S4 – Course Power Systems

General information OWE / course	
Degree programme	Electrical and Electronic Engineering
Semester	S4
Course Code (OSIRIS)	COUPOS09
Academic year	2026
Name Course short Dutch	ELT S4 Power Systems
Name Course long Dutch	Course Power Systems
Name Course short English	ELT S4 Power Systems
Name Course long English	Course Power Systems
Coordinating unit	AEA
Course type	OWE
Credits	15
Degree	B (post propaedeutic bachelor)
Grading scale course grades	Whole (without decimal)
Language of communication	English
Study load in hours	420
Instructional modes	OW (Onderwijs/Education)
Starting term education	P3A
Duration of education	Semester
Compensation options	Not applicable
Entry requirements course	Not applicable.
General discription	This unit of study covers the basic principles of 3-phase electric machines, power converters and network calculations. The most important topics are: • Rotating magnetic field machines, synchronous, asynchronous, etc. • Power converter, choppers and inverters • Symmetrical short-circuit current. • Conductor cross-section in accordance with NEN1010.
Mandatory participation	No
Examination	
Exam number in OSIRIS	**TOETS-01**
Fulltime/Parttime	Fulltime
Description (Dutch)	Synchrone Machines
Description (English)	Synchronous Machines
Format (modular)exam	KENN Knowledge exam
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	P4A (1x) P5A (1x)
Written exam type	Written
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • correctly describes the different windings in synchronous machines and their functions. • explains the operation of synchronous machines correctly. • calculates working points of synchronous machines correctly using the equivalent circuit and formulas. †

	• correctly explains the reactive power regulation of a synchronous machine to the mains. • draws phasor diagrams correctly for all possible operating states of the synchronous machine. • draws torque-speed and torque-load angle graphs correctly and applies them correctly.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-02**
Fulltime/Parttime	Fulltime
Description (Dutch)	Practicum Synchrone Machines
Description (English)	Synchronous Machines Lab
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • performs measurements on synchronous machines under supervision. • processes the measured values correctly into machine characteristics and phasor diagrams. • correctly calculates parameters of the equivalent circuit on the basis of the measured values.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-03**
Fulltime/Parttime	Fulltime
Description (Dutch)	Elektriciteitsproductie
Description (English)	Electricity Production
Format (modular)exam	KENN Knowledge exam
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	P3A (1x) P4A (1x)
Written exam type	Written
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • Must be able to specify different energy forms, carriers and converters and describe the physical basic principles. • Can describe how various forms of electricity power plants work (coal-fired power plant, nuclear power plant, gas plant, CCGT plant, hydroelectric plant, wind turbine and solar power plant). • Can explain the PV diagram of a wind turbine. • Can determine the yield of a wind turbine and wind park. • Can determine the yield of a solar panel (PV). • Can draw and name a grid-connected PV system. • Can draw and name a wind system. • Can describe a circuit process as the basis for the conversion of heat into work (Carnot). • Can calculate a simple combustion reaction (know what

	CO2 is). • Is familiar with the physical background of: AC, three-phase systems, voltages, currents and power, energy/electricity transport, synchronous grid, balance, moment of inertia of the grid, frequency- capacity control. • Can explain the structure and creation of electricity grids (describe and show) on a national (DSOs and TSO) and a European level (ENTSOe).
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-04**
Fulltime/Parttime	Fulltime
Description (Dutch)	Transmissie- en Distributiesystemen
Description (English)	Transmission and Distribution Systems
Format (modular)exam	KENN Knowledge exam
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	P4A (1x) P5A (1x)
Written exam type	ANS BOYD
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • understands how the transport and distribution network of electrical energy is organized; • can perform calculations on a 3-phase symmetric network; • masters the basic knowledge of the distribution network at different voltage levels; • can convert power transformer specifications into a useful calculation scheme for short circuit, power, and voltage drop calculations. Calculating the internal impedance of a transformer. • Can calculate short-circuit currents in networks in accordance with IEC60909 or %MVA method + Load-flow calculation in accordance with %MVA; • has knowledge of Earthing and earth faults; • can correctly deploy and calculate current and the voltage between the primary and secondary sides of distribution transforms.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-05**
Fulltime/Parttime	Fulltime
Description (Dutch)	Vermogenselektronica 1
Description (English)	Power Electronics 1
Format (modular)exam	KENN Knowledge exam
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	P3A (1x) P4A (1x)
Written exam type	Written
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • Can describe basic converter topologies including basic

	calculations. • Has knowledge of driven rectifier, levelling and filtering.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-06**
Fulltime/Parttime	Fulltime
Description (Dutch)	Vermogenselektronica 2
Description (English)	Power Electronics 2
Format (modular)exam	KENN Knowledge exam
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	P4A (1x) P5A (1x)
Written exam type	Written
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • can design and realise power electronics based on converter topologies for specified applications in the area of electrical drives, alternative electric energy sources and power supply systems for electronic devices. • you take the current standards, manufacturability, testability, safety and sustainability within an industrial environment into account in the design.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-07**
Fulltime/Parttime	Fulltime
Description (Dutch)	Practicum Vermogenselektronica
Description (English)	Power Electronics Lab
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • can carry out practical measurements and calculations on converters as part of structured assignments.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-08**
Fulltime/Parttime	Fulltime
Description (Dutch)	Asynchrone Machines
Description (English)	Asynchronous Machines
Format (modular)exam	KENN Knowledge exam
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	P3A (1x) P4A (1x)
Written exam type	Written
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • correctly explains the operation of asynchronous machines.

	• calculates operation points of asynchronous machines correctly using the equivalent circuits and formulas, both with a fixed and a variable supply frequency. • draws torque-speed graphs and applies them correctly. • calculates losses in the machine correctly.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-09**
Fulltime/Parttime	Fulltime
Description (Dutch)	Practicum Asynchrone Machines
Description (English)	Asynchronous Machines Lab
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • performs measurements on asynchronous machines under supervision. • processes the measured values correctly into machine characteristics. • correctly calculates parameters of a equivalent circuit based on the measured values.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-10**
Fulltime/Parttime	Fulltime
Description (Dutch)	Elektrische aandrijvingen
Description (English)	Electrical Drive Systems
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • correctly converts a machine characteristic into a torque-speed characteristic, relevant operating times, torques and currents. • based on this information, dimensions a suitable powertrain and selects the correct components.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-11**
Fulltime/Parttime	Fulltime
Description (Dutch)	Leerteam 4
Description (English)	Learning Team 4
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable

Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • Can evaluate S3 and S4 and reflect on himselfcan name several development areas for S5, based on feedback received in S3 and S4 and (self) reflection • Can convert points for development into SMART-formulated learning objectives and elaborate these in a PDP. • Knows how to substantiate choices for projects, internship and minorillustrates the direction of further development for the next semesters.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-12**
Fulltime/Parttime	Fulltime
Description (Dutch)	EMC-V
Description (English)	EMC-V
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: - can distinguish between the 3 different influences; - can choose the appropriate shielding; - can recognise EMC problems on a PCB and implement a solution; - knows the dangers of rapid signals on a PCB.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-13**
Fulltime/Parttime	Fulltime
Description (Dutch)	Laagspanningsinstallatie ontwerpen
Description (English)	Low voltage installation design
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	The student dimensions a low voltage installation for a domestic dwelling. The student choices the correct earthing-system (TT, TN, etc.). The student selects cables for a single phase AC distribution system, in accordance to the HD 60364. The student selects the required protections and explains the protection-principles. The student demonstrates by simulation and/or calculation that the design complies with the regulations.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-14**
Fulltime/Parttime	Fulltime
Description (Dutch)	Practicum Transmissie- en distributiesystemen

Description (English)	Transmission and Distribution Systems Lab
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	Profesional Product You can use a simulator to carry out calculations in transmission and distribution networks for both load flow as well as short circuits. You know the difference between constant power and constant impedance loads in a simulator. You can examine the common network components, such as transformers, lines or cables, etc. with the help of a simulator. You can use a simulator to answer simple questions about distribution and transmission networks. Think of, the choice of cables, determination of short-circuit currents, the influence of connecting solar parks or wind turbines to an existing network.
Educational activities offered	Not applicable

S4 - Project 4: Industrial and Power Systems

General information OWE / course	
Degree programme	Electrical and Electronic Engineering
Semester	S4
Course Code (OSIRIS)	PROIAA42
Academic year	2026
Name Course short Dutch	ELT S4 Project 4
Name Course long Dutch	Project 4: Industrial and Power Systems
Name Course short English	ELT S4 Project 4
Name Course long English	Project 4: Industrial and Power Systems
Coordinating unit	AEA
Course type	OWE
Credits	15
Degree	B (post propaedeutic bachelor)
Grading scale course grades	Whole (without decimal)
Language of communication	English
Study load in hours	420
Instructional modes	OW (Onderwijs/Education)
Starting term education	P3A
Duration of education	Semester
Compensation options	Not applicable
Entry requirements course	Project 4 builds on the knowledge, insight and skills from the OW Project 3 and the Electronics Design, Signals and Systems IPS course. So students must: - have taken these units of study. Or: - be able to demonstrate they have acquired the knowledge, insight and skills from these unit of study in another way. If in doubt, consult the learning team coach.
General discription	Project. The students work on designing and/or building a product or prototype and thereby develop professional and practical skills. The project can be carried out in a mono-disciplinary, bi-disciplinary or multidisciplinary way, either at HAN or on location. The project includes designing a system with a power converter as a key element.
Mandatory participation	No
Examination	
Exam number in OSIRIS	**TOETS-01**
Fulltime/Parttime	Fulltime
Description (Dutch)	Project 4
Description (English)	Project 4
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	1
Minimum result	5,5
Grading scale	Decimal
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	• The students are able to carry out a project with students from another degree course.

	• The students possess the basic skills in (written) communication, consultation, reflection and cooperation. • The student designs and implements a power converter. (dc wcd, DC-DC converter, etc.). • Describes the (technical) results belonging to the phases within the V model (Action plan, User/Functional/Technical Requirements, High- Level/Detail design, Realisation, Tests). • The student actively applies themselves to the task of achieving the project objectives.
Educational activities offered	Not applicable
Exam number in OSIRIS	**TOETS-02**
Fulltime/Parttime	Fulltime
Description (Dutch)	Professional Skills 4
Description (English)	Professional Skills 4
Format (modular)exam	PROD (Professional) product
Weight factor of (modular) exam	0
Minimum result	P
Grading scale	P/F
Exam sittings	YEARA
Written exam type	Not applicable
Assessment criteria (OWE)/Learning outcomes (EVL)	The student: • Connects the theory to their own experiences/behaviour and distils learning points. • Knows his own communication style and its influence on others. • Has an eye for the effectiveness of his own co-operation behaviour and adjusts his difficult behaviour if necessary.
Educational activities offered	Not applicable