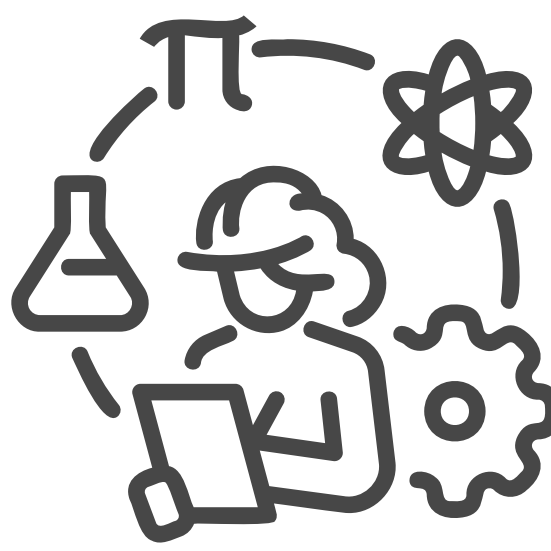




Scotch College

STEM

DESIGN & DIGITAL TECHNOLOGY

- Term only
- Semester Only
- Elective

Y6

UNIT: SYSTEMS & ENERGY IN FLIGHT

KEY ASPECTS

- Design Cycle:** Apply an iterative, testing-based approach.
- Digital Skills:** Develop software proficiency.
- Technology Impact:** Understand its role in daily life.
- Practical Safety:** Prioritize safe working practices.
- STEM Skills:** Build technical and problem-solving abilities.
- Functional Prototyping:** Focus on practical product creation.
- Creative & Critical Thinking:** Blend innovation with analysis.
- Material Properties:** Understand characteristics and applications

POTENTIAL DESIGN PROBLEMS & SOLUTIONS

- Prototype ideas for sustainable air / water transportation solutions
- How to we create a more inclusive city through
- Software design and hardware control

SPECIFIC SKILLS & CONTENT FOCUS

- Digital Systems:** Explore wired and wireless networks.
- Research Skills:** Use primary and secondary sources.
- Design Brief:** Understand and interpret requirements.
- Iterative Design:** Apply a continuous improvement cycle.
- Electrical Control:** Manage system outputs with energy.
- Project Management:** Set goals and track progress.
- Collaboration:** Work effectively in teams.
- Idea Presentation:** Test and critically analyze concepts.
- Effective Solutions:** Develop functional, well-executed designs.
- Innovation:** Create and present new ideas.

TECHNOLOGIES CONTEXT

- Engineering Principles and Systems

DIGITAL TECHNOLOGIES CONTEXT

- Digital Systems, Digital Implementation

Y7

UNIT: CONVENTIONS AND SUSTAINABILITY IN HOUSING

KEY ASPECTS

- Technology & Society:** Impact on products, services, and environment.
- Engineering Systems:** Input controlling output.
- Integrated Systems:** Interaction of hardware and software.

POTENTIAL DESIGN PROBLEMS & SOLUTIONS

- Renewable / sustainable transportation prototype design
- Technology assisted living in everyday homes

SPECIFIC SKILLS & CONTENT FOCUS

- Digital Systems:** Explore wired & wireless technologies.
- Problem Definition:** Develop a statement based on a brief.
- Research & Analysis:** Investigate purpose and key considerations.

TECHNOLOGIES CONTEXT

- Engineering Principles and Systems

DIGITAL TECHNOLOGIES CONTEXT

- Digital Systems, Digital Implementation

Y8

UNIT: HARDWARE & SOFTWARE SYSTEMS CONTROL IN GAMES

KEY ASPECTS

- Hardware:** Understand digital system components.
- Electromagnetic Control:** Manage mechanical systems electrically.
- Computational Thinking:** Apply input-process-output algorithms.
- Digital Media:** Develop and manipulate images.
- Data Analysis:** Collect and interpret information.
- Software Control:** Manage display outputs.
- Mechanisms & Motion:** Explore movement principles.
- Electrical & Mechanical Theory:** Understand core concepts.

POTENTIAL DESIGN PROBLEMS & SOLUTIONS

- Ethical / Inclusive arcade-themed game design
- Designing prototype remote-controlled vehicles to complete specific scoring / retrieval tasks

SPECIFIC SKILLS & CONTENT FOCUS

- Engineering Systems:** Control force, motion, and energy.
- Design Problem:** Investigate needs and opportunities.
- Project Direction:** Define with a design brief.
- Solution Development:** Consider constraints, tech, and resources.
- Prototyping Skills:** Use CAD, 3D printing, and laser cutting.
- Testing & Review:** Evaluate and refine designs.
- Algorithm Development:** Iterate, refine, and test with users followed through refinement and user testing

TECHNOLOGIES CONTEXT

- Engineering Principles and Systems

DIGITAL TECHNOLOGIES CONTEXT

- Digital Systems: Data: Representation, Acquiring, Managing and Analysis; Digital Implementation

Y9

UNIT: ITERATIVE PROBLEM-SOLVING IN EMERGENCY RESPONSE SCENARIOS

KEY ASPECTS

- Materials & Components:** Integrate properties into design.
- Motion & Energy:** Assess impact on engineered solutions.
- Social & Ethical Impact:** Design solutions for community needs.
- Testing & Improvement:** Use iterative techniques for refinement.
- Evaluative Thinking:** Collaborate to develop success criteria.

POTENTIAL DESIGN PROBLEMS & SOLUTIONS

- Remote medical supply transport device.
- Unmanned emergency services vehicle.
- Natural Disaster reconnaissance device

SPECIFIC SKILLS & CONTENT FOCUS

- Ethical & Sustainable Design:** Consider social and environmental impact.
- Community Needs:** Balance consumer/producer values and resources.
- Materials & Tools:** Understand properties and production equipment.
- User Research:** Identify needs through interviews and surveys.
- Design Brief:** Develop based on user insights.
- Technology & Constraints:** Explore solutions within limitations.
- Alternative Solutions:** Focus on usability, aesthetics, and feasibility.
- Production & Testing:** Implement and refine using various techniques.
- Project Management:** Consider time, risk, and sustainability.
- Evaluation:** Assess design and process against ethical criteria.

TECHNOLOGIES CONTEXT

- Engineering Principles and Systems, Materials & Technologies specialisation

DIGITAL TECHNOLOGIES CONTEXT

- Digital Systems: Data: Representation, Acquiring, Managing and Analysis; Digital Implementation

Y10

UNIT: RENEWABLE ENERGY IN TRANSPORTATION

KEY ASPECTS

- Engineering Principles:** Apply conventions in project-based experiences.
- Materials & Components:** Integrate properties into design.
- Motion & Energy:** Optimize performance in engineered solutions.
- Environmental Impact:** Address community needs sustainably.
- Iterative Testing:** Refine solutions through evaluation.
- Collaborative Evaluation:** Develop success criteria through teamwork.

POTENTIAL DESIGN PROBLEMS & SOLUTIONS

- Transportation with Renewable Energy

SPECIFIC SKILLS & CONTENT FOCUS

- Ethical & Sustainable Design:** Improve systems with responsible practices.
- Environmental Innovation:** Encourage sustainability and entrepreneurship.
- Material Impact:** Assess usability, safety, and functionality.
- Problem-Solving:** Identify, define, and justify design needs.
- Design Brief:** Develop a structured solution plan.
- Technology & Constraints:** Research and explore viable ideas.
- Alternative Solutions:** Balance function, accessibility, and aesthetics.
- Production & Testing:** Implement, justify, and refine designs.
- Project Management:** Use agile, collaborative approaches.
- Iterative Improvement:** Test, refine, and enhance designs.

TECHNOLOGIES CONTEXT

- Engineering Principles and Systems, Materials & Technologies specialisation

DIGITAL TECHNOLOGIES CONTEXT

- Digital Systems: Data: Representation, Acquiring, Managing and Analysis; Digital Implementation

YEAR 11 & 12

ATAR

AEEST ENGINEERING (MECHATRONICS)

YEAR 11 [UNIT 1 & 2]

- Students are introduced to design through techniques like sketching, drawing, photography, and prototyping to communicate ideas and apply **Design Thinking**.
- They learn key design terminology and how representation conveys meaning. Using the **Double Diamond process**, they develop products, devices, or services for end-users, prototyping and refining designs to test their effectiveness.
- The focus is on defining the **function, form, and features** to ensure the designs meet the needs of the brief.

- Materials:** Types and Classification
- Properties**
- Fundamental Engineering Calculations**
 - Dimensional Calculations
 - Perimeter & Surface Area
 - Volume
 - Density & Efficiency
- Mechanisms**
 - Mechanical Advantage & Velocity Ratio
 - Types of Motion
- Energy, Work, and Power**
 - Energy Equations
 - Energy Conservation
- Obsolescence**
- Mechatronics** (Electrical & Electronics)
 - Components
 - Electrical Laws
 - Microcontroller Interfacing
 - Control Systems
- Systems and Control**
 - Diagrams
 - Flow Charts
- Electrical and Electronics**
 - Transistor Operations
 - Data Extraction

YEAR 12 [UNITS 3 & 4]

- Students learn to create designs that benefit society, focusing on **sustainability, ethics, and social impact**.
- Using the **Double Diamond process**, they develop solutions addressing environmental, social, and cultural needs while ensuring safety.
- Students design products and layouts to communicate messages and influence attitudes, analysing demographics to create persuasive designs for real-world issues.
- Through iterative design and **Design Thinking** strategies, they refine their ideas to ensure effective communication of values and promote positive change.

- Materials Properties**
 - Key Properties
- Fundamental Engineering Calculations**
 - Density
 - Efficiency
 - Other Calculations
- Mechanisms and Motion**
 - Mechanical Advantage
 - Speed and Torque
- Energy, Work, and Power**
 - Energy and Work
 - Power
- Life Cycle Analysis**
 - Life Cycle Stages
 - Impact on Society
- Mechatronics and Microcontroller Interfacing**
 - Microcontroller Basics
 - PWM Control
- Flow Charts**
 - Flowchart Symbols
 - Drawing Flowcharts
- Materials:** Types and Classification
 - Materials Classification
 - Properties
- Fundamental Engineering Calculations**
 - Dimensional Calculations
 - Perimeter & Surface Area
 - Volume
 - Density & Efficiency
- Mechanisms**
 - Mechanical Advantage & Velocity Ratio
 - Types of Motion
- Energy, Work, and Power**
 - Energy Equations
 - Energy Conservation
- Types Obsolescence**
- Mechatronics** (Electrical & Electronics)
 - Components
 - Electrical Laws
 - Microcontroller Interfacing
 - Control Systems
- Systems and Control**
 - Diagrams
 - Flow Charts
- Electrical and Electronics**
 - Transistor Operations
 - Data Extraction

COMMON SKILLS / PROCESSES IN EACH YEAR

TOPICS / SKILLS

- Data representation
- Using data in a software algorithm
- Design and implement algorithms in visual programming environments
- Analysis of technologies & resources to develop solutions
- Development of solutions using appropriate technical terms and methods
- Developing ideas 'creativity meets critical analysis'

PROCESSES

- Using relevant hardware and software to present an idea presentation
- Following specifications/protocols while producing a designed/quality-controlled solution
- Manage design and creation processes while considering time and resources
- Use a range of technologies, components, and equipment to produce designed solutions
- Testing, data recording, and evaluating