GHENT UNIVERSITY

# Course Specifications

From the academic year 2024-2025 up to and including the academic year

## Electrical Machine Design (E036611)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0** **Study time 180 h**

**Course offerings and teaching methods in academic year 2024-2025**

| | | | |
|---|---|---|---|
| B (semester 1) | English | Gent | lecture |
| | | | seminar |

**Lecturers in academic year 2024-2025**

| | | |
|---|---|---|
| Vandevelde, Lieven | TW08 | lecturer-in-charge |
| Sergeant, Peter | TW08 | co-lecturer |

| Offered in the following programmes in 2024-2025 | crdts | offering |
|---|---|---|
| Bridging Programme Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering) | 6 | B |
| Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering) | 6 | B |

**Teaching languages**

English, Dutch

**Keywords**

design, electrical machines, transformers

**Position of the course**

In this course the device aspect of transformers and rotating electrical machines is the central theme. The aim is to present a global view on the main aspects and problems related to the design of rotating electrical machines and transformers, rather than a pure enumeration of heuristic design rules. In the excercises more specific design tasks are imposed, employing numerical design resources (finite element method). In the project, the design of various electrical motors will be investigated, i.a., the Toyota Hybrid Synergy Drive and/or the Tesla Model S.

**Contents**

- Transformers: Construction, Magnetic field pattern
- Windings of AC machines: Designs, E.m.f. and m.m.f.
- Main flux and leakage flux in electrical machines: Main flux and leakage flux
- Parasitic effects: Parasitic torques, Vibrations and noise, Losses
- Eddy currents: Basic equations, Applications
- Materials: Electrical steel, Permanent magnets, Isolation
- Numerical methods: Finite element method, Applications

**Initial competences**

courses "Electromagnetic Energy Conversion" and "Electrical Drives" or other basic courses on electromagnetism and electrical machines

**Final competences**

1 Know the design and materials of the most common electrical machines.
2 Analyse the windings of AC machines.
3 Use numerical methods for magnetic field computations in electrical machines.
4 Analyse parasitic effects (vibrations, noise, torques).
5 Understand skin and proximity effects.

**Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

**Conditions for exam contract**

This course unit cannot be taken via an exam contract

**Teaching methods**

Group work, Seminar, Lecture, Independent work

**Study material**

Type: Syllabus

Name: Selected chapters of Electric Machine Design
Indicative price: Free or paid by faculty
Optional: no
Language : English
Available on Ufora : Yes

Type: Handouts

Name: Exercises
Indicative price: Free or paid by faculty
Optional: no
Language : English
Available on Ufora : Yes

Type: Software

Name: Design software for electrical machines
Indicative price: Free or paid by faculty
Optional: no
Online Available : Yes

**References**


- Michael Liwschitz-Garik and Clyde C. Whipple, Alternating-Current Machines, D. Van Nostrand Company, Inc.
- Hans Otto Seinsch, Oberfelderscheinungen in Drehfeldmaschinen, B.G. Teubner, Stuttgart, 1992
- S.J. Salon, Finite Element Analysis of Electrical Machines, Kluwer Academic Publishers, 1995
- Jiri Lammeraner and Milos Stafl, Eddy Currents, Iliffe Books Ltd., London


**Course content-related study coaching**

**Assessment moments**

end-of-term and continuous assessment

**Examination methods in case of periodic assessment during the first examination period**

Oral assessment, Written assessment

**Examination methods in case of periodic assessment during the second examination period**

Oral assessment, Written assessment

**Examination methods in case of permanent assessment**

Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

**Extra information on the examination methods**

During examination period: theory: oral exam with written preparation; exercises: written exam. During semester: graded reports.

**Calculation of the examination mark**

Evaluation during examination period: theory: 50%, exercises: 20%
Evaluation during semester: 30% (project report)
Participation to both evaluation during examination period and evaluation during semester (i.e. when report on independent and/or group work has been submitted) is required.