WM197-15 Electrical and Electronic Principles

24/25

Department
WMG
Level
Undergraduate Level 1
Module leader
Farah Villa Lopez
Credit value
15
Module duration
14 weeks
Assessment
60% coursework, 40% exam
Study locations
University of Warwick main campus, Coventry Primary
Distance or Online Delivery

Description

Introductory description

This module provides the fundamental knowledge in electrical and electronic engineering, relevant to Degree Apprenticeship Standards ST0023, ST0024, ST0025 and ST0027.

The module covers a wide range of topics around electrical and electronic circuits, devices and systems. In this module, mathematical techniques are applied in an engineering context for the analysis of electrical and electronic circuits. Simulations and experimental measurements are carried out for the development of software simulation and practical skills.

This module is linked with C1, C2, C3, C12 and C17 of the AHEP 4.

LO1 - C1
LO2 - C1, C2
LO3 - C1, C2
LO4 - C3, C17
LO5 - C12, C17

Module web page

Module aims

This module aims to introduce learners to the fundamental principles and applications of electrical and electronics circuits and components relevant to different areas of engineering. The module enables learners to apply common methods required to analyse electrical circuits and to design basic circuits based on technical specifications.

Learners will be introduced to the use of simulation tools for the analysis of electric circuits and to the practical measurement of electrical parameters. They will collect, present and analyse experimental data to identify the response of components in simple circuits under different supply conditions.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- Introduction to charge, current, voltage, energy and power.
- Circuit elements: sources, energy storage elements, resistive elements.
- Ohm's law and Kirchhoff's laws.
- Methods of analysis: mesh, nodal and superposition.
- AC circuits: phasors and impedances.
- RC, RL and RLC circuits under AC supply, resonance.
- Transient response of RC and RL circuits.
- Frequency response of RC and RL circuits, transfer function and Bode diagrams.
- Diode, transistors and operational amplifiers.

Learning outcomes

By the end of the module, students should be able to:

- Analyse DC electric circuits using basic electrical circuit theory and electronic principles [AHEP:4-C1].
- Demonstrate knowledge on fundamental principles of electrical and electronic engineering [AHEP:4-C1, C2].
- Analyse electric circuits under switched and AC supply conditions using appropriate mathematical techniques [AHEP:4-C1, C2].
- Use simulation software to model and analyse the behaviour of electric circuits [AHEP:4-C3, C17].
- Use practical laboratory skills to investigate and analyse the behaviour of electric circuits [AHEP:4-C12, C17].

Indicative reading list

- N. Storey (2017) Electronics: A Systems Approach. 6th Edition. Harlow: Pearson Education.
- J. Nilsson and S. Riedel (2019) Electric Circuits. 11th Edition. Pearson Education.

- E. Lipiansky (2013) Electrical, Electronics and Digital Hardware Essentials for Scientists and Engineers. Hoboken: Wiley-IEEE Press.
- M. A. Salam and Q. M. Rahman (2018) Fundamentals of Electrical Circuit Analysis. Singapore: Springer Nature.
- R. C. Dorf and J. A. Svoboda (2014) Introduction to Electric Circuits. 9th Edition. Singapore: Wiley.

View reading list on Talis Aspire

Subject specific skills

Select, use and apply approved problem-solving methods to solve complex problems and determine appropriate solutions (S2 in all DA standards).

Interpret and produce technical documentation such as schematic and circuit diagrams, engineering drawings or 3D CAD models, simulation models, project plans, engineering reports, test reports, fault reports or data analytics using company documentation systems and guidelines (S4 in all DA standards).

Observe, record and draw accurate and auditable conclusions from data and/or developmental or test evidence (S5 in all DA standards).

Ensure that all systems and/or equipment has been correctly configured, calibrated and checked for safe operation before use (S11 ST0023, S13 ST0024, S13 ST0025, S12 ST0027).

Transferable skills

- Critical thinking - Recognise patterns, themes and key messages from sometimes confused and incomplete data. Make information decisions on the value of a range of sources allowing an evidence based conclusion based on this analysis.
- Problem solving - Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions. Retain an open mind, optimistic of finding solutions, thinking laterally and creatively to look beyond the obvious. Knows how to learn from failure.
- Communication - Present arguments, knowledge and ideas, in a range of formats.
- Teamwork - Operate within, and contribute to, a respectful, supportive and cooperative group climate. Sensitive to the impact of actions on others.
- Information literacy - The systematic collection, analysis and evaluation of information in the investigation of a topic.
- Digital literacy - Comfortable with using digital media to communicate, solve problems, manage information, collaborate, create and share content.
- Professionalism: Aware of how to be efficient and resilient; Manages priorities and time.

Study

Study time

Type	Required
Lectures	9 sessions of 1 hour (6%)
Seminars	3 sessions of 1 hour (2%)
Supervised practical classes	3 sessions of 1 hour (2%)
Online learning (scheduled sessions)	15 sessions of 1 hour (10%)
Online learning (independent)	10 sessions of 1 hour (7%)
Other activity	5 hours (3%)
Private study	45 hours (30%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

- Revision of module contents.
- Solution of additional seminar-type questions.
- Study and use of simulation software.
- Online forum and discussion (asynchronous).

Other activity description

- On-line support and consultancy before assessments.
- Mock online test and discussion.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D

	Weighting	Study time	Eligible for self-certification
Calculations, Simulation and Experimental on Electric circuits	60%	36 hours	No

Students will work in small groups of 3 (exceptionally 2) to complete the theoretical analysis (calculations and simulations) of electric circuits prior to the experimental lab session. During the experimental lab session, students will work in the same groups to collect the experimental measurements.

	Weighting	Study time	Eligible for self-certification

Students who do not attend the laboratory session in the prescribed teaching block will be given an opportunity to conduct the laboratory at a later date, again in small groups of 3, exceptionally 2. Therefore the reassessment is the same.

The portfolio of work will include:

- (1) Handwritten solutions to the theoretical analysis of simple electric circuits.
- (2) Simulation results of electric circuits (screenshots with captions).
  Items (1) and (2) will be up to 6 pages.
- (3) An individual written report (up to 2400 words), on the experimental work, analysis and discussion of the circuit behaviour, comparison of experimental and theoretical results, and evaluation/discussion on practical considerations.

Test	40%	24 hours	No

Invigilated computer-based test consisting of theoretical and calculation-based questions.

Feedback on assessment

Formative Feedback:

- Automated Individual feedback on on-line Moodle Revision Quizzes
- Automated Individual feedback on on-line Mock Test
- Verbal formative feedback during seminar and practical sessions.

Summative Feedback:

- Written cohort-level feedback on Assessment 1 (Test)
- Written Individual feedback on Assessment 2 (Individual written Report)

Past exam papers for WM197

Availability

Courses

This module is Core for:

- Year 1 of UWMS-H7C3 Undergraduate Applied Professional Engineering (Control/Technical Support Engineer)
- Year 1 of DWMS-H7C7 Undergraduate Applied Professional Engineering (Control/Technical Support Engineer) (Degree Apprenticeship)
- Year 1 of UWMS-H7C2 Undergraduate Applied Professional Engineering

(Electrical/Electronic Support Engineer)

- Year 1 of DWMS-H7C6 Undergraduate Applied Professional Engineering (Electrical/Electronic Support Engineer) (Degree Apprenticeship)
- Year 1 of UWMS-H7C1 Undergraduate Applied Professional Engineering (Manufacturing Engineer)
- Year 1 of DWMS-H7C5 Undergraduate Applied Professional Engineering (Manufacturing Engineer) (Degree Apprenticeship)
- Year 1 of UWMS-H7C4 Undergraduate Applied Professional Engineering (Product Design and Development Engineer)
- Year 1 of DWMS-H7C8 Undergraduate Applied Professional Engineering (Product Design and Development Engineer) (Degree Apprenticeship)