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| **Óbuda University**<br>***Donát Bánki Faculty of Mechanical and Safety Engineering*** | Institute of Mechatronics and Vehicle Engineering<br>Department of Mechatronics |

**Subject name and Neptun-code: Selected Chapters of Electricity (BMXVIBAMNE)** **Credits: 4**
*Spring Semester of the Academic year of 2022/2023. Full time training.*

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| Supervised by: | Prof. Dr. Róbert SZABOLCSI | Lectured by: | Prof. Dr. Róbert SZABOLCSI |
| Requirements of the course: (Neptun Codes) | There are no entry requirements. | | |

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| Lessons per week: | Theory: 2 | Practice (in Auditorium): 1 | Computer Lab: 0 | Consultation: 0 |
| Requirement: | Exam (**E**) | | | |

**The Syllabus**

*Aim:* to give an overview about basics of electricity, and its selected chapters dealing with electrical systems analysis and their computer simulation.

*Topics:* Electrical circuits. Electrical devices. Electrical systems. Basic laws of electricity. Ohm's Law. Kirchhoff's Current Law (KCL). Kirchhoff's Voltage Law (KVL). Finding resulting resistances. Finding resulting conductances. Current division. Voltage division. Analysis of electrical circuits using node voltage method. Analysis of electrical circuits using mesh current method. Phase compensation in electrical circuits. Basics of electrical machines. Measurement of electrical machines. AC and DC servo measurements.

**Schedule and Requirements**

| Weeks | |
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| 0. | Registration. Administration activities. |
| 1. | Introduction to the subject. Syllabus overview. Requirement of the course. Electrical circuits. Passive and active elements. Electrical devices. Electrical systems. |
| 2. | Basic laws of electricity. Ohm's Law. Kirchhoff's Current Law (KCL). Kirchhoff's Voltage Law (KVL). |
| 3. | Transients in electrical circuits. |
| 4. | Finding resulting resistances. Finding resulting conductances. Current division. Voltage division. Delta-Y, Y-delta transformations. |
| 5. | Analysis of electrical circuits using node voltage method. Analysis of electrical circuits using mesh current method. |
| 6. | Phase compensation in electrical circuits. Lag-compensation based on passive electrical filters. Lead-compensation based on passive electrical filters. Band-pass filtering. Band-rejection filtering. |
| 7. | Transfer functions of the passive filters. Bode-diagrams and Nyquist-diagrams of the filters. |
| 8. | Faraday's Law. Lenz's Law. Lorentz Force Law. Electromagnetic induction. Motional induction. Conventional DC machine, construction, classification, performances. |
| 9. | DC Generator characteristics. |
| 10. | DC Motor characteristics. |
| 11. | Induction machines. Equivalent circuits. Speed control of induction motors. Small AC motors. Two-phase induction motors. |
| 12. | Test Paper. |
| 13. | Improvement and retake activity. |
| 14. | Gaining signature. |

The course is to be considered successfully executed and the teacher's signature is gained if and only if the test papers are marked with grade higher than 2 ("Pass"/Satisfactory). If the test paper evaluated by grade of "Fail"/"Unsatisfactory (Grade 1) and is kept for non-retaken, the teacher's signature shall be denied. If test paper is a not written one, the student must be banned from the course. Any student can select between frontal teaching and project work solutions.

*To improve:* If the test paper evaluated as '*Fail'*, there are two occasions provided for students to improve.

*Participation:* The participation is obligatory at all lectures, attendance list should be signed by the students at all lectures.

*Exam (E):* written and oral, based upon the List of Questions. Exam is organized using exam items involving questions known for the students prior to the exam for 2 weeks as the minimum.

**References (but not limited to):**


1. Paul, C.R. – Nasar, S.A. – Unnewehr, L.E. Introduction to Electrical Engineering, McGraw-Hill, Inc., Int. Eds., 1992.
2. Morris, N.M. Electrical Circuit Analysis and Design, The MacMillan Press Ltd., 1993.
3. Edwards, J.D. Electrical Machines, The MacMillan Press Ltd., 1986.
4. Bolton, W. Electrical and Electronic Measurement and Testing, Longman Scientific & Technical, 1992.
5. Dorf, R.C. – Bishop, R.H. Modern Control Systems, Prentice-Hall International Inc., 12th Ed., 2011.
6. Lecture notes of the students.
7. Live videos available free at the Internet.
8. The Moodle system is available for further assistance.


*Quality Assurance:* using feedback provided by the students for improving content and methods of teaching of the subject.

Regulation:

'Student Requirement System of Óbuda University; Study and Examination Regulations of Óbuda University' is available at:

https://uni-obuda.hu/wp-content/uploads/2020/06/study-and-examination-regulations-of-obuda-university.pdf

Term:

ECTS credit: 1 credit = 30 working hours, including both the scheduled classes and the individual study (homeworks and other activities) of the students.

Condition:

This is course will serve perfectly and perform well development of the students being emotionally driven, highly motivated, eager to improve both theoretical and practical skills and knowledge, ready to sacrifice their resources (like time etc.) for their personal development; moreover students should be devoted to lead their study by their best abilities and skills expressing their social responsibility getting chance to take part at the MSc training program they attending.

13 October 2022, Budapest, Hungary.


Prof. Dr. habil. Róbert Szabolcsi
Lecturer