Unit Outline (Higher Education)

Institute / School:	Institute of Innovation, Science & Sustainability
Unit Title:	SENSORS AND ARTIFICIAL PERCEPTION
Unit ID:	ENGIN3403
Credit Points:	15.00
Prerequisite(s):	(ENGIN2402 for undergraduate Students only)
Co-requisite(s):	Nil
Exclusion(s):	(ENMTX3060)
ASCED:	039999

Description of the Unit:

This unit introduces students to the advanced concepts of sensors in artificial perception. The students will learn about the principles behind operation and functionality of different types of sensors and will be provided with knowledge to classify them in accordance to their performance and characteristics. Students will gain knowledge of the data acquisition and conditioning from a sensor system and acquire necessary skills to analyse, comprehend and apply the results to a mechatronic system. In addition to the theoretical knowledge, students will gain practical skills through different projects, assignments and laboratory works, which they would be able to correlate to industrial applications. The unit will enable students to develop strong skills in sensor systems and associated programming techniques, which they would be able to apply in designing and developing physical mechatronic systems and processes.

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 Unit but gained a final mark of 45 per cent or above, has completed all major assessment tasks (including all sub-components where a task has multiple parts) as specified in the Unit Description and is not eligible for any other form of supplementary assessment

Course Level:

Level of Unit in Course	AQF Level of Course					
	5	6	7	8	9	10
Introductory						
Intermediate						
Advanced			✔			

Learning Outcomes:

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

Knowledge:

K1. Demonstrate understanding of sensor principles.
K2. Explain the operation, characteristics and performance of different types of sensors.
K3. Reflect on the understanding of light, image and vision system.
K4. Demonstrate understanding of data conditioning alongside interpreting, analysing and evaluating data extracted from the sensors.
K5. Identify and explain sensor fusion techniques.
K6. Demonstrate understanding of various sensors in autonomous systems for perceiving the environment.
K7. Explain the working principles and operation of sensor system.

Skills:

S1. Integrate, test and critically analyse data obtained from different sensors / sensor array.
S2. Perform sensor data conditioning with appropriate software.
S3. Perform required programming associated with sensor data acquisition and processing.
S4. Analyse sensitivity and accuracy of different sensors.

Application of knowledge and skills:

A1. Design and develop a sensor system towards automation of a mechatronic industrial process.
A2. Develop model robot with sensors and associated electronics and software.
A3. Design an effective unmanned vehicle / autonomous mobile robot navigation system.
A4. Interface sensor systems and artificial intelligence methodology in an industrial mechatronic process to achieve desired control and automation.

Unit Content:

Topics may include:

- Sensor principle, overview of linear and rotational sensors along with flow, temperature, distance, force, torque and acceleration sensors.
- Overview of light, image and vision systems.
- Study of various sensors for autonomous systems including gyroscope, infrared, sonar, odor, tactile,

proximity, Hall Effect and vision based sensors.

- Sensor data acquisition, conditioning and various techniques for integrating and processing the data from different sensors / sensor array.
- Sensor fusion techniques and design and development of a model robot with integrated sensors and associated electronics and software.
- Sensor sensitivity and accuracy.
- RF and optical position / location system.
- Triangulation, ranging, phase shifting measurement and frequency modulation

Graduate Attributes

The Federation University Federation 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 Courses. Graduate attribute attainment typically follows an incremental development process mapped through Course progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni Unit, and all attributes must be directly assessed in each Course**

Graduate attribute and descriptor		**Development and acquisition of GAs in the Unit**	
		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-K7 S1-S4 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-K7 S1-S4 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-S4 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.	K1-K7 S1-S4 A1-A4	1-3

Learning Task and Assessment:

Learning Outcomes Assessed	Assessment Tasks	Assessment Type	Weighting
S1-S4, A1-A4	Experimental work and / or projects to verify students ability to apply knowledge and skills acquired in the unit.	Reports, demonstrations	10 - 30%
K1-K7, S1-S4	Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the unit.	Assignments, quizzes	10 - 30%
K1-K7	Questions and problems related to the unit contents.	Exams / Tests	40 - 60%

Alignment to the Minimum Co-Operative Standards (MiCS)

The Minimum Co-Operative Standards (MiCS) are an integral part of the Co-Operative University Model. Seven criteria inform the MiCS alignment at a Course level. Although Units must undertake MiCS mapping, there is NO expectation that Units will meet all seven criteria. The criteria are as follows:

1. Co-design with industry and students
2. Co-develop with industry and students
3. Co-deliver with industry
4. FedTASK alignment
5. Workplace learning and career preparation
6. Authentic assessment
7. Industry-link/Industry facing experience

MiCS Course level reporting highlights how each Course embraces the principles and practices associated with the Co-Operative Model. Evidence of Course alignment with the MiCS, can be captured in the Course Modification Form.

MICS Mapping has been undertaken for this Unit No

Date:

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