# 209SE Electrical Engineering
# Module Description

## Aims and Summary

The curriculum of this module covers topics associated with electrical engineering. These topics will include single phase and three phase circuits, transformers, motors and generators.

## Learning outcomes

The intended learning outcomes are that on completion of this module the student should be able to:

1. Analyse and predict the behaviour of RLC circuits in response to transient and alternating voltage excitation
2. Analyse three phase circuits
3. Model magnetic and electric fields as found in common electrical devices e.g. the transformer
4. Specify motor characteristics and design features
5. Specify alternator characteristics and design features.

## Indicative Content

**AC Power**

- Relationships between power, reactive power and apparent power factor, principle of conservation of power and reactive power, reactive power absorbed by capacitors and inductors, phasor representation, power factor correction. Analysis of series and parallel resonant circuits. Transient conditions in RLC circuits, modelling transients.

**Three Phase Circuits**

- Balanced and unbalanced 3 phase circuits, 3 phase phasor representations; power calculations, summation of phase currents; effects of harmonic components, star to delta transformations.

**Magnetic and Electric Theory (overview)**

- Electric flux, flux density, field strength, motive force, potential difference, field plotting, dielectric strength, example of insulator dielectric, forces within electric fields, permittivity. Magnetic, flux, flux density, field strength, potential difference, permeability, magnetic circuits, magnetic materials, saturation affects, B/H curve, magnetic forces between current carrying conductors, magneto-motive force.

**Transformers**

- Principle of action, e.m.f equation, magnetic flux paths within the transformer, useful and leakage flux, equivalent circuit for transformer, efficiency, regulation, transformer tests, types of transformer, K rating.

**Motors and Generators**

- Energy conversion process and energy balance. Synchronous machine and alternator. Induction motors, torque speed characteristic and slip. Cage and Slip ring motors Split phase and Shaded pole motors, efficiency, physical construction. Direct current machines, motors and generators, general types of machine, e.m.f equations, speed torque chararacteristics, efficiency etc. Physical construction of electrical machines e.g. stator and rotor design..

## Essential Reading

Course notes and on-line resources

## Teaching and Learning

Student activity comprises: 10 hours of other, 15 hours of Tutorial, 35 hours of Lecture, 40 hours of Course work, 100 hours of self-guided.

## Recommended Reading

- Edward Hughes, 2008. Electrical and Electronic Technology, 10th Ed, Harlow UK: Pearson Prentice Hall, CISBN 978-0-13-206011-0.
- D.P. Kothari, (2002). Basic Electrical Engineering, Second Edition, ISBN 0-07-043589-8
- T.K. Nagsarkar and M.S. Sukhija, M. S. (2005). Basic Electrical Engineering, ISBN 0-19-567392-1

## Pass requirements

To pass this module you must achieve a module mark of at least 40%. This is calculated as the average of the assessment marks using the weightings shown. Coursework briefs will be posted on Moodle.

| **Assessment** | **Hours** | **Weighting** | **Learning Outcomes** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** |
| Coursework - circuits and fields assignment | 20 | 30% | ✓ | ✓ | ✓ | | |
| Examination – 3 hour unseen paper | 20 | 70% | ✓ | ✓ | ✓ | ✓ | ✓ |

Re-assessment is by new coursework.

If you fail to achieve a pass in the module at the first attempt resit coursework will be available on Moodle for completion over the summer.

## Module Evaluation

You may be asked to complete a module questionnaire giving your views on how the module has gone. Please answer as honestly, thoughtfully and fully as you can. The results will be used to guide the future development of the module and help fellow students.