
Objectives of the Course

To teach the fundamental concepts, laws, and circuit analysis techniques related to electricity and magnetism, enabling students to apply these topics to engineering and scientific problems.

Course Contents

This course provides a theoretical and practical introduction to the fundamental principles of electricity and magnetism. Topics covered include electric charge, Coulomb force, electric fields, and Gauss's law, which are thoroughly examined in the context of electrostatics. The course also explores electric potential, capacitance, dielectric materials, and the basic principles of electric circuits, including resistance, current, and power. Students will study the charging and discharging processes of capacitors through RC circuits and then transition into magnetism with concepts such as magnetic fields, the motion of charges in magnetic fields, and the Biot–Savart law. Alongside theoretical foundations, the course aims to develop strong problem-solving skills applicable to engineering contexts.

Recommended or Required Reading

Bekir Karaoğlu, Physics for Universities, Seçkin Publishing, 2020. Serway, R. A., & Beichner, R. J., Physics for Scientists and Engineers 2, Translated by Prof. Dr. Kemal Çolakoğlu, Palme Publishing, 2011.

Planned Learning Activities and Teaching Methods

Lecture, discussion, problem solving

Recommended Optional Programme Components

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Instructor's Assistants

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Presentation Of Course

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Dersi Veren Öğretim Elemanları

Dr. Öğr. Üyesi Sümeyra Balcı

Program Outcomes

1. Can explain and apply the fundamental laws of electrostatics and electromagnetism, including Coulomb's law, Gauss's law, and the Biot–Savart law, to analyze physical systems.
2. Can solve basic to intermediate-level problems related to electric circuits, including those involving resistors, capacitors, and RC circuits, using appropriate circuit analysis techniques.
3. Can describe the behavior of electric and magnetic fields in various configurations and interpret their effects on charged particles and current-carrying conductors.

Order	PreparationInfo	Laboratory TeachingMethods	Theoretical	Practise
1	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 235–238	Lecture, discussion, problem solving	Electric charge, conservation and quantization of charge, types of charging	
2	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 238–240	Lecture, discussion, problem solving	Coulomb force, Coulomb's laws, principle of superposition	
3	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 240–252	Lecture, discussion, problem solving	Electric field and its properties, electric field of a point charge	
4	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 252–259	Lecture, discussion, problem solving	Electric flux, Gauss's law, calculating electric field using Gauss's method	
5	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 260–267	Lecture, discussion, problem solving	Conductors in electrostatic equilibrium, electric potential	
6	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 267–278	Lecture, discussion, problem solving	Potential difference in a uniform electric field, obtaining potential from electric field	
7	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 279–285	Lecture, discussion, problem solving	Capacitance, capacitors: planar, cylindrical, and spherical; capacitor combinations	
8	Entire syllabus from the start of the semester. Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 235–285		Midterm Exam	
9	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 285–298	Lecture, discussion, problem solving	Energy stored in a capacitor, dielectric and drift velocity p.285–298	
10	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 297–302	Lecture, discussion, problem solving	Current and resistance, electric conduction, temperature dependence of resistivity p.297–302	
11	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 302–305	Lecture, discussion, problem solving	Power in electric circuits, ideal and real batteries, current in a single-loop circuit, resistance rule, electromotive force (emf) rule; potential difference between two points in multi-loop circuits	
12	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 306–312	Lecture, discussion, problem solving	Equivalent resistance, resistors in series, resistors in parallel, ammeter–voltmeter, RC circuit (charging and discharging of a capacitor)	
13	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 313–317	Lecture, discussion, problem solving	Magnetic field, electromagnet, magnet, magnetic field lines, motion of charged particles in a uniform magnetic field	
14	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 317–324	Lecture, discussion, problem solving	Magnetic force on a current-carrying wire, magnetic torque on a current loop, magnetic dipole moment	
15	Physics for Universities – Bekir Karaoğlu, 2020, Seçkin Publishing, 4th Edition, Page range: 325–342	Lecture, discussion, problem solving	Magnetic fields produced by electric currents, Biot–Savart law, magnetic field of an infinitely/finite long wire	

Workload

Activities	Number	PLEASE SELECT TWO DISTINCT LANGUAGES
Vize	1	2,00
Final	1	2,00
Derse Katılım	14	3,00
Ders Öncesi Bireysel Çalışma	14	2,00
Ara Sınav Hazırlık	2	8,00
Final Sınavı Hazırlık	2	10,00

Assesments

Activities	Weight (%)
Ara Sınav	40,00
Final	60,00

Gıda Mühendisliği Bölümü / GIDA MÜHENDİSLİĞİ X Learning Outcome Relation

	P.O. 1	P.O. 2	P.O. 3	P.O. 4	P.O. 5	P.O. 6	P.O. 7	P.O. 8	P.O. 9	P.O. 10	P.O. 11	P.O. 12	P.O. 13	P.O. 14
L.O. 1	5					5		5						
L.O. 2	5					5		5						
L.O. 3	5					5		5						

Table :

- P.O. 1 :** Gıda Mühendisliği ile ilgili temel mühendislik konularında yeterli alt yapıya sahiptir.
- P.O. 2 :** Alanı ile ilgili problemleri belirleme, tanımlama ve çözme becerisine sahiptir.
- P.O. 3 :** Nitelikli araştırma planlama, uygulama ve sonuçları analiz etme bilgi ve becerisine sahiptir.
- P.O. 4 :** Modern teknik ve araçları seçer, kullanır ve bilişim teknolojilerinden etkin biçimde yararlanır.
- P.O. 5 :** Bilgiye erişebilme yöntemlerini kavrar.
- P.O. 6 :** Bireysel olarak farklı çalışma gruplarında etkin çalışabilir ve sorumluluk alma özgüvenine sahiptir.
- P.O. 7 :** Etkin sözlü ve yazılı iletişim kurma becerisine ve en az bir yabancı dil bilgisine sahiptir.
- P.O. 8 :** Yaşam boyu öğrenmenin gerekliliği bilincindedir; bilim ve teknolojideki gelişmeleri izler ve kendini sürekli yeniler.
- P.O. 9 :** Mesleki ve etik sorumluluk bilincine sahiptir.
- P.O. 10 :** Proje hazırlama ve değerlendirme bilgi ve yeteneklerine sahiptir.
- P.O. 11 :** İşletme yönetimi, çalışanların sağlığı, çevre ve iş güvenliği konularında bilinç sahibidir.
- P.O. 12 :** Mühendislik çözümlerinin ve uygulamalarının evrensel ve toplumsal boyutlardaki etkilerini kavrar.
- P.O. 13 :** Gıda üretim prosesleri, kalite kontrolü, ürün kalitesinin artırılması, ürün geliştirme ve gıda analizleri alanlarında yeterli düzeyde bilgi ve beceriye sahiptir.
- P.O. 14 :** Gıda güvenilirliği açısından önem arz eden risklerin ortadan kaldırılması veya minimum düzeye indirilmesine yönelik bilgi birikimi ve uygulama becerisine sahiptir.
- L.O. 1 :** Elektrostatik ve elektromanyetizmanın temel yasalarını (Coulomb yasası, Gauss yasası, Biot–Savart yasası vb.) açıklayabilir ve fiziksel sistemleri analiz etmek için uygulayabilir.
- L.O. 2 :** Dirençler, kapasitörler ve RC devreleri içeren elektrik devrelerine ilişkin temel ve orta düzey problemleri uygun devre analiz tekniklerini kullanarak çözebilir.
- L.O. 3 :** Elektrik ve manyetik alanların çeşitli düzeneklerdeki davranışlarını tanımlayabilir ve bu alanların yüklü parçacıklar ile akım taşıyan iletkenler üzerindeki etkilerini yorumlayabilir.