

Module: Advanced Mechatronic Systems *by Erping Zhou*

Code: MEC3001

20 credits at level HE6

Description and Purpose of Module

Mechatronics is concerned with the integration of mechanical, electronic, software, and control engineering topics into a unified framework that enhances the design process for product, process and system development. This module explores

- combining these four inter-related modules into systems;
- evaluating technical needs and design appropriate mechatronics systems to meet those needs;
- analyzing and implementing solutions to problems in different technical domains.

Indicative Syllabus Content

Mechatronics Systems:

Systems and measurement systems, control systems, mechatronics approach.

System models:

Mathematical models, engineering systems, mechanical, electrical, fluid and thermal system building blocks.

Dynamic responses of systems:

Modelling dynamic systems, first-order systems, second-order systems, performance measures for second-order systems, system transfer functions, systems with feedback loops, PID control.

Automated Systems:

Robots, workcell, CIM

Artificial Intelligence techniques:

Concepts in Artificial Intelligence, Fuzzy Logic, Neural Networks.

Case Study

Industrial Robots, PLC and Mechatronics

Learning, Teaching and Assessment

Formal lectures and tutorials will be used to explain theory, techniques and to highlight areas needing factual knowledge.

Case studies will develop and assess the analytical and evaluative/comparative skills.

Practical skills in robot programming and systems simulation will be developed through laboratory sessions using physical robot and computer simulation software.

An examination will assess the knowledge and understanding of elements and of the tools for analysis and design mechatronics systems.

Learning Outcomes and Assessment Criteria

	Learning Outcomes when you have successfully completed this module you will:	Assessment Criteria to demonstrate that you have achieved the learning outcome you will:
1.	understand the mechatronics systems and approach.	<ul style="list-style-type: none"> • describe a mechatronics system and a system approach. • identify and explain selected technologies/systems applied in mechatronics systems.
2.	analyse mechatronics system models and use tools for building up the modules.	<ul style="list-style-type: none"> • explain the principal features of mechatronics system models. • be able to choose which model/models is appropriate for a given application.
3.	have knowledge of systems' dynamic responses, and performance measures.	<ul style="list-style-type: none"> • be able to describe the systems' dynamic responses and performance measures. • be able to use simulation software to design, test and validate a system.
4.	program and operate safely an industrial robot.	<ul style="list-style-type: none"> • program a robot by on-line teaching and/or by off-line programming. • devise and describe in a neutral format a robot program to carry out a simple manipulation task. • explain and apply appropriate health and safety regulations on operating an industrial robot.
5.	have knowledge of current trends in artificial intelligence and heuristic control techniques.	<ul style="list-style-type: none"> • explain the concepts of artificial intelligence and apply standard techniques into practical cases.

Assessment

Your achievement of the learning outcomes for this module will be tested as follows:

Type	CW	EX

Description	Lab based coursework.	An unseen examination.
%age	50	50
Final Assessment	N	Y
Learning Outcomes	2,4	1,3,5

Prerequisite Module(s)

There are no prerequisites for this module.

Barred Combinations

No restrictions apply.

Indicative Reading

Bolton, W. (2008) *Mechatronics : a multidisciplinary approach* 4th ed
 Published Harlow : Prentice Hall
 Smali, A; Mrad, F (2008), *Applied mechatronics* Published Oxford, Oxford Univ. Press
 Tewari, Ashish (2002) "Modern control design with MATLAB and SIMULINK", Chichester ; New York : Wiley.
 Nise, Norman S (2011) sixth ed. "Control systems engineering", Hoboken, N.J. : Wiley.
 Hegde, Ganesh S (2010) *Mechatronics*, Published London : Jones and Bartlett
 Michael Negnevitsky(2004) *Artificial intelligence : a guide to intelligent systems*, Harlow : Addison Wesley.

Mechatronics Journal <http://www.bolton.ac.uk/learning/ejour/sd/09574158.htm>
<http://www.mathworks.com/products/matlab/>
 Robotics tutorials, <http://www.dprg.org/tutorials/>

Module Type:	CORE
Module Length:	2
Host Subject Group:	Engineering
Version Number::	0.1

Activity Log

User Name	Date Accessed	Action
mj3	01/02/2005 17:10:28	amended
bw2	03/02/2005 11:41:09	amended
mj3	09/05/2005 17:16:39	amended
bw2	09/05/2005 17:41:47	amended
bw2	15/03/2006 10:56:24	amended
mj3	24/06/2010 19:04:43	added
mj3	24/06/2010 19:45:21	Ammended
acj1	25/06/2010 08:26:54	Ammended
acj1	25/06/2010 08:30:19	Ammended
mj3	25/06/2010 14:18:08	Ammended
mgs1	25/06/2010 16:01:24	Ammended
mj3	28/06/2010 12:28:11	Ammended
mj3	28/07/2010 12:15:41	Ammended
mj3	28/07/2010 13:32:49	Ammended
Admin	20/08/2010 16:35:06	Validated
Admin	16/11/2010 14:52:24	Ammended
Admin	16/11/2010 14:54:13	Revalidated
ez1	18/05/2011 13:57:19	Ammended
ez1	18/05/2011 15:27:41	Ammended
ez1	14/10/2011 16:23:44	Ammended
Admin	30/01/2012 16:18:04	Revalidated

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