HASAN KALYONCU UNIVERSITY
Faculty of Engineering
Course Description Form

COURSE: Introduction to Robotics				
CODE: CENG463	**SEMESTER:** FALL OR SPRING			
LANGUAGE: ENGLISH	**TYPE:** ELECTIVE			
PRE-REQUISITES: CENG112, MATH251 **CO-REQUISITES:**	**THEORY**	**PRACTICAL**	**CREDIT**	**ECTS**
WEEKLY HOURS:	3	0	3	5

CONTENT OF THE COURSE:
Introduction, Rigid motions. Homogeneous transformations. Robot forward kinematics. Robot inverse kinematics. Differential kinematics and Jacobeans. Motion planning and trajectory generation. Robot dynamics. Mobile robots. Independent joint control. Robot sensors and actuators.

OBJECTIVE OF THE COURSE:

1. To teach students to understand the importance of the robotics systems in relation to computer systems.
2. To teach student to develop kinematic and dynamic models of robot manipulators
3. To teach students to develop motion planning and basic control techniques for robot manipulators
4. To provide experience in using software packages to solve computer engineering problems.
5. To provide practice for developing critical thinking skills and solving open ended problems.

WEEKLY SCHEDULE	
Week	**Topics**
1	Introduction
2	Rigid Motions
3	Homogeneous Transformations
4	Robot Forward Kinematics
5	Robot Inverse Kinematics
6	Differential Kinematics and Jacobians
7	Midterm I
8	Motion Planning
9	Trajectory Generation
10	Robot Dynamics
11	Midterm II
12	Mobile Robots
13	Independent Join Control
14	Robot Sensors and Actuator

TEXTBOOK: M. Spong, S. Hutchinson, and M. Vidyasagar,"Robot Modeling and Control", Wiley, 2006

REFERENCE BOOKS:

Ming Xie, FUNDAMENTALS OF ROBOTICS(3rd Edition), Series in Machine Perception and Artificial Intelligence, World Scientific Books, 2010

Modeling and Control of Manipulators, L. Sciavicco, B. Siciliano, Springer, (6th Edition), (Other References) 2005

John J. Craig, Introduction to Robotics: Mechanics and Control (3rd Edition), Prentrice Hall, 2005

EVALUATION SYSTEM:		
IN-TERM STUDIES	**QUANTITY**	**PERCENTAGE (%)**
Midterm Exam	2	30
Homework	3	15
Laboratory works		
Quiz	3	5
Final Exam	1	50
TOTAL	**9**	**100**
CONTRIBUTION OF INTERM STUDIES TO OVERALL GRADE	8	50
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE	1	50
TOTAL	**9**	**100**

COURSE CATEGORY:	**PERCENTAGE (%)**
Mathematics and Basic Sciences	30
Engineering	30
Engineering Design	40
Social Sciences	0

TABLE OF ECTS / WORKLOAD:			
Activities	**QUANTITY**	**Duration (Hour)**	**Total Workload**
Course Duration	13	3	39
Hours for off-the-classroom study (Pre-study, practice)	14	5	70
Laboratory works			
Mid-term	2	2	4
Final examination	1	2	2
Homework	3	5	15
Quiz	3	3	9
Total Work Load			**139**
Total Work Load / 30			**4.63**
ECTS Credit of the Course			**5**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
LO1	2	3	2	3	2	3	1	1	1	1	1
LO2	2	3	2	3	2	3	1	1	1	1	1

LO3	2	3	2	3	2	3	1	1	1	1	1
LO4	2	3	2	3	2	3	1	1	1	1	1
LO5	1	3	2	3	2	3	1	1	1	1	1
LO6	1	3	2	3	2	3	1	1	1	1	1
	PO: Program Outcomes | LO: Learning Outcomes Values: 0: None | 1: Low | 2: Medium | 3: High										

INSTRUCTOR(S):	Asst. Prof. Dr. Abdul Hafiz ABDULHAFIZ
FORM PREPARATION DATE:	22/05/2019

LEARNING OUTCOMES OF THE COURSE:	**PROGRAM OUTCOMES:**
LO1: Understand the importance of robotics systems in computer engineering area. **LO2:** Understand basic rigid body motions , homogenous transformations **LO3:** Develop forward and inverse kinematic models for a given manipulator, Develop differential kinematics and Jacobean operator for further robot analysis and design problems, develop dynamics models of robot manipulators. **LO4:** Develop motion planning and control techniques for robot manipulators. **LO5:** Understand modeling and control of mobile robots, understand sensor and actuator technologies for robotic systems. **LO6:** Use software tools to analyze and design robotics systems	**PO1:** Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems. **PO2:** Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose. **PO3:** Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose. **PO4:** Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; ability to employ information technologies effectively. **PO5:** Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions. **PO6:** Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually. **PO7:** Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language; ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions. **PO8:** Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself. **PO9:** Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice. **PO10:** Knowledge about business life practices such

	as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development. **PO11:** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering; awareness of the legal consequences of engineering solutions.