SUBJECT DETAILS AND SYLLABUS
2019/2020. I. SEMESTER

Subject Name	***Electromagnetic Fields***
Subject code	***IVB038ANVM***
Classes per week (L/P/Lab)	***2,2,0***
Number of Credits	***5***
Division/type	***Electrical Engineering (BSc)***
Program	***full-time***
Requirement	***exam***
Semester	***3rd / 2019-2020. fall***
Preliminary requirements	***-***
Organization name	***Institute of Information and Electrical Technology***
Responsible Lecturer(s)	***Zsolt Kisander, Dr. Gergely Nyitray***

GOAL OF INSTRUCTION

This course gives an introduction to the classical theory of electromagnetic fields. Students will learn how to model and solve electromagnetic problems that are common in the engineering practice.

SUBJECT CONTENT

Lecture:

1. Historical background. Properties and comparison of fundamental interactions mediating and interacting particles. The electric charge.
2. Coulomb-force. Static electric field generated by a single charge, electric field lines. Superposition principle, charge configurations.
3. Continuous charge distributions, line, surface, volume charge densities. Electric field generated by charge distributions. Applications of Gauss's law.
4. Work done by the electric field, potential energy. Electric potential and potential difference for point charges and charge distributions.
5. Capacitance, capacitors (parallel-plate, cylindrical, spherical). Energy stored in a capacitor. Parallel and serial configuration of capacitors.
6. Electric polarization. Dielectric materials, dielectric constant. Electric field inside different materials. Capacitors with layered dielectrics.
7. Electric current, microscopic models of conduction. Conductivity and resistivity. Direct-current circuits.
8. Magnetic fields. Motion of a charged particle in an uniform magnetic field, velocity selector. Magnetic force acting on a current-carrying conductor. Torque on a current loop in an uniform magnetic field.

9. Sources of the magnetic field. Magnetic force between two parallel conductors, Ampére's law, Biot-Savart law. Magnetic field of solenoids and toroids.
10. Magnetic field in different materials, permeability. Dia-, para-, ferromagnetism.
11. Magnetic flux, Faraday's law of induction. Motion induction, Lenz's law. Induced electromagnetic field. Generators and motors.
12. Inductance, self-induction. Inductors, energy stored in inductors. Mutual inductance. RL and RLC circuits, transformers.
13. Electromagnetic waves, Maxwell's equations. Plane waves, energy carried by electromagnetic waves. Spectrum of electromagnetic waves.

EXAMINATION AND EVALUATION SYSTEM

The midterm test consists 4-5 problems from different chapters, which can be proofs or calculations. The exact time of the test will be announced on the 12th week. Students have to pass the midterm test to get the signature. Students with signature can take the oral exam, which is about theoretical topics. The final grade is the exam grade.

LITERATURE

- Physics for Scientists and Engineers 9th ed., Serway and Jewett, 2013, ISBN-13: 9781133947271
- Introduction to Electrodynamics 4th ed., Griffiths, 2017, ISBN-13: 9781108420419

SCHEDULE

		STUDY PERIOD, STUDY WEEKS														EXAM PERIOD				
2019/2020. II. SEMESTER		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	1.	2.	3.	4.	5.
Lecture number																					
Practice/Labs number																					
Midterm test															x						
Homework	**publishing**																				
	submitting																				
Signature/Semester rating																					
Exam																	x	x	x	x	x

2020. ……

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responsible lecturer