University of Alberta

PHYS 524 Classical Electrodynamics
Section A01
Fall Term 2018

Instructor: **Prof. Doug Gingrich**
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Web Page: **eClass**

Office Hours: By appointment; or take a chance and drop-in if my door is open (do not knock if door closed)

Lecture Room & Time: CCIS 4-285, 11:00-12:20 Tuesdays and Thursdays

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Course Description: Wave guides, radiating systems; special relativity, dynamics of relativistic particles and electromagnetic fields; radiation by moving charges; multiple fields. Additional special topics will be discussed.

Future Course Description: Physical basis and foundations of Maxwell's equations, time-varying fields and conservation laws, wave equation and Green's functions, scattering and diffraction, space-time and electromagnetism, energy-momentum of electromagnetic fields, covariant form of relativistic particle dynamics, radiation sources and damping, relativistic treatment of radiation.

Course Objectives and Expected Learning Outcomes: Master the covariant formalism of electrodynamics. Learn the basics of radiation theory. Develop a solid foundation of classical electrodynamics up to QED.

Key to Success: Attend classes; do problem sets; read textbook.

Lecture Schedule & Assigned Readings: Please review your electrodynamics. A nominal lecture schedule follows.

Class	Dates	Topic	Readings
1	4 Sep	*no class*	
2	6 Sep	Organization and introduction	
3	11 Sep	4-vectors and 4-tensors	Chapter 11.6
4	13 Sep	4-vectors and 4-tensors	Chapter 11.6
5	18 Sep	Covariance of electrodynamics	Chapter 11.9
6	20 Sep	Covariance of electrodynamics	Chapter 11.10
7	25 Sep	Dynamics of particles and fields	Chapter 12.1,7
8	27 Sep	Dynamics of particles and fields	Chapter 12.8,10
9	2 Oct	*no class*	
10	4 Oct	*no class*	

11	9 Oct	Invariance and conservation laws	Chapter 6.3
12	11 Oct	Invariance and conservation laws	Chapter 6.7
13	16 Oct	**Midterm 1**	
14	18 Oct	Green functions	Chapter 6.4
15	23 Oct	Green functions	Chapter 12.11
16	25 Oct	Retarded solutions	Chapter 6.5
17	30 Oct	Retarded solutions	Chapter 14.1
18	1 Nov	Radiating systems	Chapter 9.1,2
19	6 Nov	Radiating systems	Chapter 9.3
20	8 Nov	Radiation by moving charges	Chapter 14.2
21	13 Nov	*reading week*	
22	15 Nov	*reading week*	
23	20 Nov	Radiation by moving charges	Chapter 14.3,5
24	22 Nov	Radiation reaction	Chapter 16.1
25	27 Nov	Radiation reaction	Chapter 16.2
26	29 Nov	**Midterm 2**	
27	4 Dec	*no class*	
28	6 Dec	*no class*	

Required Textbook: "Classical Electrodynamics", J.D. Jackson, Wiley, ISBN-13 978-0471309321 (note: third edition is required).

Other Useful References:

Modern Problems in Classical Electrodynamics, Brau.
The Classical Theory of Fields, Landau and Lifshitz.
Classical Electrodynamics, Schwinger, DeRaad, Milton, Tsai.
Introduction to Electrodynamics, Griffiths.

Lecture Notes: Lecture notes will not be made available during the term. If you miss a class you will be responsible for getting the material from a fellow student.

Past Evaluative Material: This is the first time I have taught this course. As such, I have no past evaluative material to give you. You can consult the exam registry for previous year exams.

Grade Evaluation: A distribution system will be used; the grades will be scaled following the University recommended distribution of grades.

EXAMS	**WEIGHTING**	**DATE**
Assignments	70%	various
Midterm 1	15%	16 Oct
Midterm 2	15%	29 Nov

Grades are unofficial until approved by the Department and/or Faculty offering the course.

Exams: There will be no exam in this course.

Midterm Tests: There will be 2 closed-book midterm tests administered during class time. No aids will be permitted.

Assigned Problem Sets: About 6 problem sets, will be assigned throughout the semester. The problem sets are due at 4:30 pm. Late submissions will not be accepted. Please put them in the box that is marked PHYS 524 near the elevators on L2 in CCIS. Do not put them under my door or in my mailbox.

Late Assignments and Missed Midterms: Late assignments will not be accepted and will be given a grade of zero. A student who cannot complete a term assignment or misses a midterm because of incapacitating illness, severe domestic affliction or other compelling reasons can apply for extension of time to complete an assignment or defer the midterm mark. Term work extensions and deferred midterm marks are a privilege and not a right; there is no guarantee that an extension or deferral will be granted. Misrepresentation of facts to gain an extension or deferral is a serious breach of the *Code of Student Behaviour*. For an excused absence where the cause is religious belief, a student must contact the instructor within two weeks of the start of Fall classes to request accommodation for the term. Instructors may request adequate documentation to substantiate the student request.

Deferred Final Examination: Since there is no final examination in this course, there is no possibility for a deferred final examination.

Re-examination: Since there is no final examination in this course, there can be no re-examination.

Student Responsibilities:
ACADEMIC INTEGRITY: "The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at https://www.ualberta.ca/governance/resources/policies-standards-and-codes-of-conduct/code-of-student-behaviour) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University."

All forms of dishonesty are unacceptable at the University. Any offence will be reported to the Associate Dean of Science who will determine the disciplinary action to be taken. Cheating, plagiarism and misrepresentation of facts are serious offences. Anyone who engages in these practices will receive at minimum a grade of zero for the exam or paper in question and no opportunity will be given to replace the grade or redistribute the weights. As well, in the Faculty of Science the sanction for **cheating** on any examination will include **a disciplinary failing grade** (NO EXCEPTIONS) and senior students should expect a period of suspension or expulsion from the University of Alberta.

CELL PHONES: Cell phones are to be turned off during lectures, labs and seminars. Cell phones are not to be brought to exams.

STUDENTS ELIGIBLE FOR ACCESSIBILITY-RELATED ACCOMMODATIONS (students registered with Accessibility Resources - AR): Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with AR deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact AR (https://www.ualberta.ca/current-students/student-accessibility-services) for further information.

ACADEMIC SUCCESS CENTRE: Students who require additional help in developing strategies for better time management, study skills or examination skills should contact the Academic Success Centre (2-300 Students' Union Building, https://www.ualberta.ca/current-students/academic-success-centre).

RECORDING AND/OR DISTRIBUTION OF COURSE MATERIALS: Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Policy about course outlines can be found in the University Calendar (https://calendar.ualberta.ca/content.php?catoid=28&navoid=6961#Evaluation_Procedures_and_Grading_System).

Disclaimer: Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.