SYLLABUS **Approved,**
DEAN,

1. Program Data

1.1. Institution of Higher Education	**Babeş-Bolyai University**
1.2. Faculty	**Faculty of Engineering**
1.3.Department	**Department of Engineering Science**
1.4. Field of Study	**Electrical Engineering**
1.5. Course of Study	**Bachelor**
1.6. Study Program	**ELECTROMECHANICS**

2. Discipline Data

2.1. Discipline Name	**Electromagnetic field theory**						
2.2. Course Coordinator	**Ş.l.dr.fiz. HAŢIEGAN CORNEL**						
2.3.1. Seminary Coordinator	**Ş.l.dr.fiz. HAŢIEGAN CORNEL**						
2.3.2. Laboratory Coordinator	**Ş.l.dr.fiz. HAŢIEGAN CORNEL**						
2.3.3. Project Coordinator	**-**						
2.4. Year of Study	**II**	2.5. Semester	**3**	2.6. Evaluation Time	**E**	2.7. Discipline Regime	Cmp.

3. Estimated Total Time (hours per semester of teaching activities)

3.1. Number of Hours per Week	**4**	from which: 3.2. Course	**2**	3.3. laboratory / seminary	**3**
3.4. Total Hours from the Curriculum Plan	**70**	from which: 3.5. Course	**28**	3.6. laboratory / seminary	**42**

Time Fund Distribution - hours	80 ore
Study of Handbook, Course Materials, Bibliography & Notes	58
Additional Documentation in Library, on Special E-learning Platforms & in the Field	10
Preparation of seminaries/laboratories/ projects, topics, reports, portfolios & essays	6
Mentoring	4
Examination	2
Other Activities	

3.7. Total Time of Individual Study	**80**
3.8. Total Hours per Semester	**150**
3.9. Number of Credits	**6**

4. Pre-condition (where is the case)

4.1. of Curriculum	• Physics, mathematics, general notions of electricity and magnetism
4.2. of Competences	• Computer usage knowledge

5. Condition (where is the case)

5.1. of Course Progress	• knowledge of the fundamental notions of electricity and magnetism
5.2.1. of Seminary Progress	• knowledge of the fundamental notions of electricity and magnetism
5.2.2. of Laboratory Progress	• knowledge of laboratory work topics
5.2.3. of Project Progress	-

6. Acquired Specific Competences

Professional Competences	• CP1 - Application of specialized knowledge of mathematics, physics, computer science specific in the field of electrical engineering. • CP2 - Operating with specialized concepts in the field of computer technology and information technology. • CP4 - Analysis and interpretation of the results of measurement and recording of electrical and non-electrical quantities in the electromechanical system, made with specific equipment and data acquisition systems.
Transversal Competences	• CT2 - Identify roles and responsibilities in a multidisciplinary team and apply effective teamwork and work techniques within the team. • CT3 - Efficient use of information resources and resources of communication and assisted professional training (internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in a language of international circulation.

7. Discipline Objectives (coming out from the Checklist of Acquired Specific Competences)

7.1. General Objective of Discipline	• Knowledge of the basics of physics with applications in engineering.
7.2. Specific Objectives	• Ways of understanding and scientific treatment of physical phenomena. • The study of physical phenomena in the context of existing laws, principles and physical theories. • Experiments and ways of processing measurement results. • Statistical interpretation of measurement results.

8. Content

8.1. Course	Teaching methods	Observation
1. Electrostatics. Coulomb's theorem. Vacuum electric field. Vacuum electric field strength. Vacuum electrical induction. Electric field lines. Gauss's theorem.	Exposure, problematization, heuristic conversation, explanation, challenging students to dialogue	2 hours
2. Electrostatics. Electric potential. Electric voltage. Electrostatic potential theorem. Electric field in dielectric media.	- / / -	2 hours
3. Electrostatics. Electric fields in metal bodies. Electrostatic balance. The laws of connection between $\overline{D}$, $\overline{E}$ and $\overline{P}$.	- / / -	2 hours
4. Electrostatics. Electric flux, the law of electric flux. Capacitors, capacitors.	- / / -	2 hours
5. Electrostatics. Vacuum electrostatic field equations. Electrical imaging method.	- / / -	2 hours
6. Electrostatics. Energy and forces in the electrostatic field. Expression of electrostatic field energy as a function of electric and potential charges. Expression of energy according to the state quantities of the electric field. Calculation of forces in the electrostatic field, generalized force theorem	- / / -	2 hours
7. Electrodynamics. Vacuum stationary magnetic field. Magnetic induction. Magnetic field strength. Magnetic field lines. Field spectra.	- / / -	2 hours
8. Electrodynamics. Magnetic flux, the law of magnetic flux.	- / / -	2 hours
9. Electrodynamics. Magnetic field in bodies. The state of magnetization of bodies. Magnetic polarization. The law of temporary magnetic polarization. The law of the connection between $\overline{B}$, $\overline{H}$ and $\overline{M}$. Absolute and relative magnetic permeability.	- / / -	2 hours
10. Electrodynamics. Ferromagnetic materials. Magnetization curve. The phenomenon of magnetic hysteresis.	- / / -	2 hours
11. Electrodynamics. The law of the magnetic circuit. The law of the magnetic circuit for moving bodies. Law of the magnetic circuit for bodies at rest.	- / / -	2 hours
12. Electrodynamics. Magnetic circuits. Magnetic reluctance. Kirkhoff's theorems for magnetic circuits. Calculation of magnetic circuits with excitation coils. Calculation of magnetic circuits with permanent magnets.	- / / -	2 hours
13. Electrodynamics. Magnetic chains, inductors. Own and mutual inductance. Useful inductances. Dispersion and magnetic coupling coefficients. Calculation of mutual inductances, Neumann's formula.	- / / -	2 hours
14. Electrodynamics. Energy and forces in the magnetic field. Expression of energy according to the magnitudes of the state of the magnetic field. Calculation of forces in the magnetic field.	- / / -	2 hours
Bibliography: • Sora C. – Bazele electrotehnicii, EDP Bucureşti, 1982 • Bogoevici N. – Electrotehnică şi măsurări electrice, , EDP Bucureşti, 1982 • Antoniu I.S. – Bazele electrotehnicii, EDP Bucureşti, 1974 • Mocanu C. – Teoria câmpului electric, EDP Bucureşti, 1998 • Gruescu L. – Electrotehnică, Editura „Eftimie Murgu" Reşiţa, 2002 • Cornel Haţiegan –*„Fizică Tehnologică.Teorie şi Aplicaţii",* Editura UEM, Reşiţa, 2010		
8.2.1. Seminary	Teaching methods	Observation
1. Electrostatic problems	Problem solving	8 hours
2. Electrodynamic problems	Problem solving	4 hours
- Electromagnetic force. The motion of an electric charge in a uniform		4 hours

magnetic field		
3. Electromagnetism problems. - - Faraday's law of electromagnetic induction		6 hours
- "Maxwell's equations."	Problem solving	6 hours
Bibliography: • Paul Cristea – Aplicaţii şi probleme de Electrotehnică Teoretică, EDP Bucureşti, 1977 • Popa Mircea, Ene Marin – Culegere de probleme de Electrotehnică şi Electroenergetică, EDP Bucureşti, 1964 • M. Preda ş.a. – Electrotehnică. Probleme, EDP Bucureşti, 1966 • M. Preda ş.a – Bazele electrotehnicii, EDP Bucureşti, 1980.		
8.2.2. Laboratory	Teaching methods	Observation
1. Labor protection rules.	Group work, problem solving and discovery, linking theoretical knowledge to practical applications	**B 1.4 / 2 hours**
2. Identify the constructive parts and establish the properties of the direct reading instruments and some circuit elements.	- / / -	**B 1.4 / 2 hours**
3. Experimental determination of Coulomb's law	- / / -	**B 1.4 / 2 hours**
4. Study of electrodynamic force	- / / -	**B 1.4 / 2 hours**
5. Study of electromagnetic force	- / / -	**B 1.4 / 2 hours**
6. Determination of Laplacian fields	- / / -	**B 1.4 / 2 hours**
7. Completion of laboratory activity	- / / -	**B 1.4 / 2 hours**
Bibliography: • Iancu Tătucu, Nicoleta Gillich -„*Electrotehnică şi Maşini Electrice-Îndrumător de laborator",* Editura UEM, Reşiţa, 1997. • Cornel Haţiegan -„*Fizică Tehnologică.Teorie şi Aplicaţii",* Editura UEM, Reşiţa, 2010		
8.2.3. Project	Teaching methods	Observation

9. Corroborating Discipline's Contents with the Expectation of the Epistemic Community Representatives, the Professional Associations and the Employers' Representatives from the Programme Corresponding Field

- They have been established with the main employers by previous discussions at the study program substantiation.

10. Evaluation

Type of activity	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Percent of final grade
10.4. Course	Debates participation	Number of interventions	5 %
	Acquired knowledge level	Exam (on paper)	30 %
10.5.1. Seminary	Activity / implication	Number of interventions	5 %
	Gained competence level	Exam (on paper)	30 %
10.5.2. Laboratory	Activity / implication	Number of interventions	10 %
	Gained competence level in practice	Interactiv	20 %
10.5.3. Project	Readiness in phrasing the project stages		
	Project quality		
10.6. Performance Minimum Standard			
• Completion of Applicative Activities (laboratory work accomplishment by the minimum grade of 5). • Completion of each exams subject by the minimum grade of 5.			

Completion Date	Course Coordinator's Signature	Laboratory/Seminary Coordinator's Signature
May 2022	**Ş.l.dr.fiz. Haţiegan Cornel**	**Ş.l.dr.fiz. Haţiegan Cornel**
Department Endorsement Date		Chief of Department Signature
.....		**Ş.l.dr.fiz. Haţiegan Cornel**