Knowledge and Skills Implementation	8	
AREN6044010	New Knowledge Acquisition and Application	6	
AREN6043010	Communication and Teamwork	6	

Entrepreneurship Track

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

Research Fellowship Track

Code	Course Name	SCU	Total
For students who take Research Track in either odd or even semester, they should take these courses:			20
AREN6055010	Recent Trend in Automotive and Robotic Engineering Research	8	
AREN6056010	Scientific Communication of Automotive and Robotic Engineering Research	6	
AREN6057010	Critical Thinking Skills in Automotive and Robotic Engineering Research	6	

Community Impact Internship Track

Code	Course Name	SCU	Total
For students who take Community Development Track in either odd or even semester, they should take these courses:			20
AREN6058010	Implementation of Automotive and Robotic Engineering Technology in Community	8	
AREN6059010	Design of Automotive and Robotic Engineering Technology in Community	6	
AREN6060010	Adaptability and Collaboration in Society	6	

Study Abroad Track

Code	Course Name	SCU	Total
Elective courses list for study abroad*			20
For students who take Study Abroad Track in either odd or even semester, they should take these courses			
GLOB6272010	Elective Course for Study Abroad 1	4	
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	

Specific Independent Study Track

Code	Course Name	SCU	Total
Elective courses list for Specific Independent Study*			20
For students who take Specific Independent Study Track in either odd or even semester, they should take these courses:			
CSIS6157010	Course Certification	3	
CSIS6158010	Technical Skill Enrichment	4	
CSIS6159010	Industrial Project	9	
CSIS6160010	Soft Skill Enrichment	4	

Code	Course Name	SCU	Total
CSIS6123010	Elective Course for Specific Independent Study 1	4	
CSIS6124010	Elective Course for Specific Independent Study 2	4	
CSIS6125010	Elective Course for Specific Independent Study 3	4	
CSIS6126010	Elective Course for Specific Independent Study 4	4	
CSIS6127010	Elective Course for Specific Independent Study 5	4	
CSIS6128010	Elective Course for Specific Independent Study 6	2	
CSIS6129010	Elective Course for Specific Independent Study 7	2	
CSIS6130010	Elective Course for Specific Independent Study 8	2	
CSIS6131010	Elective Course for Specific Independent Study 9	2	
CSIS6132010	Elective Course for Specific Independent Study 10	2	
CSIS6138010	Elective Course for Specific Independent Study 16	3	
CSIS6139010	Elective Course for Specific Independent Study 17	3	
CSIS6155010	Elective Course for Specific Independent Study 33	3	
CSIS6161010	Elective Course for Specific Independent Study 35	5	

**) For students who take BINUS specific independent study courses, they should take the first 4 courses on the list above (20 credits). Meanwhile, electives courses 1 to 35 are transferred courses for students who take specific independent study outside BINUS University. Transferred courses will be transferred based on credit transfer policies on study program with total of 20 credits.*

The Table of Prerequisite for Automotive Robotics Engineering Program

Course		SCU	Sem.	Prerequisite Course		SCU	Sem.
				SCIE6058010	Physics I	4/1	1
				MATH6170010	Calculus I	4	1
				MATH6205010	Linear Algebra	3	1
				MATH6172010	Chemistry	2	1
AREN6014010	Final Project	6	8	COMP6920010	Physical Computing & Algorithm	4	1
				SCIE6059010	Physics II	4/1	2
				MATH6173010	Calculus II	4	2
				STAT6182010	Probability and Statistics	4	2
				CPEN6237010	Circuit & Electronics	4/1	2
				AREN6062010	Mechanical Strength of Material	2	2
				MATH6174010	Discrete Mathematics	4	3
				CPEN6118010	Digital Signal Processing	2/1	3
				CPEN6267010	Microcontroller	2/1	3
				CPEN6269010	IoT Application	2	3
				AREN6061010	Machine Learning	4	3
				CPEN6238010	Computer Networks & Information Security	4/1	4
				CPEN6266010	Digital System	4/1	4
				AREN6032010	Control Systems	3/1	4
				AREN6029010	Machine Element Design	4	4

				CPEN6268010	Computer Organization and Architecture	2	5
				CPEN6240010	Mobile Application Development for Engineer	2	5
				AREN6063010	Manufacturing Processes	2	5
				AREN6030010	Robot Kinematics and Dynamics	2/1	5
				AREN6064010	Data Science and Applications	2/1	5
				AREN6065010	Advanced Robotics	2	5
				AREN6066010	Vehicle Powertrain Station	2/1	5
				AREN6068010	Vehicle Dynamics	2/1	5
				AREN6067010	Autonomous Driving Systems	2	5

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

No.	Course Code	Course Name	Minimal Grade
1.	CHAR6016010	Character Building: *Pancasila*	B