COURSE INFORMATION

Department/ Faculty:	Control and Mechatronics Engineering/ Electrical Engineering Faculty	**Page:**	1 of 5
Course code:	SKEM4153	**Academic Session/Semester:**	201718/2
Course name:	Robot Technology for Automation	**Pre/co requisite (course name and code, if applicable):**	
Credit hours:	3		

Course synopsis	This course introduces students to the main aspects of the key technologies in the design and installation of robotic systems, automated work cells, computer integrated manufacturing systems, work cell support systems, robot and system integration, as well as safety design in robot applications. The students will learn machine interference and cycle time analysis when designing and analyzing the performance of the robot work cell. In addition to that, the students will be exposed to the simulation tool in designing and analyzing the robot work cell by using RobotStudio simulation software.			
Course coordinator (if applicable)	Assoc. Prof. Ir. Dr. Mohd Ridzuan bin Ahmad			
Course lecturer(s)	**Name**	**Office**	**Contact no.**	**E-mail**
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Prepared by:	Certified by:
Name: Assoc. Prof. Ir. Dr. Mohd Ridzuan Ahmad	Name: Assoc. Prof. Ir. Dr. Norhaliza Abd Wahab
Signature: 	Signature:
Date: FEBRUARY 2018	Date: FEBRUARY 2018

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Mapping of the Course Learning Outcomes (CLO) to the Programme Learning Outcomes (PLO), Teaching & Learning (T&L) methods and Assessment methods:

No.	CLO	PLO (ICGPA CODE)	Weight (%)	Knowledge Profile EAC	*Taxonomies and **generic skills*	T&L methods	***Assessment methods
1	Describe the basic principles of selected robot technologies in industrial automation.	PLO1 (KW)	20	WK4	C2	Lecture	Q, T, F
2	Analyze the performance of robot work cell by using machine interference and cycle time computation.	PLO3 (THDS)	30	WK4	C4	Lecture	T, F
3	Analyze the performance of computer integrated manufacturing system.	PLO3 (THDS)	30	WK4	C4	Lecture	T, F
4	Design and analyze the performance of robot work cell by using RobotStudio simulation software.	PLO4 (THI)	10	WK6	CS4	Lab hands-on Session	PR
5	Produce effective technical report on the performance of robot work cell.	PLO6 (AD)	10		CS1	Lab hands-on Session	Pr

Refer *Taxonomies of Learning and **UTM's Graduate Attributes, where applicable for measurement of outcomes achievement

***T – Test; Q – Quiz; HW – Homework; PR – Project; Pr – Presentation; F – Final Exam etc.

Details on Innovative T&L practices:

No.	Type	Implementation
1	Active learning	Conducted through in-class activities and e-Learning portal.
2	Programming	Hands-on RobotStudio session to simulate the performance of the robot work cell.
3	Open Course Ware	Digital learning materials available at http://ocw.utm.my/course/view.php?id=331

Weekly Schedule:

Week 1	**Topic 1: Introduction on Applications of Robots In Industry** History of Industrial Robots, Industrial Robot Work Cells, Benefits if Using Robots, The Feasibility Study. Robot Application: Rule of Thumb, Examples of Applications, An Approach for Implementation of Robots, Safety, Training, Maintenance and Quality, Economic Analysis
Week 2	**Topic 2: Work Cell Design and Control** Robot Cell Layouts, Multiple Robots and Machine Interference, Some Considerations in Work Cell Design
Week 3	Work Cell Control. Interlocks, Error Detection and Recovery, Work Cell Controller, Robot Cycle Time Analysis, Graphical Simulation of Robotic Work Cells
Week 4	Case Study on Spot and Arc Welding, Case Study on Spray-Painting
Week 5	**Topic 3: Automated Work Cells and Computer Integrated Manufacturing Systems** The CIM Implementation Process, Making the CIM Process Work, Work Cell Design Checklist, Implementing Automated Work Cells
Week 6	System Trouble Shooting and Problem Solving. Work Cell Support Systems, Machine Vision Systems, Material Handling, Part Feeding, Inspection, and Automatic Tracking
Week 7	Work Cell Programming, Work Cell Controller Programming, Programming Sequential Cell Activity. Robot Programming
Week 8	**Mid-Semester Break**
Week 9	Programming Sequential Cell Activity. Robot Programming
Week 10	**Topic 4: Robot and System Integration** Characteristics of Factory of the Future, System Overview
Week 11	Work Cell Architecture, Interfaces
Week 12	Computer Control Hierarchy
Week 13	**Topic 5: Safety Design in Robot Applications** Safety Standards, Safeguarding a Work Cell
Week 14	Presence of Sensing Devices, Interlocks
Week 15	Developing a Safety Strategy

Transferable skills (generic skills learned in course of study which can be useful and utilised in other settings):

Programming skills using RobotStudio software Written communication

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Student learning time (SLT) details:

Distribution of student Learning Time (SLT) Course content outline	Guided Learning (Face to Face)				Teaching and Learning Activities: Guided Learning Non-Face to Face	Teaching and Learning Activities: Independent Learning Non-Face to face	TOTAL SLT
	L	**T**	**P**	**O**			
CLO1	3				4	5	12
CLO2	9				4	10	23
CLO3	27				4	10	41
CLO4			2		4	10	16
CLO5			1		4	5	10
Total SLT	**39**		**3**		**20**	**40**	**102**

L: Lecture, T: Tutorial, P: Practical, O: Others

Continuous Assessment		PLO	Percentage	Total SLT
1	Quiz	KW	5	**30m**
2	Test 1	KW, THDS	15	**Conducted during Face to Face time (1h)**
3	Test 2	THDS	10	**Conducted during Face to Face time (1h)**
4	Assignment 1	THI	10	**10h**
5	Assignment 2	AD	10	**5h**
Final Assessment			Percentage	Total SLT
1	Final Examination	KW	50	**2h 30m**
Grand Total			**100%**	**120**

Special requirement to deliver the course (e.g: software, nursery, computer lab, simulation room):

RobotStudio simulation of the robot work cell and Flexim.

Learning resources:

Main references

1. James A. Rehg: Introduction to Robotics in CIM Systems. Fifth Edition, Prentice-Hall. 2003.
2. Mikell P. Groover: Automation, Production Systems, and Computer Integrated Manufacturing, Second Edition. 2004.
3. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey: Industrial Robotics: Technology, Programming, and Applications, McGraw-Hill. 1986.
4. Farid M. L. Amirouche: Computer-Aided Design and Manufacturing. Prentice-Hall. 1992.
5. Richard K. Miller, Industrial Robot Handbook. Van Nostrand Reinhold, N.Y. 1987.

Online references

1. UTM's Open Course Ware (http://ocw.utm.my/course/view.php?id=331)
2. eLearning (http://elearning.utm.my)

Academic honesty and plagiarism:

Assignments are individual tasks and NOT group activities (UNLESS EXPLICITLY INDICATED AS GROUP ACTIVITIES) Copying of work (texts, simulation results etc.) from other students/groups or from other sources is not allowed. Brief quotations are allowed and then only if indicated as such. Existing texts should be reformulated with your own words used to explain what you have read. It is not acceptable to retype existing texts and just acknowledge the source as a reference. Be warned: students who submit copied work will obtain a mark of zero for the assignment and disciplinary steps may be taken by the Faculty. It is also unacceptable to do somebody else's work, to lend your work to them or to make your work available to them to copy.

Other additional information (Course policy, any specific instruction etc.):

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Disclaimer: