Electromagnetism course descriptions
Aims and Objectives

• To understand the importance of Electromagnetism and its place in Physics
• To develop an understanding of the production and interaction of electric and magnetic fields in a vacuum
• To develop a basic understanding of Maxwell’s equations in preparation for the second year course
Aims and Objectives

Five branches of Physics that are the building blocks of the subject that every physicist must know:

1. Classical Mechanics
2. Special Relativity
3. Electromagnetism
4. Quantum Mechanics
5. Thermodynamics

listed roughly in the order that it is necessary to learn them in.
Aims and Objectives

Much of the first two years of the IC Physics degree is devoted to making sure you have a firm grounding in these five areas.

This is the first of two core EM courses; several other core and optional courses will enhance understanding
Assumed Prior Knowledge

• All your A level maths and term 1 maths. Plus vector calculus but we’ll tread carefully
• Though this course will go from the ground up, it is assumed a certain basic knowledge of high school physics is maintained and all first term knowledge should be assumed
You’re from a broad range of backgrounds and have covered a wide range of high school level syllabuses. Some of you will know a lot more EM than others. This course will start from the beginning and become quite advanced by the end. **All students will find some** of the course to be revision. **No student will find the whole** of the course to be revision. **All students’ understanding of familiar concepts will be enhanced by the course.**
Syllabus

Section 1: Electric charge
Section 2: Electric fields
Section 3: Gauss’s law
Section 4: Electrostatic energy
Section 5: Capacitance
Syllabus

Section 6: Current and Ohm’s law
Section 7: Static magnetic fields
Section 8: Time varying magnetic fields
Section 9: Maxwell’s equations
Problem sheet

**Problem sheets:** At the end of each section. Not assessed.
Designed to assist with your knowledge and understanding of the course, to be completed in your own time and possibly in Academic Tutorials. Solutions posted on Blackboard a few days after section completion.
It is entirely up to you when you choose to use the solutions and how you use them.
Assessed problems

**Assessed problems:** Most weeks during the term
Given out on Fridays (also uploaded onto Blackboard)
2/3rds are MCQs
1/3rd are longer questions that you get marked feedback on
Discussion problems

Tutorial discussion problems: These are pieces of non-assessed taught exercises that the tutor may cover. They are designed to enhance your learning of the subject and may well investigate areas that aren’t directly from the lecture notes. They do however form part of the syllabus. Full worked solutions will be put on Blackboard at the end of a tutorial week.
The exam

**June Exam:** The majority of the summative assessment for the course comes from the Electricity, Magnetism and Relativity exam towards the end of the 3\textsuperscript{rd} term.
Recommended Texts

Essential

Sears and Zemansky’s University Physics with Modern Physics, 12th Edition (2008), Young and Freedman (9780321501301) – the recommended text for all first year undergraduates. All students should have access to a copy.

Doesn’t properly use vector calculus though
Recommended Texts

Also useful
Introduction to Electrodynamics (Griffiths)

Feynman lectures volume 2 (first half)

Electricity and Magnetism (Purcell and Morin)

Electromagnetic Fields and Waves (Lorrain and Corson)