ECSE 353
Electromagnetic Fields & Waves

www.mcgill.ca/mycourses/

Jon Webb
jon.webb@mcgill.ca
398-7126

ECSE 353 Introduction: 1

What does Electromagnetics have to do with Computers?

1. At high speeds, lumped-component circuit theory is not enough!
2. Computers involve technologies based on EM phenomena, e.g. laser printing, magnetic recording, CD ROMs, LCD displays.
3. Electromagnetic Interference (EMI) is an increasing problem

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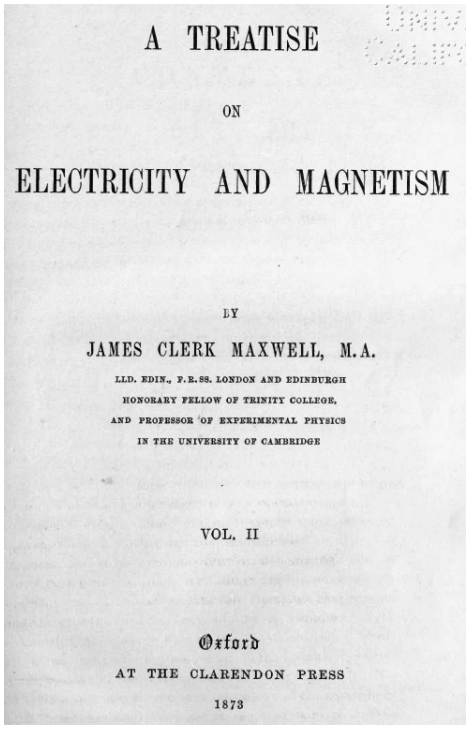


A TREATISE

ON

ELECTRICITY AND MAGNETISM

BY

JAMES CLERK MAXWELL, M.A.

LLD. EDIN., F.R.SS. LONDON AND EDINBURGH
HONORARY FELLOW OF TRINITY COLLEGE,
AND PROFESSOR OF EXPERIMENTAL PHYSICS
IN THE UNIVERSITY OF CAMBRIDGE

VOL. II

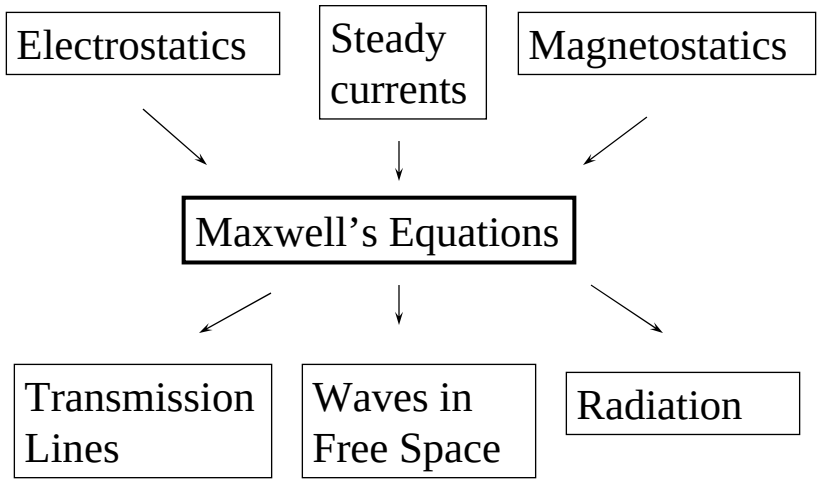
Oxford
AT THE CLARENDON PRESS
1873

$$\nabla \times \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla \cdot \mathbf{B} = 0$$

$$\nabla \cdot \mathbf{D} = \rho$$



Prerequisites

- MATH 264 Advanced Calculus
- ECSE 210 Circuit Analysis (C or better)

Course text

D. K. Cheng, “Field and wave electromagnetics”, Addison-Wesley, second edition, 1989. (On reserve at Schulich Library).

Calculator

The only calculator permitted in exams is the Faculty Standard calculator: CASIO fx-115, CASIO fx-991, CASIO fx-570ms, SHARP EL-520, or SHARP EL-546 ONLY.
(www.mcgill.ca/engineering/student/sao/policies/examinations/calculators/)

Grading Scheme

- 2 class tests, 15% each
- Final exam, 70%

Missed Class Tests (for valid medical reasons)

- One test: 80% final
- Two tests: 100% final

Problem Sets

- These will be taken from the course text
- They will not be marked
- Solutions will be presented in tutorials
- You are *strongly advised* to complete the problem sets and attend tutorials

Lectures

MWF 11:35-12:25 TR1080

Tutorials

Starting week of September 8, 2008.

Times and rooms to be determined.

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Office Hours

You may see me about any aspect of the course at the following times (or by appointment):

M	11:00-11:25	TR4103
W	11:00-11:25	TR4103
F	13:00-13:30	TR4103

(From 2008-09-05 to 2008-12-01 inclusive, except Thanksgiving, Monday, 2008-10-13).

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Academic Integrity

McGILL UNIVERSITY VALUES ACADEMIC INTEGRITY. THEREFORE ALL STUDENTS MUST UNDERSTAND THE MEANING AND CONSEQUENCES OF CHEATING, PLAGIARISM AND OTHER ACADEMIC OFFENCES UNDER THE CODE OF STUDENT CONDUCT AND DISCIPLINARY PROCEDURES

(see www.mcgill.ca/integrity for more information).

Guide to the Timetable Column Headings

Material. Best estimate of approximately what material will be covered in class on that day. Also, please note the dates of the two *class tests*.
Sections. Sections of the class text (D. K. Cheng, "Field and wave electromagnetics") corresponding to the material mentioned in the "Material" column
Probs Covered. Problem numbers from Cheng for which the relevant material will have been covered by that day
Problem Sets. Problem numbers from Cheng, for each of 12 problem sets (except set 9). Each problem set has been placed at a date which is a suggestion for when you might start to work on that set, given the material covered by then and the date of the tutorial which covers the set. See also the "Probs Covered" column.
Tutorials. Generally, each tutorial covers one of the problem sets – the numbers are given. The second tutorial in each week is a repeat of the first; you may attend either.

	2008		Sections		Material	Probs Covered	Problem Sets		Tutorials		
1	Sep 03	Wed			Introduction		1	2-16,18,32,36	None	Sep 03	Wed
2	Sep 05	Fri		Material for first test	Distributed Capacitance					Sep 05	Fri
3	Sep 08	Mon	3.2, 3.4		Postulates of electrostatics, Gauss' Law	3-10,11,12	2	3-10,11,12	1	Sep 08	Mon
4	Sep 10	Wed	3.5.0, 4.2		Potentials	3-13,4-3,4				Sep 10	Wed
5	Sep 12	Fri	3.6		Conductors					Sep 12	Fri
6	Sep 15	Mon	3.7,3.5.1,3.8		Dielectrics	3-22	3	3-13,22,4-3,4	2	Sep 15	Mon
7	Sep 17	Wed	3.9		Boundary conditions	3-25 to 29				Sep 17	Wed
8	Sep 19	Fri	3.10		Capacitance	3-30,32,34				Sep 19	Fri
9	Sep 22	Mon	3.11		Electric energy	3-40	4	3-25 to 29	3	Sep 22	Mon
10	Sep 24	Wed	5.1, 5.2	Material for second test	Current density and Ohm's Law	5-3				Sep 24	Wed
11	Sep 26	Fri	5.3, 5.4		EMF; Equation of Continuity	5-9				Sep 26	Fri
12	Sep 29	Mon	5.5,5.7		Power Dissipation; C & R	5-8	5	3-30,32,34,40	4	Sep 29	Mon
13	Oct 01	Wed	6.1, 6.2		Postulates of magnetostatics, Ampere's Law	6-3,6-6				Oct 01	Wed
14	Oct 03	Fri	6.2, 6.6		Dipoles and magnetization					Oct 03	Fri
15	Oct 06	Mon	6.7, 6.9, 6.10		H; Magnetic materials; Boundary conditions	6-21,22, 32	6	5-3,9,8,6-3,6	5	Oct 06	Mon
16	Oct 08	Wed	7.2.0, 7.2.1		Faraday's Law	7-2,5				Oct 08	Wed
17	Oct 10	Fri			**First Test. Problem Sets 2-5.**					Oct 10	Fri
	Oct 13	Mon			**Thanksgiving**				6	Oct 13	Mon
18	Oct 15	Wed	6.11		Inductance	6-36,37,38	7	6-22,32,7-2,5		Oct 15	Wed
19	Oct 17	Fri	6.12		Magnetic Energy	6-41				Oct 17	Fri
20	Oct 20	Mon	7.3,7.5		Maxwell's Equations				7	Oct 20	Mon
21	Oct 22	Wed	9.3		Transmission Line Equations		8	6-36,37,38,41		Oct 22	Wed
22	Oct 24	Fri	9.3		Transmission Line Equations	9-10				Oct 24	Fri
23	Oct 27	Mon	9.4.0		Sinusoidal Waves on Transmission Lines				8	Oct 27	Mon
24	Oct 29	Wed	9.4.4		Sinusoidal Waves on Transmission Lines	9-18				Oct 29	Wed
25	Oct 31	Fri	9.4.2		Sinusoidal Waves on Transmission Lines	9-30				Oct 31	Fri
26	Nov 03	Mon			**Second Test. Problem Sets 6-8.**					Nov 03	Mon
27	Nov 05	Wed			Scattering parameters		9	ProblemSet_09.pdf	None	Nov 05	Wed
28	Nov 07	Fri			Scattering parameters					Nov 07	Fri
29	Nov 10	Mon	9.5.0, 9.5.1		Transients on Transmission Lines				9	Nov 10	Mon
30	Nov 12	Wed	9.5.1, 9.5.2		Transients on Transmission Lines	9-33,34,35,36	10	9-33,34,35,36		Nov 12	Wed
31	Nov 14	Fri	7.7,8.2.0		Plane Waves in Free Space					Nov 14	Fri
32	Nov 17	Mon	8.2.3		Polarization				10	Nov 17	Mon
33	Nov 19	Wed	8.3.2		Waves in good conductors	8-6,7	11	8-6,7,16,21,26		Nov 19	Wed
34	Nov 21	Fri	8.5		Flow of Electromagnetic Power	8-16				Nov 21	Fri
35	Nov 24	Mon	8.8		Normal Incidence at Plane Dielectric Boundary	8-21,26			11	Nov 24	Mon
36	Nov 26	Wed	11.1		Potentials					Nov 26	Wed
37	Nov 28	Fri	11.2		Radiation from Elemental Dipole	11-2, 4	12	11-2,5,6,11		Nov 28	Fri
38	Dec 01	Mon	11.3		Antenna Patterns and Antenna Parameters				12	Dec 01	Mon
39	Dec 02	**TUE**								Dec 02	**TUE**