COURSE OUTLINE: RAA103 - ROBOT CELL DESIGN

Prepared: Dean Matthews
Approved: Sherri Smith, Chair, Natural Environment, Business, Design and Culinary

Course Code: Title	RAA103: ROBOT CELL DESIGN AND SAFETY
Program Number: Name	4068: ROBOTICS AUTOMATION
Department:	ROBOTICS GRADUATE CERTIFICATE
Semesters/Terms:	18F
Course Description:	The students in this course will gain an understanding of workplace safety and safeguarding in typical manufacturing environments and also learn the implementation tactics of safety devices. They will also investigate important design practices of automated cells including robot reach studies, gripper designs and peripheral component design criteria
Total Credits:	3
Hours/Week:	3
Total Hours:	45
Prerequisites:	There are no pre-requisites for this course.
Corequisites:	There are no co-requisites for this course.
This course is a pre-requisite for:	RAA200, RAA201, RAA203, RAA204
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 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 4 Assist in the assessment and management of robotic systems by applying business principles to the electromechanical environment. VLO 5 Validate and optimize the functioning of motor, drive, control, and robotic systems. VLO 6 Integrate budgetary, technical, functional and safety considerations in the design and optimization of custom automation solutions. 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 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 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. 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:	Passing Grade: 50%, D
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: Fourth ISBN: 978-0-13-349961-2

Course Outcomes and Learning Objectives:

Course Outcome 1	**Learning Objectives for Course Outcome 1**
1. Examine standard safeguarding types used in automated cells	1.1 Investigate safety practices and standards as they relate to manufacturing cells 1.2 Identify elements of an automation cell that require safeguarding 1.3 Differentiate between various safety devices and their implementation 1.4 Contrast and compare safety devices used in the robotics lab at Sault College
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Investigate manufacturing cell design	2.1 Differentiate the key concepts of manual vs.automated assembly systems 2.2 Investigate concepts of reach study and cycle rate as they pertain to automated cells and robots 2.3 Examine robotic gripper design elements
Course Outcome 3	**Learning Objectives for Course Outcome 3**
3. Investigate WMS and larger manufacturing cells	3.1 Investigate the design of warehouse management systems 3.2 Examine the 10 Principles of Material HandlingÂ□, from Ch. 80 Maynards Industrial Engineering Handbook 3.3 Analyze material transport systems

Course Outcome 4	Learning Objectives for Course Outcome 4
4. Practice different types of robot reach limitation as it pertains to safety in robot cells	4.1 Examine soft limit robot reach, world zones, safe operation software 4.2 Examine hard limit robot reach 4.3 Examine software applications that prevent robot incursions.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight	Course Outcome Assessed
Assignments	25%	
Lab practical	15%	
Project writeup	20%	
Test 1	20%	
Test 2	20%	

Date: September 7, 2018

Please refer to the course outline addendum on the Learning Management System for further information.