Course Outline (Higher Education)

School / Faculty: Faculty of Science and Technology
Course Title: SENSORS AND ARTIFICIAL PERCEPTION
Course ID: ENGIN3403
Credit Points: 15.00
Prerequisite(s): ENGIN2402 (MEASUREMENT AND COMPUTER INSTRUMENTATION)
Co-requisite(s): Nil
Exclusion(s): Nil
ASCED Code: 303101
Grading Scheme: Graded (HD, D, C, etc.)

Program Level:

<table>
<thead>
<tr>
<th>AQF Level of Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
</tr>
<tr>
<td>Level</td>
</tr>
<tr>
<td>Introductory</td>
</tr>
<tr>
<td>Intermediate</td>
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<tr>
<td>Advanced</td>
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</table>

Learning Outcomes:

On successful completion of the course 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.
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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.

Course 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

Values and Graduate Attributes:

Values:

V1. Appreciate the wide range of applications and use of sensor system in physical industrial mechatronic systems.
V2. Appreciate the use of artificial perception in control and automation of an industrial mechatronic process.

Graduate Attributes:

FedUni graduate attributes statement. To have graduates with knowledge, skills and competence that enable them to stand out as critical, creative and enquiring learners who are capable, flexible and work ready, and responsible, ethical and engaged citizens.
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<table>
<thead>
<tr>
<th>Attribute</th>
<th>Brief Description</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge, skills and competence</td>
<td>Mechatronics is a fast-changing technological area which impacts on our every-day life. Students will develop an appreciation that learning is a life-long process.</td>
<td>High</td>
</tr>
<tr>
<td>Critical, creative and enquiring learners</td>
<td>Development of independent, critical and creative learners is an essential feature of engineering education. Assessments tasks are individualised, so students need to rely on their personal efforts to arrive at their conclusions.</td>
<td>High</td>
</tr>
<tr>
<td>Capable, flexible and work ready</td>
<td>Mechatronics is an interdisciplinary engineering philosophy. It requires a team work approach to execute tasks to achieve common objectives. Training for engagements is built in to the Mechatronics program. A student will graduate with a new outlook as an engaging capable, flexible and work ready individual.</td>
<td>Low</td>
</tr>
<tr>
<td>Responsible, ethical and engaged citizens</td>
<td>Through the project-based learning of Mechatronics programme delivery, a student will value the engineering input for the advancement of humanity. Students are made aware that the engineer does not work or act in isolation, but is part of a wider community that includes many stakeholders, some of which may have no technical knowledge of what the engineer does. An awareness of community as a responsible, ethical and engaged citizen is important when finding a design solution.</td>
<td>Low</td>
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</table>

## Learning Task and Assessment:

<table>
<thead>
<tr>
<th>Learning Outcomes Assessed</th>
<th>Assessment Task</th>
<th>Assessment Type</th>
<th>Weighting</th>
</tr>
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<tbody>
<tr>
<td>S1-S4, A1-A4</td>
<td>Experimental work and / or projects to verify students ability to apply knowledge and skills acquired in the course</td>
<td>Reports, demonstrations</td>
<td>10 - 30%</td>
</tr>
<tr>
<td>K1-K7, S1-S4</td>
<td>Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the course</td>
<td>Assignments, quizzes</td>
<td>10 - 30%</td>
</tr>
<tr>
<td>K1-K7</td>
<td>Questions and problems related to the course contents</td>
<td>Mid and / or End of semester examination</td>
<td>40 - 60%</td>
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## Adopted Reference Style:

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