

DESIGN ELECTRO-MECHANICAL SYSTEMS

UNIT CODE: ENG/OS/MC/CR/01/6/A

Unit description

This unit describes the competencies required by a technician in order to design electro-mechanical systems. It involves observing occupational health and safety, identifying problem and assessing sites, developing multiple model solutions to existing problems, simulating developed models, identifying and selecting product design materials, documenting design work and monitoring and evaluating design performance.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. <i>Bold and italicized terms are elaborated in the Range.</i>
1. Observe occupational health and safety	1.1 <i>Personal protective equipment</i> (PPE) are used according to OSHA 2007 1.2 <i>Tools and equipment</i> are stored and maintained correctly according to manufacturer's specifications 1.3 Tools and equipment are used correctly according to designated purpose 1.4 Workspace housekeeping is maintained according to Standard operating procedures (SOPs) 1.5 Workplace is planned according to design specifications.
2. Identify problem and assess site	2.1 Problem is defined according to user needs 2.2 Problem is broken down into attainable tasks according to the magnitude of the problem 2.3 Site visit authorization is obtained according to organization policy 2.4 Site specifications are obtained using the right tools and equipment 2.5 Site specifications are documented according to SOPs.
3. Develop multiple model solutions to existing problem	3.1 Existing solutions are examined as per the existing problem 3.2 Multiple ideas are generated according to problem specifications 3.3 <i>Pertinent information</i> is gathered according to ideas developed 3.4 Gathered information is analysed according to SOPs

	<p>3.5 Best working solution model is selected according to analysed data</p> <p>3.6 Document selected model solution according to SOPs</p>
4. Simulate developed model	<p>4.1 Modelling requirements are obtained according to the requirement.</p> <p>4.2 Model is developed according to design requirements</p> <p>4.3 Developed model is simulated/tested according to design requirements</p> <p>4.4 Data is collected and documented according to SOPs</p> <p>4.5 Model is redesigned according to user needs.</p>
5. Identify and select product design materials	<p>5.1 Individual product components are identified according to design specifications</p> <p>5.2 Materials needed for the individual components are identified according to design specifications</p> <p>5.3 Material specification is documented according to product design</p>
6. Document design work	<p>6.1 Technical report is developed according to the product design</p> <p>6.2 Operation and maintenance manual is developed according to product design</p> <p>6.3 The product design is patented according to Industrial Property Act,2001</p>
7. Monitor and evaluate design performance	<p>7.1 Feedback is gathered according to product performance</p> <p>7.2 Product performance is evaluated according to gathered data</p> <p>7.3 Report is generated according to product performance</p>

RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
Personal protective equipment may include but is not limited to:	<ul style="list-style-type: none"> • Goggles • Ear muff • Safety mask • Helmets/head gear • Safety boots • Gloves

Variable	Range
	<ul style="list-style-type: none"> • Overall/dust coat
Tools and equipment may include but is not limited to:	<ul style="list-style-type: none"> • Hand tools • Power tools • Machines
Pertinent information may include but is not limited to:	<ul style="list-style-type: none"> • Functionality • Failure trends • Mechanical strength analysis • Ergonomics • Software needs • Legal regulations
Modelling requirements may include but is not limited to:	<ul style="list-style-type: none"> • Software • Materials • Tools • Workspace
Technical report may include but is not limited to:	<ul style="list-style-type: none"> • Data sheet • Design drawings • Design calculations • Power specifications • Variables and constants • Notes

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Electrical circuit design
- Mechanical structural design
- Computer Aided Design
- Mechatronic programming
- Technical report writing
- PPE
- Data analysis
- Interpretation of technical drawings
- Simulation
- Documentation
- Types of tools and equipment
- Properties of materials
- Electrical and mechanical machine drives

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Design of mechatronic systems
- Communication skills
- Problem solving
- Model development
- Creativity and innovation
- Data collection and analysis
- Use of tools and equipment
- Technical presentation
- Technical drawing

EVIDENCE GUIDE

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

1. Critical Aspects of Competency.	1.1 Observed occupational health and safety 1.2 Identified design problem and did site assessment 1.3 Developed multiple model solutions to identified problem 1.4 Simulated developed model 1.5 Identified and selected product design materials 1.6 Documented design work 1.7 Monitored and evaluated design performance
2. Resource Implications.	2.1 Computers 2.2 Software 2.3 Projectors 2.4 Whiteboards 2.5 Tools and equipment 2.6 Whiteboard markers
3. Methods of Assessment.	<i>Competency may be assessed through:</i> 3.1 Practical 3.2 Observation 3.3 Questionnaire 3.4 Case studies 3.5 Written examinations 3.6 Oral presentation
4. Context of Assessment.	4.1 Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions.
5. Guidance information for assessment.	5.1 This unit may be assessed on an integrated basis with others within this occupational sector.