Course Outline (Higher Education)

School: School of Engineering, Information Technology and Physical Sciences

Course Title: INTELLIGENT MECHANISMS DESIGN

Course ID: ENGIN3406

Credit Points: 15.00

Prerequisite(s): (ENGIN2303 or ENMEC2111)

Co-requisite(s): Nil

Exclusion(s): (ENMTX4010)

ASCED: 039999

Description of the Course:

This course introduces students to basic principles of Intelligent Mechanisms and kinematics and dynamics. This course will introduce design of specific advanced intelligent mechanisms with forward and inverse kinematics. Further, dynamics of mechanisms and control of mechanisms with PID, Joint space, operational space and force control.

Grade Scheme: Graded (HD, D, C, P, MF, F, XF)

Work Experience:

No work experience: Student is not undertaking work experience in industry.

Placement Component: No

Supplementary Assessment: Yes

Where supplementary assessment is available a student must have failed overall in the course but gained a final mark of 45 per cent or above and submitted all major assessment tasks.

Program Level:

Level of course in Program	AQF Level of Program					
	5	6	7	8	9	10
Introductory						
Intermediate						
Advanced			✔			

Learning Outcomes:

On successful completion of the course the students are expected to be able to:

Knowledge:

K1. Explain common terminologies and conventions in intelligent mechanisms.
K2. Synthesise the important concepts in kinematics and dynamics of robot manipulators.
K3. Translate the basic theories and mathematics behind intelligent mechanism design into engineering practice.
K4. Develop mathematical models of the kinematics and dynamics of the industrial manipulators.

Skills:

S1. Design mechanisms using forward and inverse kinematics.
S2. Develop mathematical models of mechanisms.
S3. Analyse the dynamics of mechanisms.
S4. Apply the mathematical principles for the control of mechanisms.
S5. Use mathematical tools for the design and control of mechanisms.

Application of knowledge and skills:

A1. Integrate knowledge relating to the design and development of intelligent mechanisms.
A2. Apply of theories to analyse the dynamics of mechanisms.
A3. Use theories for the intelligent control of mechanisms.

Course Content:

Topics may include:

- Introduction to intelligent mechanisms
- Spatial Descriptions
- Forward Kinematics
- Jocobians (velocity, explicit form, static forces)
- Inverse kinematics
- Dynamics (acceleration, explicit form)
- Control (PID, joint space, operational space, force control)

Values:

V1. Appreciate the value of basic engineering theories for design and development of intelligent mechanisms

V2. Appreciate the importance of advance control of mechanisms for efficient operation of mechanisms

V3. Appreciate the importance of mathematics for design of intelligent mechanisms

Graduate Attributes

The Federation University FedUni graduate attributes (GA) are entrenched in the Higher Education Graduate Attributes Policy (LT1228). FedUni graduates develop these graduate attributes through their engagement in explicit learning and teaching and assessment tasks that are embedded in all FedUni programs. Graduate attribute attainment typically follows an incremental development process mapped through program progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni course, and all attributes must be directly assessed in each program**

Graduate attribute and descriptor		Development and acquisition of GAs in the course	
		Learning Outcomes (KSA)	Assessment task (AT#)
GA 1 Thinkers	Our graduates are curious, reflective and critical. Able to analyse the world in a way that generates valued insights, they are change makers seeking and creating new solutions.	K1-K4 S1-S5 A1-A3	1-3
GA 2 Innovators	Our graduates have ideas and are able to realise their dreams. They think and act creatively to achieve and inspire positive change.	K1-K4 S1-S5 A1-A3	1-3
GA 3 Citizens	Our graduates engage in socially and culturally appropriate ways to advance individual, community and global well-being. They are socially and environmentally aware, acting ethically, equitably and compassionately.	A1-A3	1-3
GA 4 Communicators	Our graduates create, exchange, impart and convey information, ideas, and concepts effectively. They are respectful, inclusive and empathetic towards their audience, and express thoughts, feelings and information in ways that help others to understand.	K1-K4 S1-S5 A1-A3	1-3
GA 5 Leaders	Our graduates display and promote positive behaviours, and aspire to make a difference. They act with integrity, are receptive to alternatives and foster sustainable and resilient practices.	K3-K4 S4-S5 A1-A3	1-3

Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
K1-K4, S1-S5, A1-A3	Understanding of principles and mathematics involved	Laboratory and tutorials	10 - 30%
K1-K4, S1-S5, A1-A3	To verify the gradual understanding of concepts	Assignments	20 - 40%
K1-K4, S1-S5, A1-A3	Any combination of questions and problems from the whole of the course content.	Exams / Tests	40 - 60%

Adopted Reference Style:

Other (IEEE: Refer to the library website for more information)

Refer to the library website for more information

Fed Cite - referencing tool