

ELEC 2010 POWER AND MACHINES

Credit Points 10

Legacy Code 300052

Coordinator Mahmood Nagrial ([https://directory.westernsydney.edu.au/search/name/Mahmood Nagrial/](https://directory.westernsydney.edu.au/search/name/Mahmood%20Nagrial/))

Description This subject develops an understanding of the basic concepts of power and machines, including modern power systems and transformers, in addition to the fundamentals of electromechanical energy conversion. Students will also study magnetic circuits, modern permanent magnet materials and their characteristics, and balanced and unbalanced three-phase power systems.

School Eng, Design & Built Env

Discipline Electrical And Electronic Engineering And Technology

Student Contribution Band HECS Band 2 10cp

Check your fees via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Undergraduate Level 2 subject

Pre-requisite(s) ELEC 2001 OR ELEC 2013

Learning Outcomes

On successful completion of this subject, students should be able to:

1. Explain general arrangements of power systems.
2. Identify the various types of power stations, distribution systems, cost of operation and protection.
3. Analyse magnetic circuits with and without permanent magnet materials
4. Analyse magnetically coupled circuits.
5. Explain the construction of 3-phase and single phase transformers, their analyses and performance.
6. Evaluate basic concepts of energy conversion.
7. Understand general arrangements of power systems.
8. Gain knowledge of various types of power stations, distribution systems, cost of operation and protection.
9. Understand and analyse magnetic circuits with and without permanent magnet materials.
10. Understand magnetically coupled circuits.
11. Understand the construction of 3-phase and single phase transformers, their analyses and performance.
12. Understand basic concepts of energy conversion.

Subject Content

1. Historical Development, Arguments of AC versus DC.
2. Balanced and unbalanced three phase power systems, Single phase and three-phase circuits.
3. General arrangement of a power system, interconnected systems, standard voltage levels.
4. Distribution systems and substations, load characteristics and tariff structure and objectives of system protection and earthing systems.
5. Magnetic circuits with permanent magnets, fundamentals and properties of permanent magnet materials

6. Transformers (Construction, Equivalent circuits, Performance, Losses and efficiency, Voltage regulation and tests of transformers), Determination of equivalent circuit parameters and Three-phase transformers

7. Electromagnetic energy conversion principles; DC and AC machine fundamentals, Practical considerations and design limitations.

Historical Development

Arguments of AC versus DC for widespread usage-examples.

Balanced and unbalanced three phase power systems.

Single phase and three-phase circuits.

General arrangement of a power system.

Interconnected systems, standard voltage levels.

Distribution systems and substations.

Load characteristics and tariff structure.

Objectives of system protection and earthing systems.

Fundamentals and properties of permanent magnet materials.

Magnetic circuits with permanent magnets.

Mutual and leakage inductances.

Construction of transformers.

Equivalent circuits of transformers.

Performance of transformers.

Losses and efficiency of transformers.

Maximum efficiency of transformers.

Voltage regulation and tests of transformers.

Determination of equivalent circuit parameters.

Three-phase transformers, typical connections and phasor group.

Electromagnetic energy conversion principles.

DC machine fundamentals.

AC machine fundamentals.

Practical considerations and design limitations.

Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/Group Task
Numerical Problem Solving	1.5 hours	20	N	Individual
Practical	3 hours (per practical)	20	N	Both (Individual & Group)
Final Exam	2 hours	60	N	Individual

Teaching Periods

Sydney City Campus - Term 2 (2023)

Sydney City

On-site

Subject Contact Peter Lendrum ([https://directory.westernsydney.edu.au/search/name/Peter Lendrum/](https://directory.westernsydney.edu.au/search/name/Peter%20Lendrum/))

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=ELEC2010_23-SC2_SC_1#subjects)

Sydney City Campus - Term 1 (2024)

Sydney City

On-site

Subject Contact Mahmood Nagrial ([https://directory.westernsydney.edu.au/search/name/Mahmood Nagrial/](https://directory.westernsydney.edu.au/search/name/Mahmood%20Nagrial/))

View timetable (https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=ELEC2010_24-SC1_SC_1#subjects)

Sydney City Campus - Term 3 (2024)

Sydney City

On-site

Subject Contact Mahmood Nagrial ([https://directory.westernsydney.edu.au/search/name/Mahmood Nagrial/](https://directory.westernsydney.edu.au/search/name/Mahmood%20Nagrial/))

View timetable (https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=ELEC2010_24-SC3_SC_1#subjects)