Subject:	ROBO
Course Number:	130
Descriptive Title:	Fundamentals of Robotics
Division:	Industry and Technology
Department:	Robotics
Course Disciplines:	Electronics and Computer Hardware Technology, Manufacturing Technology
Catalog Description:	This introductory course provides students with a general overview of basic robot configurations, robot controllers and servo systems, robotic motion analysis, programming, and general applications across industries and sectors. Students will explore advanced applications and concepts that will enable them to grasp all facets of the robotics industry and where they would likely want to focus their career pursuits. The curriculum will guide students in developing an understanding of the various settings that robots have been deployed and help students to identify which type of robot would be utilized, as well as understand how they function from the beginning of a work cycle to the end.
Prerequisite:	
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	3
Hours Laboratory (per week):	0
Outside Study Hours:	6
Total Course Hours:	54
Course Units:	3
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	
Transfer UC:	Yes
Effective Date:	pending
General Education ECC:	
Term:	
Other:	
CSU GE:	
Term:	
Other:	

IGETC:	
Term:	
Other:	
CalGETC:	
Term:	
Other:	
Student Learning Outcomes:	1. SLO #1 – ROBOT TYPES AND SUBSYSTEMS. The student will be able to define what a robot is, distinguish between the different types of robots, identify the purpose of robots and all related subsystems of the varying robot types. Students will also be able to interpret the various subfields of robotics to help carve a path for their future careers. 2. SLO #2 – CONTROLLER AND SERVO SYSTEMS. The student will be able to articulate the various types of robot controller interfaces. Students will be able to identify servo systems and demonstrate how they integrate into the subsystems. Students will also be able to propose a robot and select its anatomy to demonstrate an understanding of how the subsystems interact with the whole. 3. SLO #3 – ROBOT CAREER SOLIDIFICATION By the end of the course, the student will be able to articulate all aspects of the robotics industry, understand all robot types and under what circumstances they are deployed, and in which setting they will be placed (including safety aspects), and identify which specialization or sub-field of robotics they would like to pursue a career in.
Course Objectives:	1. Define a robot, distinguish between the different types of robots, identify the purpose of robots. 2. Interpret why different types of robots are deployed in specific locations and industries. 3. Examine and identify the electronic and mechanical components of a robot. Familiarize with the subsystems required to establish a robotic system. 4. Understand the advanced concepts and applications currently being deployed in the robotics industry, and what the expected future skill-set requirements are. 5. Write up a proposal for a robot, identifying the various components, subsystems, etc. and how it will perform the task that it has been assigned. 6. Explain the differences between a satellite, lander, and rover. 7. Differentiate the various sensors used in robots, including how they are integrated and under what circumstances they are selected. Acquire the industry vernacular and demonstrate familiarization with robot-dominated sensors.
Major Topics:	I. Robotics Overview (4 hours, Lecture) A. Definition of robots B. Types of robots C. Purposes and applications of robots D. Basic robot configurations II. Robot Controller and Servo System (10 hours, Lecture)

A. Robot controls
B. Intelligent robots
C. Spatial resolution
D. Accuracy and repeatability
E. Compliance
F. Open and closed loop controllers
G. Sensors
H. Machine vision

A. Optical shaft encoders

J. Potentiometers
K. Robot drive systems
L. Actuators
M. Robot motors

III. Robot Motion Analysis (10 hours, Lecture)

A. Six degrees of freedom
B. Industrial robot motion
C. Rotating joints
D. Three degrees of freedom
E. Coordinate system robots
F. Kinematics
G. Forward kinematics
H. Inverse kinematics

A. Dynamics

J. Simulations and trajectory generation
K. Gripper fingers
L. Sensors and sensing system
M. Safety

N. Sensing device characteristics
O. Types of sensors
P. Force and wrist sensors
Q. Tactile sensor array and artificial skins
R. Additional sensors
S. Modes of operation
T. Interpreter and compiler

IV. ROBOT PROGRAMMING (10 hours, Lecture)

A. Types of programming
B. Work cell operations
C. Programming methods
D. Graphical simulation
E. Subtasks
F. Trajectory planning
G. Programming system modules
H. Programming language types

	I. Online and offline programming J. Subroutines K. Artificial intelligence V. ROBOT APPLICATIONS (10 hours, Lecture) A. Semiconductor manufacturing B. Atmosphere versus vacuum robots C. Assembly robots D. Materials handling robots E. Arc welding F. Industries with robots G. Safety measures H. Sensors I. Virtual reality Vi. ADVANCED ROBOT APPLICATIONS AND CONCEPTS (10 hours, Lecture) A. Artificial intelligence B. Machine and deep learning C. Soft robotics (biomimicry) D. Cybernetics E. Exoskeletons F. Satellite, landers, and rovers G. Giant robots H. Robotics in virtual reality I. Robotics competitions
Total Lecture Hours:	54
Total Laboratory Hours:	0
Total Hours:	54
A.1. Primary Methods of Evaluation (Part 1 - CCN courses only):	
Primary Method of Evaluation:	3) Skills demonstration
Typical Assignment Using Primary Method of Evaluation:	In a three- to five-page report, identify different types of robots. Examine components of a robot and demonstrate knowledge of subsystems and how they interact with one-another. Submit report to instructor for evaluation.
Critical Thinking Assignment 1:	Write a two- to three-page report that explores a robotics topic and how it can be applied for societal benefit. Submit report to the instructor.
Critical Thinking Assignment 2:	Design on paper or with a Computer Aided Design/Drafting (CADD) program a robot based on a problem to be solved, justifying type, sensor selection, and subsystem. Submit report to the instructor. In a two- to three-page report, present and justify a robotics sub-field that aligns with the students desired career goal destination. Submit report to the instructor.

Other Evaluation Methods:	Class Performance, Completion, Essay Exams, Matching Items, Multiple Choice, Performance Exams, Presentation, Quizzes, True/False, Written Homework
If Other:	
Instructional Methods:	Demonstration, Discussion, Group Activities, Guest Speakers, Lecture, Multimedia presentations
If other:	Simulation
Work Outside of Class:	Problem solving activity, Required reading, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	
Up-To-Date Representative Texts:	Dr. R.K. Jain. Zero to Mastery in Robotics. Independently Published. 2022
Alternative Texts:	
Required Supplementary Readings:	
Other Required Materials:	
Requisite	
Category	
Requisite course:	
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite Skill:	
Requisite Skill and Matching skill(s): Bold the requisite skill(s). if applicable	
Requisite course:	
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Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). if applicable	

Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Joseph Weichman
Date:	04/10/2024
Original Board Approval Date:	03/24/2025
Effective Term:	Fall 2025