Identification	**Subject (code, title, credits)**	ETR 555- Electromagnetic Field Theory –6 ECTS	
	Department	Electronics, Telecommunications and Radio Engineering	
	Program (undergraduate, graduate)	Master	
	Term	Spring 2023	
	Instructor	Shahmerdan Amirov	
	E-mail:	amir.atu@list.ru	
	Phone:	(+99450) 210-16 -20	
	Classroom/hours	203N Thursday 15:10-18:00	
	Office hours		
Prerequisites	Physics II (PHSC 112)		
Language	English		
Compulsory/Elective	Compulsory		
Required textbooks and course materials	**Core textbook:** **David J. Griffith Introduction to Electrodynamics** **Hugh D.Young, Roger A.Freedman** ***University Physics. Pearson International Edition.P.1551*** ***Supplementary books.2.*****. Douglas C.Giancoli.** ***Physics for scientists and engineers. Pearson International Edition.*** ***4. Amirov Sh.Sh. Lecture notes in Electricity and Magnetism***		
Course website	http://www.maths.tcd.ie		
Course outline	Electromagnetic theory covers basic principles of electronic filaments, cathode rat tubes, ionic devices, semiconductors, resistors and diodes on their base, transistors, amplifiers, operational amplifiers , oscillatory circuits, generators of sinusoidal oscillations, as well as the rectifiers.		
Course objectives	After studying this course the student should be able to: • Calculating electric fields and electric potentials • Analysis combination of capacitors. Calculating power and energy in circuits. • Applying Kirchoff's current and voltage laws in circuits.. • Analysis of magnetically coupled circuits.		
Teaching methods	**Lecture**		☑
	Group discussion		☑
	Experiential exercise		☑
	Case analysis		☑
	Simulation		☑
	Course paper		☑
	Others		☑
Evaluation	**Methods**	**Date/deadlines**	**Percentage (%)**
	Midterm Exam		30
	Activity	At the end of the semester	5
	Class Participation	At each lesson	5
	Quizzes	2 quizzes during the semester	10
	Project	During the semester	10
	Presentation/Group Discussion		
	Final Exam		40
	Others		
	Total		100
Policy	Lesson organization General information on the subject will be provided for the students during lectures.		

Student's knowledge on the previous topics will be evaluated and new topic will be explained by mins of visual aids during seminars. Student's knowledge level will be tested oraly and in written forms before midterm and final exams. Submission of the individual works by the end of course is obligatory.

Attendance

Participation of students at all classis is important. Students should inform dean's office about missing lessons for particular reasons (illness, family issues and etc.). Students, missing more than 25% of lessons, are not allowed to take the exam.

Lates

Those students who are late for lessons for more than 15 minutes are not allowed to participate at the lesson. Despite this, the student is allowed to take part in the second part of the lesson.

Tests

Those students who have informed the teacher and the dean's office about missing the test in advance for particular reasons, are allowed to take the test next week.

Exams

All the issues related to the participation and admission to the exam are regulated by the faculty dean.

Topics of midterm and final exams are provided for the students before the exams. The questions of midterm exam are not repeated in the final exam.

Violation of the rules of the exams

Disrupting the test and taking copy during midterm and final exams is forbidden. Test papers of the student who do not follow these rules are canceled and the students are expelled from the test by getting 0 (zero).

The rule for completing the course

In accordance with the University rules the overall success rate to complete the course should be 60% or above. The students who failed the exam would be to take this subject next semester or next year.

Rules of conduct for Students

Disruption of the lesson and not following ethical norms during the lesson, as well as conduction of the discussions by the students without permission and using mobile phones is forbidden.

Quizzes

- Quizzes will be held 3 times during the semester The quizzes will be announced in the classroom two weeks before. Quiz is from homework problems.

The homework problems will be selected from questions and problems in the end. of each chapter. The No. of homework problems will be announced after finishing each chapter.

Project

The project will be held once at the end semester and will be evaluated with 10 points. The topic is chosen by the teacher and covers the topics covered in the lesson.

- **Attendance**

Students who attend the whole classes will get 5 marks. for two absence student loses 1 mark.

- **Activity**

Students who will be active during discussion of past lessons will be awarded with one activity mark.

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook/Assignments
1	17.02.23	***Lecture №1*** **Electric charge. Conductors, Insulators and induced charges. Vector form of Coulomb's law. Electric field and electric forces. The superposition of electric fields. Electric field lines . The Electric field of a ring of charge. The electric field of a line**	[1] p.709-741

		of charge. ***Seminar №1*** **Problem solving**	
2	24.02.23	***Lecture №2*** **Enclosed charge and Electric Flux. Calculating Electric Flux of uniform and nonuniform electric fields. Problem solving** **Gauss's law. Charge inside a spherical surface. Charge inside a nonspherical surface. Field of a line charge.** ***Seminar №2*** **Problem solving.**	[1] p.750-773
3	01.03.23	***Lecture №3*** **Field of an infinite plane sheet of charge. Field between opposite charged parallel conducting plates.** **Field of uniformly charged sphere. Field of a hollow charged sphere. Charges on conductors.** ***Seminar №3*** **Problem solving**	[1] p-780-795
4	08.03.23	***Lecture №4*** **Electric potential due to two point charges. Electric potential of a charged conducting sphere, oppositely charged parallel plates , a ring of charge, charged conducting cylinder ana a line of charge. Equipotential surfaces.** ***Seminar №4*** **Problem solving**	[1] p.800-815
5	15.03.23	***Lecture №5*** **Electric dipoles. Force and torque on an electric dipole. Dipole in an external electric field. Potential energy of an electric dipole. Field of an electric dipole. Electric potential due to dipole. Problem solving** ***Seminar №5*** **Problem solving**	[1] p.815-838
6	22.03.23	***Lecture №6*** **Capacitors and capacitance. Capacitors in series and parallel. Energy storage in capacitors and electric field energy. Dielectrics. Electric Flux density and Dielectric constant. The**	[1] p.846-872

		boundary conditions for electrostatic fields. ***Seminar №6*** **Problem solving**	
7	29.03.23	***Lecture №7*** **Magnetostatics. Magnetic field of a moving charge. Magnetic field of a current element. Magnetic field of a straight current carrying conductor. Magnetic field of a circular current loop. Ampere's law.** ***Seminar №7*** **Problem solving**	[1]p.881-900,
		Midterm Exam	
8	06.04.23	***Lecture №8*** **Magnetic field lines and magnetic flux. Gauss 's law for magnetic field. Motion of charged particles in a magnetic Field. Magnetic force on current carrying conductor. Force and Torque on a current loop. Force between parallel conductors.** ***Seminar №8*** **Problem solving**	[1] p.957-984
9	13.04.23	***Lecture №9*** **Magnetic properties of matter. Magnetizability. Types of magnets(Para-,Dia- and Ferro magnets. Magnetization vector.** ***Seminar №9*** **Problem solving**	[1] p.916-947
10	20.04.23	***Lecture №10*** **Electromagnetic induction. Faraday's law. Lenz's law. Motional electromotive force. Induced electric fields. Eddy currents. Displacement current.** ***Seminar №10*** **Problem solving**	[4]p. 73-96
11	27.04.23	***Lecture №11*** **Energy in a sinusoidal wave. Standing waves in a cavity. Relativistic momentum. Relativistic kinetic energy. Rest energy.** ***Seminar №11*** **Problem solving**	[1]p.993-1020

12	04.05.23	***Lecture №12*** **Electromagnetic waves in matter.Energy and momentum in electromagnetic waves.Poynting vector.** ***Seminar №12*** **Problem solving**	[1]p.1030-1045
13	11.05.23	***Lecture №13*** **Maxwell's equations and electromagnetic waves. The Electromagnetic spectrum. A plane electromagnetic wave. A sinusoidal electromagnetic wave.** ***Seminar №13*** **Problem solving**	[1] p.1061-1085
14	18.04.23	***Lecture №14*** **Electromagnetic Momentum flow and Radiation Pressure. Standing electromagnetic waves. Intensity in a standing wave.** ***Seminar №14*** **Problem solving .**	[3]p.555-611
15	25.04.23	***Lecture №15*** **Relativity of time intervals and length. The Lorentz transformations .The Doppler effect for Electromag netic Waves.** ***Seminar №15*** **Problem solving .**	[1]p.1092-1116
		Final Exam