Unit Outline (Higher Education)

Institute / School: Institute of Innovation, Science & Sustainability

Unit Title: Smart Engineering Technologies

Unit ID: ENGPG9407

Credit Points: 15.00

Prerequisite(s): Nil

Co-requisite(s): Nil

Exclusion(s): (ENGRG9401)

ASCED: 030303

Description of the Unit:

The unit introduces key technologies essential for modern engineering practices. These include modern tunneling technologies, sensor technologies, industrial robots, data analytics, and artificial intelligence. The unit aims to prepare students to become the engineering and applied science professionals of tomorrow.

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

Work Experience:

No work experience

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						

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

Learning Outcomes:

Knowledge:

K1. Explain shaft sinking and tunnelling by drilling and blasting method.
K2. Describe mechanised tunnelling method.
K3. Identify sensoring technologies for engineering application.
K4. Observe engineering applications of robots.
K5. Recognise engineering applications of data analytics.
K6. Review engineering applications of artificial intelligence.

Skills:

S1. Select appropriate tunnelling method for applications in mining and civil engineering.
S2. Analyse tunnelling projects and provide solutions to complex underground tunnelling problems.
S3. Investigate emerging technologies for engineering applications to improve performance, including, but not limited to, new tunnelling technologies, sensor technologies, industrial robots, data analytics and artificial intelligence.

Application of knowledge and skills:

A1. Evaluate, plan, and implement a tunnelling system for a project.
A2. Apply emerging technologies for engineering applications to improve performance, including, but not limited to, new tunnelling technologies, sensor technologies, industrial robots, data analytics and artificial intelligence.

Unit Content:

Topics may include:
1. Tunnelling by drilling and blasting.
2. Mechanised tunnelling.
3. Sensor technologies.
4. Industrial robots.
5. Data analytics.
6. Artificial intelligence.

FEDTASKS

Federation University Federation recognises that students require key transferable employability skills to prepare them for their future workplace and society. FEDTASKS (**T**ransferable **A**ttributes **S**kills and **K**nowledge) provide a targeted focus on five key transferable Attributes, Skills, and Knowledge that are be embedded within curriculum, developed gradually towards successful measures and interlinked with cross-discipline and Co-operative Learning opportunities. *One or more FEDTASK, transferable Attributes, Skills or Knowledge must be evident in the specified learning outcomes and assessment for each FedUni Unit, and all must be directly assessed in each Course.*

FEDTASK attribute and descriptor		Development and acquisition of FEDTASKS in the Unit	
		Learning Outcomes (KSA)	Assessment task (AT#)
FEDTASK 1 Interpersonal	Students at this level will demonstrate an advanced ability in a range of contexts to effectively communicate, interact and work with others both individually and in groups. Students will be required to display high level skills in-person and/or online in: • Using and demonstrating a high level of verbal and non-verbal communication • Demonstrating a mastery of listening for meaning and influencing via active listening • Demonstrating and showing empathy for others • High order skills in negotiating and conflict resolution skills\\ • Demonstrating mastery of working respectfully in cross-cultural and diverse teams.	Not applicable	Not applicable
FEDTASK 2 Leadership	Students at this level will demonstrate a mastery in professional skills and behaviours in leading others. • Creating and sustaining a collegial environment • Demonstrating a high level of self -awareness and the ability to self-reflect and justify decisions • Inspiring and initiating opportunities to lead others • Making informed professional decisions • Demonstrating initiative in new professional situations.	Not applicable	Not applicable
FEDTASK 3 Critical Thinking and Creativity	Students at this level will demonstrate high level skills in working in complexity and ambiguity using the imagination to create new ideas. Students will be required to display skills in: • Reflecting critically to generate and consider complex ideas and concepts at an abstract level • Analysing complex and abstract ideas, concepts and information • Communicate alternative perspectives to justify complex ideas • Demonstrate a mastery of challenging conventional thinking to clarify complex concepts • Forming creative solutions in problem solving to new situations for further learning.	Not applicable	Not applicable
FEDTASK 4 Digital Literacy	Students at this level will demonstrate the ability to work competently across a wide range of tools, platforms and applications to achieve a range of tasks. Students will be required to display skills in: • Mastering, exploring, evaluating, managing, curating, organising and sharing digital information professionally • Collating, managing complex data, accessing and using digital data securely • Receiving and responding professionally to messages in a range of professional digital media • Contributing competently and professionally to digital teams and working groups • Participating at a high level in digital learning opportunities.	Not applicable	Not applicable
FEDTASK 5 sustainable and Ethical Mindset	Students at this level will demonstrate a mastery of considering and assessing the consequences and impact of ideas and actions in enacting professional ethical and sustainable decisions. Students will be required to display skills in: • Demonstrate informed judgment making that considers the impact of devising complex solutions in ambiguous global economic environmental and societal contexts • Professionally committing to the promulgation of social responsibility • Demonstrate the ability to evaluate ethical, socially responsible and/or sustainable challenges and generating and articulating responses • Communicating lifelong, life-wide and life-deep learning to be open to the diverse professional others • Generating, leading and implementing required actions to foster sustainability in their professional and personal life	Not applicable	Not applicable

Learning Task and Assessment:

Learning Outcomes Assessed	Assessment Tasks	Assessment Type	Weighting
K1-2, S1-2, A1	Numerical and conceptual tasks	assignments	15-30%
K3-6, S3, A2	Up to three projects covering tunnelling technologies, sensor technologies, industrial robots, data analytics or artificial intelligence, or other emerging technologies specified by the unit coordinator.	reports	70-85%

Adopted Reference Style:

IEEE ()

Refer to the library website for more information

Fed Cite - referencing tool