# Electrical Circuit Principles

# Module Information

**2022.01, Approved**

## Summary Information

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| Module Code | 4303CIT |
| Formal Module Title | Electrical Circuit Principles |
| Owning School | Engineering |
| Career | Undergraduate |
| Credits | 20 |
| Academic level | FHEQ Level 4 |
| Grading Schema | 40 |

**Teaching Responsibility**

| LJMU Schools involved in Delivery |
|---|
| LJMU Partner Taught |

**Partner Teaching Institution**

| Institution Name |
|---|
| Changshu Institute of Technology |

## Learning Methods

| Learning Method Type | Hours |
|---|---|
| Lecture | 64 |
| Practical | 16 |

## Module Offering(s)

| Display Name | Location | Start Month | Duration Number Duration Unit |
|---|---|---|---|
| SEP-PAR | PAR | September | 12 Weeks |

## Aims and Outcomes

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| Aims | By learning this module, the students can acquire much knowledge of circuit, including the basic principles, basic methods of analysis and fundamental experimental ability. What's more, it can also enhance the students' capacity of logical analysing and ability to solve practical circuit problems, which serves as a solid foundation for the learning of further relevant specialized courses. |

**After completing the module the student should be able to:**

**Learning Outcomes**

| Code | Number | Description |
|---|---|---|
| MLO1 | 1 | Understand the fundamental relationships governing electric circuits. |
| MLO2 | 2 | Use circuit analysis techniques to determine operating points of dc circuits. |
| MLO3 | 3 | Derive the power relations in ac circuits and perform calculations. |
| MLO4 | 4 | Apply complex numbers and phasors to solve ac circuits. |

## Module Content

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| Outline Syllabus | Outline Syllabus1. Circuit Variables and Circuit Elements • Circuit Analysis: an Overview • Voltage, Current, and the Basic Circuit Elements • The Ideal Basic Circuit Element • Power and Energy • Voltage and Current Sources • Electrical Resistance (OHM's Law)• Kirchhoff's Laws • Analysis of a Circuit Containing Dependent Sources2. Some Circuit Simplification Techniques • Source Transformations• Superposition 3. Techniques of Circuit Analysis• Introduction to the Node-Voltage Method • The Node-Voltage Method and Dependent Sources • The Node-Voltage Method: Some Special Cases • Introduction to the Mesh-Current Method • The Mesh-Current Method and Dependent Sources • The Mesh-Current Method: Some Special Cases • The Node-Voltage Method Versus the Mesh-Current Method • Thevenin and Norton Equivalents • Maximum Power Transfer 4. The Natural and Step Response of RL and RC Circuits • The Inductor • The Capacitor • Series-Parallel Combinations of Inductance and Capacitance • Natural Response of RL and RC Circuits • Step Response of RL and RC Circuits 5. Sinusoidal Steady-State Analysis • The Sinusoidal Source• The Sinusoidal Response • The Phasor • Kirchhoff's Laws in the Frequency Domain • Circuit Simplifications • The Node-Voltage Method• The Mesh-Current Method • Instantaneous, Average, and Reactive Power• The rms Value and Power Calculations• Complex Power and Power Calculations 6. Introduction to Frequency Selective Circuits• Low-Pass Filters• High-Pass Filters • Bandpass Filters • Band reject Filters |
| Module Overview | |
| Additional Information | This module will introduce the basic theory, principles, phenomena, analysis methods of the circuit. It contains: the basic circuit components; the analysis of linear DC circuit; the theorems of circuits and its applications; the analysis of sine stationary state circuit; the analysis of linear dynamic circuit in time-domain and complex frequency-domain; the network graph theory and network equations.Reports are 2500 maximum word count.Examinations are 2 hour duration. |

## Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Module Learning Outcome Mapping |
|---|---|---|---|---|
| Exam | Final Exam | 50 | 2 | MLO3, MLO4 |
| Technology | Programming | 50 | 0 | MLO1, MLO2 |

## Module Contacts

**Module Leader**

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|
| Martin Jones | Yes | N/A |

**Partner Module Team**

| Contact Name | Applies to all offerings | Offerings |
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