King Saud University
College of Science
Physics & Astronomy Department
PHYS 104, General Physics II,

Course Description:

The course has been designed to explain the basic principles of electricity and magnetism. The student realizes, at the beginning, the meaning of the electric charges and their interactions with each other as well as their effect on the surrounding space throughout their electric field. After that, the electric potential, due to the electric field, and the electric stored energy in the capacitors are introduced to connect the topic of electricity with other topics in physics. Furthermore, the concept of the direct current and the electric energy consumption are introduced; accordingly, the student will be able to understand how to calculate the cost of the electricity bill. Therefore, the students connect the concepts with the reality. In the middle part of the course, the magnetic field and its effects on the electric charge are explained. Then, the students know how magnetism is created by electricity, and vice versa. As a result, this gives more understanding of how both electricity and magnetism are tightly related to each other. At the end of the course, the alternating current circuits (AC) are explained as well as the concept of the effective values of the voltage and the current (V_{rms} and I_{rms}), the phase angle (N), and the power factor. Consequently, the students should know the meaning of the alternating circuit impedance and the consumed energy as well as the state of resonance in the AC circuits.

Textbook:

Physics for Scientists and Engineers, 10^{th} Edition (by Raymond A. Serway and John W. Jewett). Chapters 22-32.

Other Readings:

1- Fundamentals of physics, 10th edition (by David Halliday, Robert Resnick and Jearl Walker). Chapters 21-31.
2. http://hyperphysics.phy-astr.gsu.edu/hbase/emcon.html#emcon.

Course Evaluation:

Midterm Exam 1	15%
Midterm Exam 2	15%
Experimental Labs	30%
Final Exam	40%
Total	**100%**

Tentative schedule:

Sections	Contents	Pages	Examples	Problems	Lectures
Chapter 22	**Electric Fields**	**588-614**			**4**
22.3	Coulomb's Law	593-598	22.01 22.02 22.03	22.09 22.12 22.38 22.30	
22.4	Analysis Model: Particle in a Field (Electric)	598-603	22.05 22.06	22.15 22.20 22.21 22.35	
22.5	Electric Field Lines	603-605			
22.6	Motion of Charged Particles in a Uniform Electric Field	605-607	22.07 22.08	22.24 22.25	
Chapter 23	**Continuous Charge Distributions and Gauss's Law**	**615-635**			**4**
23.2	Electric Flux	620-623	23.04	23.10 23.11 23.37	
23.3	Gauss's Law	623-625	23.05	23.13 23.14 23.15 23.16 23.18 23.19	
23.4	Application of Gauss's Law to Various Charge Distributions	625-630	23.06 23.07 23.08 23.09	23.24 23.27 23.29 23.33 23.34 23.38	
Chapter 24	**Electric Potential**	**636-662**			**3**
24.1	Electric Potential, Potential Difference	637-639		24.01 24.02	
24.2	Potential Differences in a Uniform Electric Field	639-642	24.01 24.02	24.03	
24.3	Electric Potential and Potential Energy Due to Point Charges	642-645	24.03	24.08	
24.6	Conductors in Electrostatic Equilibrium	651-662		24.34 24.35	

Chapter 25	**Capacitance and Dielectrics**	**663-690**			**4**
25.1	Definition of Capacitance	664-665		25.01	
25.2	Calculating Capacitance	665-668		25.03 25.04	
25.3	Combinations of Capacitors	668-672	25.03	25.07 25.09 25.11 25.12	
25.4	Energy Stored in a Charged Capacitor	672-676	25.04	25.17 25.35	
25.5	Capacitors with Dielectrics	676-678	25.05	25.25	
Chapter 26	**Current and Resistance**	**691-712**			**5**
26.1	Electric Current	692-694	26.01	26.04 26.06	
26.2	Resistance	694-699	26.02 26.03	26.10 26.13	
26.4	Resistance and Temperature	701-702		26.17 26.18	
26.6	Electrical Power	703-706	26.04 26.05	26.23 26.28 26.30 26.35	
Chapter 27	**Direct Current Circuits**	**713-741**			**5**
27.1	Electromotive Force	714-716	27.01	27.01	
27.2	Resistors in Series and Parallel	716-723	27.04 27.05	27.09 27.13 27.33	
27.3	Kirchhoff's Rules	723-726	27.06 27.07	27.21 27.37	
Chapter 28	**Magnetic Fields**	**742-770**			**4**
28.1	Analysis Model: Particle in a Field (Magnetic)	743-748	28.01	28.03 28.04	
28.2	Motion of a Charged Particle in a Uniform Magnetic Field	748-752	28.02 28.03	28.09	
28.3	Applications Involving Charged Particles Moving in a Magnetic Field (Velocity Selector)	752		28.16	
28.4	Magnetic Force Acting on a Current-Carrying Conductor	755-757	-	28.21 28.25	

Chapter 29	**Sources of the Magnetic Field**	**771-796**			**4**
29.1	The Biot–Savart Law	772-777	-	29.01	
29.2	The Magnetic Force Between Two Parallel Conductors	777-778	-	29.12 29.13	
29.3	Ampère's Law	779-782	29.05		
29.4	The Magnetic Field of a Solenoid	782-783	-	29.23	
29.5	Gauss's Law in Magnetism	784-786	29.07	29.27	
Chapter 30	**Faraday's Law**	**797-823**			**2**
30.1	Faraday's Law of Induction	798-801	30.01	30.01 30.04	
30.2	Motional emf	801-805	30.02	30.15	
Chapter 31	**Inductance**	**824-846**			**2**
31.1	Self-Induction and Inductance	825-826	31.01	31.03 31.04	
31.3	Energy in a Magnetic Field	830-832	-	31.20 31.21	
Chapter 32	**Alternating Current Circuits**	**847-872**			**6**
32.1	AC Sources	848	-		
32.2	Resistors in an AC Circuit	848-851	32.01	32.01 32.04	
32.3	Inductors in an AC Circuit	851-853	-	32.06 32.09	
32.4	Capacitors in an AC Circuit	854-856		32.12 32.13	
32.5	The RLC Series Circuit	856-859	32.04	32.16 32.19 32.20	
32.6	Power in an AC Circuit	859-861	32.05	32.21 32.23 32.24	
32.7	Resonance in a Series RLC Circuit	861-863	32.06	32.25	