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

To be 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. Providingg 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.

Program Objective

The objectives of the program are to:

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

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

1. Advanced Driver Assistance-Systems Engineer
2. Autonomous Driving Engineer
3. Intelligent Robotics-Systems Engineer
4. Artificial Intelligence of Things Engineer
5. Data Science Engineer
6. Electric Vehicle Engineer
7. Quality Control Engineer
8. 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: 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	CHAR6017010	Character Building: Kewarganegaraan	2	20
	SCIE6059010	Physics II	4/1	

Sem	Code	Course Name	SCU	Total
	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: Agama	2	20
	CPEN6117010	Computer Organization and Architecture	4	
	AREN6028010	Machine Learning	3/1	
	CPEN6257010	Introduction to Microcontroller	5/1	
	AREN6003010	Strength of Materials	2	
	LANG6120010	Indonesian	2	
5	AREN6029010	Machine Element Design	4	20
	ENTR6590010	Entrepreneurship: Market Validation	2	
	Stream: Intelligent Robotics			
	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	
	Stream: Intelligent Automotive			
	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	**Enrichment Program I**		20	20
7	**Enrichment Program II**		20	20
8	AREN6014010	Final Project	6	6
			TOTAL CREDIT 146 SCU	

Enrichment Program I (6th Semester) & Enrichment Program II (7th Semester):

-) *Student will take one of enrichment program tracks (off campus). See 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

Note:

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

Description:

Student will take one of enrichment program tracks

Company Internship Track

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

Enrichment Program is a compulsory off-campus enrichment program for all students

Research Fellowship Track

Code	Course Name	SCU	Total
Enrichment Program I/II			
AREN6055010	Recent Trend in Automotive and Robotic Engineering Research	8	20
AREN6056010	Scientific Communication of Automotive and Robotic Engineering Research	6	
AREN6057010	Critical Thinking Skills in Automotive and Robotic Engineering Research	6	

Enrichment Program is a compulsory off-campus enrichment program for all students

Entrepreneurship Track

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

Enrichment Program is a <u>*compulsory*</u> *off-campus enrichment program for all students*

Community Impact Internship Track

Code	Course Name	SCU	Total
Enrichment Program I/II			
AREN6058010	Implementation of Automotive and Robotic Engineering Technology in Community	8	20
AREN6059010	Design of Automotive and Robotic Engineering Technology in Community	6	
AREN6060010	Adaptability and Collaboration in Society	6	

Enrichment Program is a <u>*compulsory*</u> *off-campus enrichment program for all students*

Study Abroad Track

Code	Course Name	SCU	Total
Enrichment Program I			
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	

Enrichment Program is a <u>*compulsory*</u> *off-campus enrichment program for all students*

Specific Indenpendent Study Track

Code	Course Name	SCU	Total
Enrichment Program I/II			
CSIS6157010	Course Certification	3	
CSIS6158010	Technical Skill Enrichment	4	
CSIS6159010	Industrial Project	9	
CSIS6160010	Soft Skill Enrichment	4	
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	20
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 32 are transferred courses for students who take specific independent study courses 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 Business Engineering

Course		SCU	Sem.	Prerequisite Course
AREN6014010	Final Project	6	8	Seluruh Mata Kuliah Inti Computer Engineering dan Mata Kuliah Program Automotive Robotics Engineering

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

No	Course Code	Course Name	Minimal Grade
1.	CHAR6016011	Character Building: Pancasila	B