

Full Title	Instrumentation and Automation (Part-Time)		
Status	Uploaded to Banner	Start Term	2018
NFQ Level	07	ECTS Credits	10
Module Code	ELEC07077	Duration	36 Weeks - (36 Weeks)
Grading Mode	Numeric	Department	Mechanical & Industrial Eng
Module Author	Eilish Zaletel		

Module Description

Sensors: The student will gain an understanding of electrical, electronic and mechanical sensors/actuators, including their required signal-conditioning and digital interfacing to acquire and analyse data.

Control Theory: This module introduces open loop and closed loop systems control theory. Concepts such as feedback, steady state error, disturbances, ON/OFF controllers, proportional, integral and derivative controllers will be examined to show that proper control system design leads to systems that are efficiently and adequately controlled.

Industrial Robots: Definition and classification of robots. Robot anatomy: joints and links, control systems, end effectors, sensors in robotic applications. Robotic maintenance and safety. Application of industrial and materials handling robots

Production, Automation and Computer Integrated Manufacturing. How these technologies are used to construct modern manufacturing systems, including Flexible Manufacturing Systems (FMS)

Learning Outcomes

☰ **On completion of this module the learner will/should be able to:**

1. Describe the principle of operation and characteristics of sensors and actuators.
2. Analyse control concepts including open loop, closed loop, relays, motor control, sequential control, process control, PID control.
3. Investigate robotic capability, technology and anatomy
4. Evaluate the technical, financial and engineering aspects of automated production systems
5. Investigate the application of Flexible Manufacturing Systems with particular reference to Bottleneck modelling.

Indicative Syllabus

Types of sensors: Position/displacement/proximity, potentiometer, LVDT, strain, temperature (thermocouples, RTDs, thermistors), pressure, liquid level, heat flux, fluid flow sensors. Digital/analog. Passive/Active. The signal-conditioning and digital interfacing needed to acquire and analyse data.

Sensor Characteristics: precision, accuracy, hysteresis loop, sensitivity, calibration, linearity

Control Theory: Control concepts: Open-loop, closed loop and sequential control systems, ON/OFF controllers, Relays, Motor Controllers, Proportional, Integral and Derivative (PID) Control.

Industrial Robots: Definitions and classification of robots. Robot anatomy: joints and links, control systems, end effectors, sensors in robotic applications. Robotic maintenance and safety. Application of industrial and materials handling robots

Automation Technologies : How production, automation and material handling technologies are used to construct modern manufacturing systems

Product/Production relationships. Cost of Manufacturing Operations

Production Concepts and Mathematical Models

Flexible Manufacturing Systems: Classification, application, benefits, planning and implementation

Teaching and Learning Strategy

This module combines face-to-face and a high level of self-learning. Taking into consideration that students work remotely, a high level of self learning is expected as well as online assessments to be completed. Time allocation is given to support and monitor their learning.

The module is delivered as a 3 hour lecture every fortnight with a weekly ½ hour online support and monitoring. The ½ hour each week is to allow the student the opportunity to question the lecturer on the course content, and mainly to offer assistance with the mathematical aspects of the course.

Assessment Strategy

60% ongoing assignments

40% end of term exam-type assessment

Repeat Assessment Strategies

Students will be given the opportunity to take a repeat examination.

Indicative Coursework and Continuous Assessment:		100 %		
Form	Title	Percent	Week (Indicative)	Learning Outcomes
Assessment	Ongoing assessments	60 %	OnGoing	1,3
Closed Book Exam	Final Exam End of term exam	40 %	End of Semester	2,4,5

Blended Delivery Mode Average Weekly Workload:			2.00 Hours		
Type	Description	Location	Hours	Frequency	Weekly Avg
Practical	Lecture/ Practical	Engineering Laboratory	3	Fortnightly	1.50
Online Learning	Online support and monitoring	Not Specified	0.5	Weekly	0.50

Recommended Reading Book List

Bolton, W., (2009). *Mechatronics: A Multidisciplinary Approach (4th Edition)*. Prentice Hall.
ISBN 0132407639 ISBN-13 9780132407632

Groover, P., (2007). *Automation, Production Systems, and Computer-Integrated Manufacturing (3rd Edition)*. Prentice Hall.
ISBN 0132393212 ISBN-13 9780132393218

Bolton, W., (2013). *Mechatronics: Electronic control systems in mechanical and electrical engineering (5th Edition)*. Prentice Hall.
ISBN 0273742868 ISBN-13 9780273742869

Nise, S., (2014). *Control Systems Engineering, 7th Edition*. Wiley.

Journal Resources**Online Resources****Programme Membership**

GA_EMANG_B07 201800 Bachelor of Engineering in Manufacturing Engineering (Part-time)