*Recommended template: “Course Description, Syllabus, Course Requirements”*

# course syllabus and course requirementsacademic year … semester …

|  |  |
| --- | --- |
| Course title | Electrical Power Converters 2.  |
| **Course Code** | IVB466ANVM |
| **Hours/Week: le/pr/lab** | 2/1/1 |
| **Credits** | 3 |
| **Degree Programme** | Electrical Engineer |
| **Study Mode** | Full time |
| **Requirements** | Midterm |
| **Teaching Period** | 5. |
| **Prerequisites** | Electrical Power Converters 1. |
| **Department(s)****Course Director** | dr. Kvasznicza Zoltán |
| **Teaching Staff** | dr. Kvasznicza Zoltán, Showqi Hageb |
|  |  |

# course description

*A short description of the course (max. 10 sentences).*

*Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description*

Construction of DC machines, principle of operation, DC generators and motors.

Basics and kinetics of electrical drives. General questions of the application of electric motors, motor choosing.

# syllabus

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

## **goals and objectives**

*Goals, student learning outcome.*

*Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction*

…

The aim of this subject is to give general knowledge about DC electrical power converters and fundamentals of electric drives to the students. Students study general issues of the application of rotating electrical machines as well as the selection methods of electric motors. Aim of this subject is to give the students possibility to practise their theoretical knowledge by doing measurements in a laboratory.

## **course content**

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

|  |  |
| --- | --- |
|  | TOPICS |
| LECTURE | 1. Principle construction, operation of direct current machines. Connections and characteristic curves of direct current generators. Connections and characteristic curves of direct current machines.
2. Methods of starting, breaking, speed variation and reversal of direct current motors. Basic equations and unit systems. Properties of translational and rotational movements, analogies. Moment of inertia; theoretical calculations, simple cases.
3. Kinetics of electric drives. Role and characteristics of gears; ratio of gears; calculation and marking of gears. Reduction of the characteristics of the drive to the motor: Emerging problems and their solution; rules of reduction.
4. Reduction from rotational movement to rotational movement: Reduction of torques and moments of inertia in ideal and real cases (with loss).Reduction from translational movement to rotational movement: Calculation of the torque corresponding to the loading force and the reduced moment of inertia corresponding to the mass in ideal and real gears. Inertia factor, stored energy factor.
5. Classification of torques in electric drives: Interpretation of the quadrants. Torques (mechanical characteristic curves) of electric motors. Interpretation of *Mm*, properties of synchronous, shunt and series type motors.
6. Classification of moments of load considering their kinetics (passive and active moments of loads); by their dependence on the properties of the drive.
7. Equation of motion of electric drives: Interpretation of the dynamical moment ;interpretation of the equation of motion; general precondition of stability.
8. Determination of the angular velocity – time functions: In case of *Md* = *f*(*ω*) = constant: Determining, defining *ω* = *f*(*t*); *t*12; *Tin*; in case of the function *Md* = *f*(*ω*) = -a*ω* + *b*: Determining, defining *ω* = *f*(*t*); *t*12; *Tm*; calculation of the function *ω*(*t*) in case of breaking.
9. General issues of the application of electric rotational machines:General structural and mechanical properties: Structural design and mounting positions, building dimensions, vibrations and noise levels, protection levels, marking system and definitions, insulation classes of electric rotational machines.
10. Heating-up, cooling-down and cooling methods of electric rotational machines: Losses, heating and cooling processes of electric rotational machines, differential equation of heating; electric equivalent circuit of heating for stationary and transient operational modes.
11. Introduction of the standard (reduced) loss P’w; determination of the time function of heating and cooling, evaluation of the functions physical bases of cooling electric rotational machines; heat conductance, radiation, natural and artificial convection. Definition of heat-transfer; cooling methods of electric rotational machines; simplified and general marking system.
12. Classification of the operation types of electric motors. Selection methods of electric motors: Selection of motors for continuous operation; selection of motors for continuous periodic operation; method of the equivalent loss; medium overheating.
13. *P’wk*; cooling reduction factor; introduction of the reduced playing period; methods of equivalent torque, power and current; selection of motors for discontinuous periodic operation; selection of motors for short-time operation; determination of the values of *σ* and *ξ*.
 |
| PRACTICE | * Numerical problems

*.* |
| laboratory practice | 1. Taking the characteristic curve of direct current generators
2. Taking the characteristic curve of direct current motor
3. Determination of electromechanical time constant
 |

### **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. | … | … | … | … |
| 2. |  |  |  |  |
| 3. |  |  |  |  |
| 4. |  |  |  |  |
| 5. |  |  |  |  |
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| 7. |  |  |  |  |
| 8. |  |  |  |  |
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| 12. |  |  |  |  |
| 13. |  |  |  |  |
| 14. |  |  |  |  |
| 15. |  |  |  |  |

|  |
| --- |
| PRACTICE, LABORATORY PRACTICE |
| week | **Topic** | **Compulsory reading; page number****(from … to …)** | **Required tasks (assignments, tests, etc.)** | **Completion date, due date** |
| 1. | … |  |  |  |
| 2. |  |  |  |  |
| 3. |  |  |  |  |
| 4. |  |  |  |  |
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| 14. |  |  |  |  |
| 15. |  |  |  |  |

## **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.*

Attending is required all classes and its control takes place occasionally at presentations and at every practical and laboratory classes. Presentations and practical classes cannot be made up, laboratory classes can be made up once at an extra date agreed with the laboratory lecturer. In case of absence the student must present a valid excuse, such as a doctor's note.

***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 resulting in mid-term grade(PTE TVSz 40§(3))

**Mid-term assessments, performance evaluation and their ratio in the final grade**(The samples in the table to be deleted.)

|  |  |  |
| --- | --- | --- |
| **Type** | **Assessment** | **Ratio in the final grade** |
| Test 1 (DC machines) | Max. 50 points | 20 % |
| Test 2 (Electrical drives) | Max. 50 points | 20 % |
| Test 3 (Electrical drives) | Max. 50 points | 20 % |

**Opportunity and procedure for re-takes**(PTE TVSz 47§(4))

*The specific regulations for improving grades and resitting testsmust be read and applied according to the general Code of Studies and Examinations. E.g.: all tests and assessment tasks can be repeated/improved 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.*

Possibility

Re-take possibility twice in the last week of the study period and in the first two weeks of the exam period.

**Grade calculation as a percentage**

based on the aggregate performance according to the following table

|  |  |
| --- | --- |
| **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.

Course-unitwithfinal examination

**Mid-term assessments, performance evaluation and their weightingas 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. *e.g..: Test 1*
 | *eg. max 20 points* | *eg. 20 %* |
| 1. *e.g.: Test 2*
 | *eg. max 30 points* | *eg. 30 %* |
| 1. *e.g.: home assignment (project documentation)*
 | *eg. max 30 points* | *eg. 30 %* |
| 1. *…*
 | *eg. max 15 points* | *eg. 20 %* |

**Requirements for the end-of-semester signature**

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

…

**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.*

…

***Type of examination*** *(written, oral): ……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  ***…*** %, the performance at the exam accounts for ***…*** % 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.

## **Specified literature**

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

##### **compulsory reading and availability**

* Electric Motors and Drives Fundamentals, A. Hughes, Heinemann Newnes

##### **recommended literature and availability**

* Electric drives: Concepts and Applications, V. Subrahmanyam, McGraw-Hill