Year 9 - iSTEM 2023

<table>
<tr><th colspan="3">TERM 1</th></tr>
<tr><td rowspan="2">TIMING
Weeks 1 – 8</td><td colspan="2">STEM fundamentals
‘STEM fundamentals’ develops knowledge, skills and understanding of essential STEM principles and processes. Students engage with engineering design processes to solve a range of problems. They develop fundamental skills required to complete other elective topics which form the basis of this course.</td></tr>
<tr><td>UNIT OVERVIEW
• undertake a range of activities that highlight STEM principles and processes
• describe components of an engineering design process, define real-world problems or needs
• apply data science principles to activities or projects
• iterate and improve on design solutions using experimentation and testing
• document and communicate design solutions
• demonstrate basic 2D and 3D drawing techniques
• use project management techniques in the completion of projects
• develop basic computer-aided design (CAD) skills using suitable drawing software
• identify and use a range of problem-solving strategies in the development of practical solutions
• work individually and collaboratively to apply an engineering design process to complete real-world problems and challenges</td><td>ASSESSMENT
Task Number: 1
Nature of Task:
Practical Task and Portfolio Percentage: 50%
Week: Term 1, Week 10
Reported: Semester 1</td></tr>
<tr><td rowspan="2">TIMING
Weeks 9 – 11</td><td colspan="2">Computer-Aided Design (CAD)
Technological advancements in manufacturing combined with innovations in 3D modelling software have created an evolving need for a workforce with computer-aided design skills.
In this topic students develop skills in computer-aided design (CAD) with an emphasis on 3D modelling. Practical activities prepare students to develop skills in rapid prototyping, including additive and subtractive manufacturing. Students will be learning to competently use CAD skills and 3D modelling to create, test, and present solutions to real-world problems.</td></tr>
<tr><td>UNIT OVERVIEW
• outline the historical perspectives that have led to the development of computer-aided design (CAD)
• describe a range of CAD concepts, compare the benefits of CAD systems with traditional drawing methods
• identify CAD (3D modelling) representations and techniques
• explore the relationship between CAD applications and advanced manufacturing
• explore 3D coordinate geometry
• use a range of CAD (3D modelling) techniques
• investigate the nature of work and pathways into professions which utilise CAD (3D modelling) skills, problem solving and design
• use CAD (3D modelling) and rendering techniques to develop solutions to real-world problems
• work individually and collaboratively to apply engineering design processes to create, analyse, and iterate CAD (3D modelling) solutions
• incorporate quality CAD drawings produced from 3D modelling into engineering reports and presentations.</td><td></td></tr>
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<table>
<tr><th colspan="3">TERM 2</th></tr>
<tr><td rowspan="3">TIMING
Weeks 1 – 6</td><td colspan="2">Computer-Aided Design (CAD)
Technological advancements in manufacturing combined with innovations in 3D modelling software have created an evolving need for a workforce with computer-aided design skills.
In this topic students develop skills in computer-aided design (CAD) with an emphasis on 3D modelling. Practical activities prepare students to develop skills in rapid prototyping, including additive and subtractive manufacturing. Students will be learning to competently use CAD skills and 3D modelling to create, test, and present solutions to real-world problems.</td></tr>
<tr><td>UNIT OVERVIEW</td><td>ASSESSMENT</td></tr>
<tr><td>• outline the historical perspectives that have led to the development of computer-aided design (CAD)
• describe a range of CAD concepts, compare the benefits of CAD systems with traditional drawing methods
• identify CAD (3D modelling) representations and techniques
• explore the relationship between CAD applications and advanced manufacturing
• explore 3D coordinate geometry
• use a range of CAD (3D modelling) techniques
• investigate the nature of work and pathways into professions which utilise CAD (3D modelling) skills, problem solving and design
• use CAD (3D modelling) and rendering techniques to develop solutions to real-world problems
• work individually and collaboratively to apply engineering design processes to create, analyse, and iterate CAD (3D modelling) solutions
• incorporate quality CAD drawings produced from 3D modelling into engineering reports and presentations.</td><td>Task Number:2
Nature of Task:
Practical Task and Portfolio
Percentage:50%
Week:Term 2, Week 4
Reported: Semester 1</td></tr>
<tr><td rowspan="3">TIMING
Weeks 7 – 10</td><td colspan="2">Design for Space: ProtoSat
Students develop knowledge and an understanding of the role of CubeSats in space science, and the benefits of space science research for society. Working in groups, students follow an engineering design process to design, make, and evaluate a 1U CubeSat to collect weather data, and undertake ground testing using industry-inspired processes.</td></tr>
<tr><td>UNIT OVERVIEW</td><td>ASSESSMENT</td></tr>
<tr><td>• Build on their knowledge and skills of coding using a general-purpose programming language to construct and code a FlatSat (CubeSat component ground testing device), designed to measure temperature, humidity, and air pressure. Students use the data collected to compare with other published sources of weather data and deduce possible causes for any differences.
• Use computer-aided design (CAD) software to design a case for their prototype CubeSat which houses the microcontroller and power supply and complies with the requirements definition. Students use cardboard prototyping and available fabrication techniques, which may include advanced manufacturing processes such as laser cutting or 3D printing (in addition to manual fabrication techniques) to develop prototypes based on their CAD designs and the requirements definition.
• Research, plan, and investigate the durability of at least one aspect of their CubeSat design and evaluate the results to make any necessary modifications. Students deploy the final design of their ProtoSat to collect weather data for a location within the school for a period of 2 weeks.
• Download the collected data and develop their skills in working with data by analysing aggregated datasets and creating visualisations.</td><td></td></tr>
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<table>
<tr><th colspan="3">TERM 3</th></tr>
<tr><td rowspan="2">TIMING
Weeks 1 – 6</td><td colspan="2">Design for Space: ProtoSat
Students develop knowledge and an understanding of the role of CubeSats in space science, and the benefits of space science research for society. Working in groups, students follow an engineering design process to design, make, and evaluate a 1U CubeSat to collect weather data, and undertake ground testing using industry-inspired processes.</td></tr>
<tr><td>UNIT OVERVIEW
• Build on their knowledge and skills of coding using a general-purpose programming language to construct and code a FlatSat (CubeSat component ground testing device), designed to measure temperature, humidity, and air pressure. Students use the data collected to compare with other published sources of weather data and deduce possible causes for any differences.
• Use computer-aided design (CAD) software to design a case for their prototype CubeSat which houses the microcontroller and power supply and complies with the requirements definition. Students use cardboard prototyping and available fabrication techniques, which may include advanced manufacturing processes such as laser cutting or 3D printing (in addition to manual fabrication techniques) to develop prototypes based on their CAD designs and the requirements definition.
• Research, plan, and investigate the durability of at least one aspect of their CubeSat design and evaluate the results to make any necessary modifications. Students deploy the final design of their ProtoSat to collect weather data for a location within the school for a period of 2 weeks.
• Download the collected data and develop their skills in working with data by analysing aggregated datasets and creating visualisations.</td><td>ASSESSMENT
Task Number: 3
Nature of Task:
Practical Task and Portfolio
Percentage:50%
Week:
Term 3, Week 10
Reported: Semester 2</td></tr>
<tr><td rowspan="2">TIMING
Weeks 7 – 10</td><td colspan="2">STEM Project-Based Learning
Project-based learning is an approach to teaching and learning that engages students in rich and authentic learning experiences. In project-based learning environments, students gain knowledge and skills by investigating and responding to engaging questions, problems, or challenges.</td></tr>
<tr><td>UNIT OVERVIEW
• In this topic, students develop and realise solutions to STEM focused project-based learning tasks. It requires students to utilise problem-solving strategies to apply appropriate design, production, and evaluation skills to real-world problems.
• To complete this topic, students will follow design thinking processes and complete an iSTEM engineering design process and engineering report. Working in a team students will develop a STEM based solution to one of 6 challenges in the local area provided by the CSIRO STEM Community partnerships. Students will create a presentation of their solution to be delivered at the STEM Community Partnerships Showcase in November. Students will participate in site visits and will be mentored by an Industry Partner. The project will be chosen from the following scenarios.
o Western Sydney Aerotropolis
o Aging Population
o Heat Stress
o Managing Natural Environments
o Mental Health
o Recycling and Waste Management
o Sustainable Transport</td><td>ASSESSMENT</td></tr>
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<table>
<tr><th colspan="3">TERM 4</th></tr>
<tr><td rowspan="2">TIMING
Weeks 1 – 10</td><td colspan="2">STEM Project-Based Learning
Project-based learning is an approach to teaching and learning that engages students in rich and authentic learning experiences. In project-based learning environments, students gain knowledge and skills by investigating and responding to engaging questions, problems, or challenges.</td></tr>
<tr><td>UNIT OVERVIEW</td><td>ASSESSMENT</td></tr>
<tr><td></td><td>In this topic, students develop and realise solutions to STEM focused project-based learning tasks. It requires students to utilise problem-solving strategies to apply appropriate design, production, and evaluation skills to real-world problems.
To complete this topic, students will follow design thinking processes and complete an iSTEM engineering design process and engineering report. Working in a team students will develop a STEM based solution to one of 6 challenges in the local area provided by the CSIRO STEM Community partnerships. Students will create a presentation of their solution to be delivered at the STEM Community Partnerships Showcase in November. Students will participate in site visits and will be mentored by an Industry Partner. The project will be chosen from the following scenarios.
Western Sydney Aerotropolis
Aging Population
Heat Stress
Managing Natural Environments
Mental Health
Recycling and Waste Management
Sustainable Transport</td><td>Task Number:4
Nature of Task:
Practical Task and Portfolio Percentage:
50%
Week:
Term 4, Week 5
Reported: Semester 2</td></tr>
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