

Exam syllabus for TFY4240, spring 2017

The following exam syllabus is “anchored” in Griffiths’ textbook. Chapter numbers refer to the Pearson New International Edition of the 4th edition, as this may be the most common version available. “Lecture notes” refer to the notes by Ingve Simonsen. I have commented explicitly on those exam-relevant topics/approaches that are not covered in Griffiths, or are not covered in sufficient detail there. If anything is unclear, please do not hesitate to contact me.

Chapter 1: Vector analysis

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This is mathematical “background” material. In general, you should know this material at the level that it has been used in the course, both in lectures and tutorials. You should also know about the Levi-Civita tensor and how to use it in calculations. This topic is not covered in Griffiths, but it is discussed in my notes named “Vector analysis” (available as a pdf file in the lecture log, see the “Other” column for Wednesday January 11) and also in the lecture notes, Ch. 1.

Chapter 2: Electrostatics

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Everything is relevant, except:

- Sec. 4: Work and energy in electrostatics
- Sec. 5.4: Capacitors

Also, in Sec. 5.3 you are only expected to know the first paragraph (Eqs. (48) and (49)).

Chapter 3: Potentials

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Everything is relevant, except:

- Sec. 1.2-1.4 (this can be “nice to know” as general background, but you would not get any direct questions about it)
- Sec. 1.6: Conductors and the second uniqueness theorem
- Sec. 2.3: Force and energy

Chapter 4: Electric fields in matter

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Everything is relevant, except:

- Sec. 1.3: Alignment of polar molecules
- Sec. 4.3: Energy in dielectric systems
- Sec. 4.4: Forces on dielectrics

Chapter 5: Magnetostatics

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Everything is relevant.

Chapter 6: Magnetic fields in matter

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Everything is relevant, except:

- Sec. 1.2: Torques and forces on magnetic dipoles
- Sec. 1.3: Effect of a magnetic field on atomic orbits

Concerning Sec. 4.2 on ferromagnetism, you will not get any questions about domains or hysteresis loops.

Chapter 7: Electrodynamics

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Everything is relevant, except:

- Sec. 2.4: Energy in magnetic fields
- Sec. 3.4: Magnetic charge

Chapter 8: Conservation laws

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Everything is relevant, except:

- Sec. 2.4: Angular momentum
- Sec. 3: Magnetic forces do no work

Conservation of angular momentum was also discussed in lectures with a different emphasis from Griffiths, but this material is also NOT exam-relevant.

The example “Maxwell stress tensor for two charged cylinders” (available as a pdf file in the lecture log, see the “Other” column for Wednesday March 1) is exam-relevant.

In the lectures we discussed tensors at a more advanced level than Griffiths. This material is covered in the lecture notes (Ch. 8, pp. 7-15) and is exam-relevant.

Chapter 9: Electromagnetic waves

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Everything is relevant, except the following sections:

- Sec. 1.4: Boundary conditions: reflections and transmission
- Sec. 4.2: Reflection at a conducting surface
- Sec. 5.3: The coaxial transmission line

In Sec. 1.1, the material about waves on a stretched string (starting on the middle of p. 388 and ending with eq. (3)) is not exam-relevant.

Chapters 10-12: Please note that in the Pearson New International Edition of the 4th edition, “Radiation” appears as Chapter 10, “Electrodynamics and relativity” as Chapter 11, and “Potentials and fields” as Chapter 12. From a pedagogical point of view, this order makes no sense at all, considering that both the “Radiation” and “Electrodynamics and relativity” chapters make use of results derived in the “Potentials and fields” chapter. The logical order is therefore

Potentials and fields - Radiation - Electrodynamics and relativity, so below I list the chapters in that order. Also note that in the lecture log on the course website, I have used the chapter numbering of the 3rd edition, which follows the logical order, i.e. 10. Potentials and fields, 11. Radiation, 12. Electrodynamics and relativity.

Chapter 12: Potentials and fields

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Everything is relevant, except:

- Sec. 1.4: Lorentz force law in potential form

In the lectures, we used the Green function method to find the retarded potentials. This method is not covered in Griffiths, but it is covered in the lecture notes (Ch. 10 and the two notes about Green functions) and is exam-relevant.

Chapter 10: Radiation

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Everything is relevant, except:

- Sec. 2.2: Radiation reaction
- Sec. 2.3: The mechanism responsible for the radiation reaction

However, in Sec. 1.4: Radiation from an arbitrary source, only the main conclusion, that the leading contribution is the electric dipole term, is exam-relevant. The derivation of this result is therefore not relevant.

Chapter 11: Electrodynamics and relativity

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This material is NOT exam-relevant.

Tutorials (1-12):

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All tutorial problems and their solutions are exam-relevant.