MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 423: Robotics; Fundamentals and Applications (4) Selected Elective for Mechatronics Concentration, Elective for all others

Course Description: (2019-20 Catalog)	Introduction to robots and their types. Homogeneous transformations. Kinematic equations and their solutions. Motion trajectories, statics, dynamics, and control of robots. Robot programming. Actuators, sensors and vision systems. 3 lectures, 1 laboratory.
Prerequisite Courses:	ME 326, ME 418 or ME 419 or ME 422.
Prerequisites by Topic:	1. Intermediate Dynamics 2. Mechanical Control Systems (or concurrent)
Textbook: **(and/or other required material)**	Introduction to Robotics: Analysis, Control, Applications, 3rd Edition, Saeed B. Niku, John Wiley and Sons, 2019.
References:	
Course Coordinator/Instructor:	Saeed Niku, Professor of ME
Course Learning Outcomes:	1. Familiarity with robot terminology, robot types and robotic applications. 2. Formulating transformation matrices and kinematic equations for serial and parallel robots and solving them. 3. Synthesizing robot programs for a variety of applications. 4. Designing the procedures needed to accomplish robotics tasks. 5. Synthesizing robotic components such as actuators, visions systems, and sensors, into a robotics system.
Relationship of Course to Mechanical Engineering Program Outcomes:	SO 1: Mastered (M) SO 2: Mastered (M) SO 3: SO 4: SO 5: Mastered (M) SO 6: Mastered (M) SO 7: Mastered (M)
Topics Covered:	1. Introduction to robot manipulators, definitions, terminology

2. Robot types and history
3. Significance of robots
4. Robot structure and operation
5. Homogenous transformations
6. Kinematic equations of serial and parallel robots and their solutions
7. Screw-based mechanics
8. Differential relationships and Jacobians
9. Motion trajectories
10. Statics and dynamics of robots
11. Robot control
12. Programming of robots
13. Sensors and actuators: design and operations
14. Vision Systems
15. End effectors
16. Fuzzy logic systems

Laboratory Projects: The lab activities include experiments in assembly, pick and place, part handling, etc. with 4 robots, as well as experiments in motor control, vision systems, automatic manufacturing, and Fuzzy Logic.

Class/Lab Schedule: Three 50-minute lectures per week, one 170-minute lab per week

Contribution of Course to Meeting the Professional Component:

(a)College-level mathematics and basic sciences:	0 credits
(b) Engineering Topics:	3 credit
Design	1 credit
(c)General Education:	0 credits
(d) Other:	0 credits

Prepared by: Saeed Niku

Date: 10/23/2019