



Australian Government

UEEEL0043 Develop engineering solutions for induction machine and control problems

Release: 1

UEEEL0043 Develop engineering solutions for induction machine and control problems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to develop engineering solutions for induction machine and control problems.

It includes working safely; determining problems; obtaining induction machine operation, construction and application; gathering and analysing solutions; applying problem-solving techniques; and developing and documenting solutions.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

UEEEL0062 Provide engineering solutions to problems in complex polyphase power circuits

UEECD0036 Provide engineering solutions for problems in complex multiple path circuit

UEECD0039 Provide solutions to basic engineering computational problems

and

UEECD0041 Solve electrotechnical engineering problems

or

UEECD0043 Solve problems in direct current circuits

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0021 Solve problems in electromagnetic devices

or

UEECD0044 Solve problems in multiple path circuits

UEECD0046 Solve problems in single path circuits

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0021 Solve problems in electromagnetic devices

or

UEEEEC0074 Troubleshoot resonance circuits in an electronic apparatus

UEEEEC0065 Solve problems in basic electronic circuits

Competency Field

Electrical

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to develop engineering solution for induction machine problems

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

1.1 Work health and safety (WHS)/occupational health and safety (OHS) processes and workplace procedures for a given work area are identified, obtained and applied

1.2 WHS/OHS risk control measures and workplace procedures in preparation for the work are followed

1.3 Scope of induction machine problem is determined from performance specifications and/or documentation and in consultation with relevant person/s

1.4 Activities are planned to meet scheduled timelines in consultation with others involved in the work

1.5 Strategies are formed to ensure solution development and implementation is carried out efficiently

2 Develop engineering solution

2.1 WHS/OHS risk control measures and workplace procedures for carrying out the work are followed

2.2 Induction machine construction, operation, characteristics and applications are applied to developing solutions to induction machine problems

2.3 Parameters tested, data taken, specifications and performance requirements to each machine problem are obtained in accordance with workplace procedures

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| | 2.4 | Approaches to resolving induction machine problems are analysed to provide most effective solutions |
| | 2.5 | Unplanned events are dealt with safely and effectively in accordance with relevant industry standards and workplace procedures |
| | 2.6 | Quality of work is monitored in accordance with relevant industry standards and workplace procedures |
| 3 | Implement engineering solution and complete documentation | |
| | 3.1 | Solutions to machine problems are tested to determine their effectiveness and modified as required |
| | 3.2 | Adopted solutions are documented, including instruction for implementation with risk control measures |
| | 3.3 | Relevant person/s required to implement solutions to induction machine problems is coordinated in accordance with relevant industry standards and workplace procedures |
| | 3.4 | Justification for solutions used to solve induction machine problems is documented in work/project records in accordance with relevant industry standards |

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Developing engineering solutions must include the following:

- at least two induction machine problems

Unit Mapping Information

This unit replaces and is equivalent to UEENEEG145A Develop engineering solutions for induction machine and control problems.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEEEL0043 Develop engineering solutions for induction machine and control problems

Modification History

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least one occasion and include:

- understanding the extent of the machine problem
- forming effective strategies for solution development and implementation
- obtaining machine parameters, specifications and performance requirements appropriate to each problem
- testing and solutions to machine problems
- documenting instruction for implementation of solutions that incorporate risk control measure to be followed
- documenting justification of solutions implemented in accordance with professional standards
- dealing with unplanned events
- analysing approaches to solutions
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- determining the scope of induction machine problems
- monitoring quality of work
- planning activities to meet timelines.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- induction machines diagnostics and engineering solutions for induction motor problems, including:
 - operating principles of polyphase induction motors encompassing:
 - rotating magnetic field torque slip
 - MMF relationships
 - leakage fluxes

- construction of polyphase induction motors encompassing:
 - squirrel cage motors
 - slip-ring motors
 - construction considerations in minimisation of tooth locking
- speed-torque relationships in induction motors encompassing:
 - maximum torque
 - torque – slip relationships
 - squirrel cage rotor types
 - power flow in the motors
 - power distribution
 - torque units
 - slip ring rotors
- induction motor performance testing encompassing:
 - no-load tests
 - locked rotor tests
 - development of motor equivalent circuit from test results
 - analysis of motor performance using circle diagrams
- induction motor starters encompassing:
 - starting requirements
 - type of starters
 - starting torque
 - starting dynamics
 - static friction
 - mechanical loads
 - starting duration
- reduced voltage starting encompassing:
 - starting dynamics
 - change over conditions
 - starting duration
 - acceleration curves
- speed control of induction motors encompassing:
 - constant torque, constant power concepts
 - torque-flux-voltage relationships
 - rotor resistance control
 - stator impedance control
 - variable frequency control (e.g. PAM, PWM and flux vector control)
- braking of induction motors encompassing:
 - electrical braking systems (plugging, direct current (d.c.) dynamic, regenerative and capacitor-magnetic)
 - mechanical braking systems (mechanical drum, demag and eddy current)

- motor protection encompassing:
 - overload
 - earth fault
 - phase failure
- motor selection criteria and RMS rating
- induction motor maintenance/repair encompassing:
 - routine maintenance schedules
 - type of repairs (mechanical and electrical)
- single phase induction motors encompassing:
 - operating principles (especially RMF)
 - construction types
 - speed-torque relationships
 - testing
- relevant induction machine construction, operation, characteristics and applications, including driven load and duty cycle
- relevant machine parameters, specifications and performance requirements
- relevant manufacturer specifications and operating instructions/manuals
- relevant job safety assessments or risk mitigation processes
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace quality, instructions, policies and procedures.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or simulations
- relevant and appropriate materials, tools, facilities and equipment currently used in industry
- resources that reflect current industry practices in relation to developing engineering solutions for induction machine problems
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

Links

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