COURSE OUTLINE: ELR216 - INTRO TO ROBOTICS

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Course Code: Title	ELR216: INTRODUCTION TO ROBOTICS
Program Number: Name	4026: ELECTRICAL TN-PROC 4029: ELECTRICAL TY-PROCES 4127: ELECTRICAL TN-TRADES
Department:	ELECT./INSTRUMENTATION PS
Academic Year:	2022-2023
Course Description:	Introduction to Robotics introduces the student to the basic concepts and components associated with industrial robotic systems. This introductory course gives the student a basic understanding of where robotic systems fit in an automated industrial production ecosystem. Theory and discussions include robotic and industrial automation fundamental topics such as system configurations, industrial applications, robotic safety, methods of power transmission, types of control, tooling, and interfacing with peripherals.
Total Credits:	2
Hours/Week:	2
Total Hours:	28
Prerequisites:	ELN210
Corequisites:	ELR232
Vocational Learning Outcomes (VLO's) addressed in this course: **Please refer to program web page for a complete listing of program outcomes where applicable.**	**4026 - ELECTRICAL TN-PROC** VLO 1 Interpret and produce electrical and electronics drawings including other related documents and graphics. VLO 12 Apply health and safety standards and best practices to workplaces. VLO 13 Perform tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles. VLO 16 Select electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person. **4029 - ELECTRICAL TY-PROCES** VLO 1 Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics. VLO 12 Apply and monitor health and safety standards and best practices to workplaces. VLO 13 Perform and monitor tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles. VLO 16 Select and recommend electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person. **4127 - ELECTRICAL TN-TRADES**

	VLO 1	Interpret and produce electrical and electronic drawings including other related documents and graphics.
	VLO 12	Apply health and safety standards and best practices to workplaces.
	VLO 13	Perform tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.
	VLO 16	Select electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.
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 A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.	
Other Course Evaluation & Assessment Requirements:	Smart watches, smart phones and similar devices are not allowed during tests or quizzes and must be removed. Smart phones are not acceptable for use as a calculator during a test or quiz. Grade Definition Grade Point Equivalent A+ 90 - 100% 4.00 A 80 - 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 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:	Industrial Robotics Fundamentals by Larry Ross, Stephen Fardo, Michael Walach Publisher: G-W Edition: Third ISBN: 978-1-63126-941-7

Course Outcomes and Learning Objectives:

Course Outcome 1	**Learning Objectives for Course Outcome 1**
1. Understand various basic terminology and the concepts of robots.	1.1 Describe early robots and their role. 1.2 State the important developments in the evolution of robots. 1.3 List and explain the classifications of industrial robots. 1.4 Define two types of automation. 1.5 Discuss the role of robots in the workforce.
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Understand the fundamentals of a robots and related equipment and their industrial applications.	2.1 Identify the five major parts of a robot. 2.2 Explain degrees of freedom as applied to robots. 2.3 Classify robots according to type of control systems and type of actuator drives. 2.4 Discuss the four basic configurations for robots. 2.5 Describe how robots are integrated into manufacturing process. 2.6 Discuss factors to consider in selecting the proper robot for a given task. 2.7 Identify applications where robots are used in industry. 2.8 Discuss the types of movements an end effector can perform. 2.9 Describe the types of end effector grippers and end effector tools. 2.10 Identify the benefits of changeable end effectors. 2.11 List important factors and desirable characteristics to be considered in the design of end effectors.
Course Outcome 3	**Learning Objectives for Course Outcome 3**
3. Understand the fundamentals of a robots and related equipment safety.	3.1 Discuss general safety practices for the student lab and work area. 3.2 Discuss safety practices related to robots and related equipment. 3.3 Describe guidelines, barriers, sensors, and overload protection for robotic safety as related to industry and the student lab environment.
Course Outcome 4	**Learning Objectives for Course Outcome 4**
4. Understand the fundamentals of robot programming.	4.1 Discuss the three generations in the evolution of programming for robots. 4.2 Identify classifications of robots according to the pattern of motion they use. 4.3 List the four programming methods for robots. 4.4 Describe the use of high-level programming languages for robots. 4.5 Discuss the differences between hierarchical control and task level programming.

	4.6 Discuss universal programming concepts using the ABB IRC5 RAPID programming language as an example. 4.7 Understand the fundamentals of robotic system interfaces and vision systems.
Course Outcome 5	**Learning Objectives for Course Outcome 5**
5. Understand the fundamentals of robot electromechanical systems.	5.1 Explain how sensing, timing, and control systems are used in the operation of robots. 5.2 Discuss rotary motion systems used for robotics. 5.3 Describe the characteristics of hydraulic and pneumatic systems. 5.4 Discuss the characteristics of fluid flow.
Course Outcome 6	**Learning Objectives for Course Outcome 6**
6. Understand the fundamentals of maintaining a robotic system.	6.1 Describe successful troubleshooting methods for robotic systems. 6.2 Follow the proper techniques for general servicing of equipment. 6.3 List the steps in developing a preventive maintenance plan.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Assignments and Quizzes	30%
Test 1	35%
Test 2	35%

Date: June 1, 2022

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