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CURRICULUM GUIDE: OFFICIAL COURSE OUTLINE

Course Code	PHYS 142	Course Title	Engineering Physics II: Electricity and Magnetism, Optics			
Credit Value	4	Department	Mathematics and Science			
No. of weeks	14	Hrs. per week	*Lecture*	*Tutorial*	*Laboratory*	*Total*
			3	0	3	6
Course Description	Part II of a two-semester calculus-based general physics course designed for physical science and engineering students. Topics include electricity and magnetism, simple DC and AC circuits, electromagnetic waves, and optics. Students with credit for PHYS 102 may not take PHYS 142 for further credit.					
Prerequisite(s)	ENGL 099, PHYS 141, MATH 152 (MATH 152 may be taken concurrently)					

Initial Articulation Targets	*UBC*	*SFU*	*UVic*	*UNBC*	*TRU*
	PHYS_V 118 (3) & UBCV PHYS_V 119 (1)	PHYS 141 (4), Q/B-Sci	PHYS 1XX (1.5); ALEX PHYS 141 (4) & ALEX PHYS 142 (4) = UVIC PHYS 110 (1.5) & UVIC PHYS 111 (1.5)	PHYS 111 (4)	PHYS 1XXX (3)
	For updated information on the transferability of this course, please consult the BC Transfer Guide, www.bctransferguide.ca				

Learning Outcomes

Upon successful completion of this course, the student will be able to:

- Understand the meaning of quantized and conserved charge.
- Describe the relationships that govern electricity and magnetism and the interactions between them.
- Apply Coulomb's Law, Ohm's Law, Kirchhoff's Rules, Ampère's Law, and Faraday-Lenz's Law to solve problems in electromagnetism.
- Calculate potential differences, currents, resistances, and electromotive forces for simple AC and DC circuits.
- Describe the magnetic fields, forces, and potentials involved in the interaction of point charges and currents.
- Explain how devices such as inductors, capacitors, resistors, and measurement tools like ammeters, ohmmeters, and galvanometers are used.
- Recognize the importance of electricity and magnetism in technology and daily life.
- Draw free-body diagrams to determine the forces on an object, including gravity, electric force, and magnetic force.

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	• Determine the electric and magnetic forces and fields from charge distributions that are both fixed and moving, using Maxwell's Equations: Gauss' Law, Faraday's Law, and Ampere-Maxwell's Law. • Solve circuits involving resistors, capacitors, and inductors using Kirchhoff's loop and junction rules. • Relate Maxwell's equations to electromagnetic radiation. • Explain the ray optics of light and use the law of reflection and Snell's Law to predict the path of light rays and determine the location of images formed by lenses. • Set up, record, and analyze data from experiments using uncertainty analysis, and compare the results to theory.
Content	**Core** topics – all of the following will be covered: • Electrostatics: Coulomb's Law, Gauss' Law, Electric Potential • Magnetism: Ampere's Law • Electromagnetic Induction: Faraday's Law • Circuits: Resistors, Capacitors, Inductors • Electromagnetic Radiation • Ray Optics, Law of Reflection, Snell's Law, Lenses Additional topics may also be covered, at the discretion of the instructor: • Nuclear Physics and Radioactivity Labs: • Simple DC Circuits; Resistors Colour Reading • Electric Field Mapping; Equipotential Lines • Capacitors in Series and Parallel • Ohm's Law and Kirchhoff's Laws • Charging and Discharging Capacitors in DC Circuits • Measuring Time Constant in AC Circuits • Magnetic Field and Magnetic Induction • Inductors and Capacitors in AC Circuits • Reflection and Refraction • Lenses
Methods of Instruction	Lectures, problem sessions, assignments, laboratory work, presentations, assigned reading, quizzes, exams
Required Textbook(s)	The following textbook(s) is/are required, or approved equivalent(s). Moebs, William et al. University Physics Volume 1, 2, 3. Houston, TX: OpenStax CNX, 2022.
Required Equipment and Technology	Students are required to have a computer with internet access. The following resources are provided by the College: • Office 365 • Student email

Homework Hours	At minimum, students can expect one hour of homework for every hour of instructional time.		
Evaluation	*Component* Quizzes and assignments Laboratory experiments and activities • Weight divided over 10 labs Midterm exam (1-2) Comprehensive final exam	*% Value* 10-25% 10-20% 20-40% 30-35%	
Completion Requirements	The minimum grade to pass this course is D (50%). Unless otherwise stated, a minimum grade of C- (55%) is required for this course to fulfil a prerequisite.		
Course Designer(s)	Michael Wortis, Ph.D., Professor Emeritus, Department of Physics, Simon Fraser University	Consultant(s), *if applicable*	Neil Alberding, Ph.D., Department of Physics, Simon Fraser University and other SFU faculty/staff
Dean's Approval	Marv Westrom, Ph.D. Professor Emeritus, Faculty of Education, University of British Columbia	Dean's Approval Date	September 29, 2010
Curriculum Committee Approval Date	September 29, 2010	First Term Offered	Fall 2011
Last Review Date	September 1, 2024	Next Review Date	September 1, 2029
Revision History	June 11, 2012-Removed from course content: "details of these units may be adjusted at the discretion of the instructor." By Mary Imran (by request of Barbara Moon) March 1, 2023-Minor updates (e.g., assessment ranges, textbooks) by Kelly Cheung September 1, 2024 - Lab assignments and assessments detailed by Kelly Cheung.		