Course Outline (Higher Education)

School: School of Engineering, Information Technology and Physical Sciences

Course Title: MECHATRONICS COMPONENTS DESIGN

Course ID: ENGIN3402

Credit Points: 15.00

Prerequisite(s): (ENCOR1010 or ENGIN1004) (ENGIN2303 or ENMEC2111)

Co-requisite(s): Nil

Exclusion(s): (ENMTX3020)

ASCED: 030101

Description of the Course:

This course covers advanced principles of mechanical component design (relevant to mechatronics systems). Approaches to the design of specific machine components (such as bolts, rolling bearings, stepped shafts, belts, clutches and gears) are considered in the broader context of the choices presented to a design engineer. The design process includes considerations of safety and compliance with standards. Assessment of mechanical failure is also discussed in some depth.

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						

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

Learning Outcomes:

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

Knowledge:

K1. Articulate the common terminologies associated with mechatronics component design.
K2. Exhibit theoretical proficiency in mechatronic component design process.
K3. Describe the typical components of mechatronics systems.
K4. Recognise the stress-strain based principles of mechatronics design.
K5. Explain failure criteria in the context of mechatronics component design.

Skills:

S1. Identify appropriate analytical models to describe and predict the behaviour of standard mechatronic components.
S2. Reduce the behaviour of a complex mechatronic systems into appropriate sub- systems/elements and then analyse the behaviour of their elements.
S3. Apply stress analysis theory, fatigue theory and appropriate criteria of failure to the design of simple mechatronic elements.
S4. Analyse and evaluate forces and stresses within a spur gear system.
S5. Select appropriate mechanical components from manufacturers` catalogues.
S6. Apply codes and standards to machine component design.
S7. Communicate the results of a design assignment by means of drawings and a design report.
S8. Make appropriate use of available computer aided design software.

Application of knowledge and skills:

A1. Integrate the knowledge and understanding from different engineering disciplines in designing mechatronics components.
A2. Application of basic theories for mechatronic component design.
A3. Verification of simulation models with basic engineering theories.
A4. Effective and efficient integration of engineering knowledge for mechatronics component design.

Course Content:

Topics may include:

- Mechanical design principles of mechatronics systems

- Design, manufacture and assembly of basic machine elements used in mechatronic systems (Threaded Fasteners and Power Screws, Riveted, Welded and Bonded Joints, Springs, Bearings, Belt and Chain Drives, Spur Gears, Shafts and Shaft Fittings, Brakes and Clutches)

- Machine frames, welded, adhesive & bolted joints, fasteners
- Stepped shafts & features, rolling element bearings; gear mechanics.
- Design for strength, design for other mechanical failure modes including fatigue, stress concentration
- Safety, ergonomics & standards.

Values:

V1. Appreciate the importance of basic engineering knowledge for mechatronics component design.
V2. Appreciate the effectiveness of design of basic components for mechatronics systems.
V3. Appreciate the usefulness of simulation techniques for efficient mechatronic component design.

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-K5 S1-S8 A1-A4	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-K5 S1-S8 A1-A4	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.	S1-S8 A1-A4	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-K5 S1-S8 A1-A4	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.	S1-S8 A1,A4	1-3

Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
S1-S8, A1-A4	Experimental work and / or projects to verify students ability to apply knowledge and skills acquired in the course	Reports, demonstrations	10 - 30%
K1-K5, S1-S8	Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the course	Assignments, quizzes	20 - 40%
K1-K5	Questions and problems related to the course contents	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