COURSE OUTLINE: RAA201 - ROBOTICS WITH VISION

Prepared: Donovan Kennedy
Approved: Corey Meunier, Chair, Technology and Skilled Trades

Course Code: Title	RAA201: APPLICATIONS OF ROBOTICS WITH VISION
Program Number: Name	4068: ROBOTICS AUTOMATION
Department:	ROBOTICS GRADUATE CERTIFICATE
Semesters/Terms:	20W
Course Description:	The objective of this course is to introduce students to machine vision technology and how it is used in conjunction with robotic applications. The student will explore methods of illumination, learn different techniques for part identification and investigate frames of reference for cameras and robots using the ABB integrated vision package.
Total Credits:	5
Hours/Week:	5
Total Hours:	75
Prerequisites:	RAA100, RAA103, RAA106
Corequisites:	There are no co-requisites for this course.
Vocational Learning Outcomes (VLO's) addressed in this course: **Please refer to program web page for a complete listing of program outcomes where applicable.**	**4068 - ROBOTICS AUTOMATION** VLO 1 Construct and evaluate robotic control programs for various scenarios against which to model the functionality and stability of automation systems. VLO 2 Plan and lead the installation of new industrial equipment and its physical and digital integration with existing systems. VLO 3 Collaborate with health and safety personnel to develop plans and specifications that incorporate, among other elements, safety controls and physical guarding to comply with all applicable regulatory safety designs and standards used in industrial robotic applications. VLO 5 Validate and optimize the functioning of motor, drive, control, and robotic systems. VLO 7 Formulate and use a variety of troubleshooting techniques on new and legacy electromechanical equipment, processes, systems and subsystems.
Essential Employability Skills (EES) addressed in this course:	EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience. EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.

	EES 10 Manage the use of time and other resources to complete projects. EES 11 Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	
Other Course Evaluation & Assessment Requirements:	Grade Definition Grade Point Equivalent A+ 90 - 100% 4.00 A 80 - 89% 4.00 B 70 - 79% 3.00 C 60 - 69% 2.00 D (Fail)50 - 59% 1.00 F (Fail)49% and below 0.00 CR (Credit) Credit for diploma requirements has been awarded. S Satisfactory achievement in field /clinical placement or non-graded subject area. U Unsatisfactory achievement in field/clinical placement or non-graded subject area. X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. NR Grade not reported to Registrar`s office. W Student has withdrawn from the course without academic penalty.
Books and Required Resources:	Automation, Production Systems, and Computer-Integrated Manufacturing by Mikell P. Groover Publisher: Pearson Edition: Fifth ISBN: 978-0-13-460546-3

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
1.1 Define the initial setup of a vision cell	1.1 Illustrate parts of cameras and peripheral equipment used in vision applications such as aperture, lens and lighting. 1.2 Connect a camera to a robot using Ethernet fieldbus 1.3 Demonstrate a typical camera setup in a robot cell
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Illustrate various applications of machine vision	2.1 Identify applications of machine vision in robotic applications 2.2 Examine different parts of a typical vision application setup including calibration, lighting and lenses. 2.3 Determine 2D offsets using a vision camera
Course Outcome 3	**Learning Objectives for Course Outcome 3**
3. Demonstrate how machine vision cameras can be used in conjunction with robots for part identification	3.1 Differentiate between pixels and robot coordinates 3.2 Apply vision offsets obtained to robot positions 3.3 Use integrated vision application to program the robot to move to part location

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Assignments & Labs	40%
Attendance & Participation	10%
Lab Practical Test	20%
Test 1	15%
Test 2	15%

Date:	December 18, 2019
Addendum:	Please refer to the course outline addendum on the Learning Management System for further information.