PHYSICS 4211 - ELECTRICITY & MAGNETISM II – FS23

Instructor: Jerry Peacher
109 Physics
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Office Hours: MTWTh 3:45 - 4:30 pm
Generally available at other times or by appointment.

Class meets at 10:00 am, MWF, in room 127 of Physics.

Text: INTRODUCTION TO ELECTRODYNAMICS, FOURTH EDITION,
by David J. Griffiths

Course outline

Ch 5	Magnetostatics
Ch 6	Magnetic Fields in Matter
Ch 7	Electrodynamics
Ch 8	Conservation Laws
Ch 9	Electromagnetic Waves
Ch 10	Potentials and Fields
Ch 11	Radiation
Ch 12	Electrodynamics and Relativity

Course points:

Quizzes	100 points	
Test 1	100 points	Monday, Sept. 25, 2023
Test 2	100 points	Monday, Oct. 30, 2023
Final	100 points	Thursday, Dec. 14, 2023 (7:30 - 9:30 am)
Homework	100 points	
Total	500 points	

Grades: A(450 - 500), B(400 - 450), C(350 - 400), D(300 - 350), F(<300)

Homework is an important part of this course. It will allow you to test yourself to see how well you have absorbed the material. Keeping up with the homework should help you to keep up with the course and do better on the exams. Homework is due by 5:00 p.m. of the due day indicated in the syllabus. Late homework will be penalized at the rate of 10% per day. No homework will be accepted after it is returned to the class.

This course is offered by the UMR Physics Department,
Chaired by Dr. Thomas Vojta (vojtat@mst.edu), 102 Physics, Phone: 341 - 4781
under the auspices of the College of Arts and Sciences,

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DATE	Ch	TOPICS COVERED	PROBLEM ASSIGNMENTS	
M - Aug 21	5	Magnetic field B, Lorentz force Cvclotron and Cycloid motions.		
W - Aug 23	5	Currents I, K, J, Continuity Equation Biot-Savart Law, B_{line}, B_{ring}	Ch 5- 1,2a,3,4,5	H01
F - Aug 25	5	Div B, Curl B, Ampere's Law B(solenoid), B(toroid)	Ch 5- 6,8a,9,10a,13	H02
M - Aug 28	5	Vector potential, A(solenoid), A(wire)		
W - Aug 30	5	Multipole expansion of A, Magnetic dipole moment, B for a magnetic dipole	Ch5-14,16,24,26	H03
F – Sept 01	6	Dipole-Dipole interaction, Paramagnetism, Diamagnetism, Ferromagnetism, Atomic orbits	Ch5-30,34,35,37,41	H04
M - Sept 04		*Labor Day*	*class break*	
W - Sept 06	6	Bound currents, H field, Ampere's Law using H, Boundary conditions	Ch6-1,3b,6,7	H05
F - Sept 08	6	Ampere's Law, D, Maxwell's Eqs. in matter, Boundary conditions	Ch6-12,16,17,23	H06
M - Sept 11	7	Ohm's Law, Motional emf, Faraday's Law, Lenz's Law, Inductance		
W - Sept 13	7	Faraday's Law, Lenz's Law Inductance	Ch 7 - 1,2,3,7,8	H07
F - Sept 15		Lenz's Law, Inductance	Ch 7 - 11,12,13,15	H08
M - Sept 18	7	Inductance (Mutual, Self), Neumann formula		
W - Sept 20	7	Energy in B field, Maxwell's correction to Ampere's Law, Displacement current	Ch 7-16,22,23,24	H09
F - Sept 22	7	Maxwell's Equations in matter Boundary Conditions	Ch 7-28(a&c),29,30	H10
M - Sept 25		**Test 1**		
W - Sept 27	8	Poynting's theorem, Newton's 3rd Law,	Ch 7 – 34,37,40,58	H11
F – Sept 29	8	Momentum Conservation		
M – Oct 02	8	Maxwell stress tensor		
W - Oct 04	8	Maxwell stress tensor	Ch 8 - 1,2,4,5,6,9	H12
F - Oct 06		Fall Break	Fall Break	

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DATE	Ch	TOPICS COVERED	PROBLEM ASSIGNMENTS	
M - Oct 09	9	Wave equation, Sinusoidal waves, Plane waves, Polarization, Time-averaged Energy and Momentum in EM waves		
W - Oct 11	9	EM waves in matter, Index of refraction, Normal Incidence	Ch 9 – 2,3,8,9	H13
F - Oct 13	9	Oblique Incidence, Brewster's angle, Fresnel's Eqns.	Ch 9 –10,11,12	H14
M - Oct 16	9	EM waves in a conductor, Skin depth		
W - Oct 18	9	EM waves in a conductor Reflection, Transmission for a conductor	Ch 9 –13,14,17	H15
F - Oct 20	9	Reflection at a conducting surface, Mirror formula	Ch 9 – 18,19,20	H16
M - Oct 23	9	Skip 9.4, Guided Waves,		
W - Oct 25	9	TE waves in a rectangular wave guide	Ch 9 – 21,22,29	H17
F - Oct 27	10	Potential formulation, Retarded formalism		
M - Oct 30		**Test 2**		
W – Nov 01	10	Lienard-Wiechart potentials, Radiation from an arbitrary distribution	Ch 10 - 1,2,3,4	H18
F - Nov 03	10	E and B fields from a moving charge	Ch 10 – 5,6,12,13	H19
M - Nov 06	11	E and B fields from a moving charge	Ch 10 –20,21	H20
W - Nov 08	11	Electric dipole radiation	Ch 11- 3,6,8,12	H21
F - Nov 10	11	Larmor formula	Ch 11- 14,22,23	H22
M - Nov 13	12	Einstein's postulates, Geometry of Relativity Structure of Spacetime		
W - Nov 15	12	Proper time and velocity	Ch 12 –4,5,7,8	H23
F - Nov 17	12	Relativistic Energy and momentum	Ch 12 –9,10, 13,15	H24
M - Nov 20		*Thanksgiving*	*Class break*	
W - Nov 22		*Thanksgiving*	*Class break*	
F - Nov 24		*Thanksgiving*	*Class break*	
M - Nov 27	12	Relativistic Energy and momentum		
W - Nov 29	12	Relativistic Dynamics	Ch 12 –17,19,20,21	H25
F – Dec 01	12	Relativistic Kinematics	Ch 12 – 24,25,26,27	H26
M - Dec 04	12	Relativistic Electrodynamics	Ch 12 – 29,30,33,34	H27
W - Dec 06	12	Relativistic Electrodynamics	Ch 12 –43,47	H28
F - Dec 08	12	Relativistic Electrodynamics		

Final exam: Thursday, Dec. 14, 2023, from 7:30 to 9:30 am