COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2025/2026. SEMESTER 2.

Course title	*Electrical Power Converters 1.*
Course Code	*IVB465ANVM*
Hours/Week: le/pr/lab	*3/1/1*
Credits	*4*
Degree Programme	*Electrical Engineering*
Study Mode	*Full time training*
Requirements	*Exam*
Teaching Period	*4.*
Prerequisites	*Electromagnetic fields (IVB038AMNVM)*
Department(s)	*Department of Electric Networks*
Course Director	*dr. Kvasznicza Zoltán, Showqi Mohamed Ali*
Teaching Staff	

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

Students get to know the principle structure, operation, and operational issues of transformers, synchronous, and asynchronous machines.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

Main aim of this course is to make the students familiar with the working principle, operational properties, selection and operation conditions of electrical machines applied in the engineering practice along with the fundamentals of electric drives.

2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	1. *The topic and significance of the Electrical converters* 2. *Transformers:* a. *Construction and principle operation of single-phase transformers.* b. *Equivalent circuit and operating of single-phase transformers.* c. *Principle operation and vector groups of three-phase transformers.* d. *Parallel operation and efficiency of three-phase transformers.* e. *Structure and cooling methods of transformers.* f. *Special transformers.* 3. *Synchronous machines:* a. *Construction and principle operation of synchronous machines* b. *Winding of AC machines.* c. *Equivalent circuit and vector diagrams of synchronous machines.* d. *Operating conditions of synchronous machines, connection to the network and diagrams.*

	e. *Synchronous Motors.* 4. *Asynchronous machines:* a. *Construction, principle operation and equivalent circuit of asynchronous machines.* b. *Types of asynchronous machines (squirrel cage and slip ring)* c. *Vector diagrams and characteristics of asynchronous machines.* d. *Current-displacement rotor induction motors (Deep-bar and double-cage rotor induction motors)* e. *Starting methods of asynchronous motors.* f. *Braking methods and speed control of asynchronous motors.* g. *Construction and principle operation of single-phase asynchronous motors.*
PRACTICE	*Solving numerical problems.*
LABORATORY PRACTICE	*Performing measurements in the laboratory.*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	*Construction and principle operation of single-phase transformers.* *Equivalent circuit and operating conditions of transformers.*	[1.] 2-29	…	…
2.	*Principle operation and vector groups of three-phase transformers.* *Parallel operation and efficiency of transformers.*	[1.] 30-66		
3.	*Structure and cooling methods of transformers.*	[1.] 67-90		
4.	*Special transformers.*	[1.] 91-110		
5.	*Construction and principle operation of synchronous machines.* *Winding of AC machines.*	[2.] 2-23	TEST	
6.	*Equivalent circuit and vector diagrams of synchronous machines.*	[2.] 24-31		
7.	*Operating conditions of synchronous machines, connection to the network and diagrams, synchronous motors.*	[2.] 32-46		
8.	*Construction, principle operation and equivalent circuit of asynchronous machine, characteristics and circle diagrams.*	[3.] 2-27	TEST	
9.	-----			
10.	------			
11.	*Types of asynchronous machines (squirrel cage and slip ring).* *Asynchronous motors, Starting methods.*	[3.] 27-60		
12.	*Braking methods of asynchronous motors,* *Speed control of asynchronous motors..*	[3.] 61-94		

13.	*Construction and principle operation of single-phase asynchronous motors.*	[3.] 95-112	TEST	
14.	*Retake*			

PRACTICE, LABORATORY PRACTICE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	*General information about measurements and electrical safety technology.*			
2.	*Numerical problems about transformers*			
3.	*Numerical problems about transformers*			
4.	*Measurement (transformer)*		*TEST (LAB)*	
5.	*Numerical problems about synch. machines*			
6.	*Numerical problems about synch. machines*		*TEST (LAB)*	
7.	*Measurement (synchronous machines)*			
8.	*Measurement (synchronous machines)*			
9.	*-------*			
10.	*-------*			
11.	*Numerical problems about asynchronous machines*			
12.	*Numerical problems about asynchronous machines*			
13.	*Numerical problems about Single-phase asynchronous machines*			
14.	*Measurement (asynchronous machines)*		*TEST (LAB)*	

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Participation in lectures, exercise, and written assessments is mandatory. It is checked every time during lectures, exercises and written assessments. The presentation and the numerical exercise *cannot be replaced; the measurement exercise can be done once at a separate time agreed with the leader of the exercise. Absence from classes can only be justified on the basis of medical certificate.*

Method for monitoring attendance*(e.g.: attendance sheet / online test/ register, etc.)*

Attendance sheet

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course-unit with final examination

Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam

(The samples in the table to be deleted.)

Type	**Assessment**	***Weighting as a proportion of the pre-requisite for taking the exam***
1. Test 1	*max 50 points*	*30 %*
2. Test 2	*max 50 points*	*30 %*

3. Test 3	*max 5 points*	*30 %*
4. Test (LAB)		*10 %*

Requirements for the end-of-semester signature

(Eg.: mid-term assessment of 40%)

A signature is obtained by the student who:

- actively participates in all exercises (only certified absences are acceptable), and the prescribed number of hours min. attends 70% of lectures,
- write the tests and lab exercises with at least (pass) results.

Re-takes for the end-of-semester signature (PTE TVSz 50§(2))

The specific regulations for grade betterment and re-take must be read and applied according to the general Code of Studies and Examinations. E.g.: all the tests and the records to be submitted can be repeated/improved each at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

- *The retake can be made up in the last week of the studying period or in the first two weeks of the exam period.*
- *The retake measurement can be carried out during the due studying period.*

Type of examination: *written*

The exam is successful if the result is minimum 40 %. *(The minimum cannot exceed 40%.)*

Calculation of the grade *(TVSz 47§ (3))*

The mid-term performance accounts for ***40*** %, the performance at the exam accounts for 60 % in the calculation of the final grade.

Calculation of the final grade based on aggregate performance in percentage.

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1.] Dr. Kvasznica Zoltán: Electrical Power Convertors (Transformer)
[2.] Dr. Kvasznica Zoltán: Electrical Power Convertors (Synchronous machines)
[3.] Dr. Kvasznica Zoltán: Electrical Power Convertors (Asynchronous machines)
[4.] Stephen J. Chapman: Electric Machinery Fundamentals

RECOMMENDED LITERATURE AND AVAILABILITY

[5.] B. L. Theraja: A Textbook of Electrical Technology
[6.] Mihail Antchev: Technologies for Electrical Power Conversion, Efficiency, and Distribution: Methods and Processes;