
Lecture 1. 08/21/12 (Tue) Week 1
Structure of the EE-271 course. Main concepts of electromagnetism. Electromagnetic field as a form of matter. Fundamental (universal) constants \( \varepsilon_0 \), \( \mu_0 \), and \( c \) as characteristics of space. Scalar and vector fields. Lines of force (streamlines). Coordinate systems.

Lecture 2. 08/22/12 (Wed) Week 1
Force (vector) characteristics of electric field (E, D), magnetic field (H, B), and electromagnetic field. Lorentz force. Superposition principle. Equation for streamlines.

Lecture 3. 08/23/12 (Thu) Week 1

Lecture 4. 08/28/12 (Tue) Week 2
Introduction to Maxwell’s equations (in integral form). Review of the main phenomena and experiment-based laws of electromagnetism: Coulomb’s law, Gauss’s law, charge conservation law an continuity of current, differential form of Ohm’s law.

Lecture 5. 08/29/12 (Wed) Week 2
Review of the main phenomena and experiment-based laws of electromagnetism (continuation): Bio-Savart’s law, law of continuity of magnetic force lines, Ampere’s circuital law, Faraday’s electromagnetic induction law, and Maxwell’s displacement current.

Lecture 6. 08/30/12 (Wed) Week 2
Lecture 7. 09/04/12 (Tue) Week 3

Lecture 8. 09/05/12 (Wed) Week 3

Lecture 9. 09/06/12 (Thu) Week 3

Lecture 10. 09/11/12 (Tue) Week 4

Lecture 11. 09/12/12 (Wed) Week 4
Quiz. Electromagnetic properties of materials.

Lecture 12. 09/13/12 (Thu) Week 4

Lecture 13. 09/18/12 (Tue) Week 5
Experimental Demonstrations at EMC Lab (HyPoint) – ½ of class

Lecture 14. 09/19/12 (Wed) Week 5
Individual work on the class project.

Lecture 15. 09/20/12 (Thu) Week 5
Experimental Demonstrations at EMC Lab (HyPoint) – ½ of class

Part 2. Static electric field: main concepts, definitions, and laws.

Lecture 16. 09/25/12 (Tue) Week 6
Static fields. Main equations for electrostatic field. Charge distributions. Superposition principle in electrostatics – for electric field and potential. Image principle in electrostatics.
Lecture 17. 09/26/12 (Wed) Week 6
Electric displacement, or electric flux vector $\vec{D}$. Gauss’s Law. Gaussian surfaces. Application of Gauss’s law.

Lecture 18. 09/27/12 (Thu) Week 6
Potential in electrostatic field. Poisson’s and Laplace’s equations for electrostatic potential. Superposition principle for electrostatic potential. Particular cases for calculating potentials.

Lecture 19. 10/02/12 (Tue) Week 7
Problem-solving practicum.

Lecture 20. 10/03/12 (Wed) Week 7

Lecture 21. 10/04/12 (Thu) Week 7
Problem-solving practicum.

Lecture 22. 10/09/12 (Tue) Week 8
Dielectrics in electrostatic field. Boundary conditions in electrostatics. Boundary “free space – perfect electric conductor”. Boundary between two dielectrics.

Lecture 23. 10/10/12 (Wed) Week 8
Problem-solving practicum

Lecture 24. 10/11/12 (Thu) Week 8
TEST # 1. “Electrostatics”.

  Part 3. Steady electric current. Static magnetic field: main concepts, definitions, and laws.

Lecture 25. 10/16/12 (Tue) Week 9

Lecture 26. 10/17/12 (Wed) Week 9
Lecture 27. 10/18/12 (Thu) Week 9

Lecture 28. 10/23/12 (Tue) Week 10
Ampere’s circuital law (ACL). Practical application of ACL. Work in the magnetic field.

Lecture 29. 10/24/12 (Wed) Week 10
Magnetic circuits.

Lecture 30. 10/25/12 (Thu) Week 10

Lecture 31. 10/30/12 (Tue) Week 11

Lecture 32. 10/31/12 (Wed) Week 11
Problem-solving practicum

Lecture 33. 11/01/12 (Thu) Week 11
TEST # 2. “Magnetic field”.

Part 4. Electrodynamics: main concepts, definitions, and laws.

Lecture 34. 11/06/12 (Tue) Week 12

Lecture 35. 11/07/12 (Wed) Week 12

Lecture 36. 11/08/12 (Thu) Week 12
Types of electromagnetic waves. Uniform plane electromagnetic wave with linear polarization. Characteristics of plane electromagnetic waves for some practical cases.

Lecture 37. 11/13/12 (Tue) Week 13
Plane electromagnetic wave incidence on the boundary of two media.

Lecture 38. 11/14/12 (Wed) Week 13
Problem-solving practicum.
Lecture 39. 11/15/12 (Thu) Week 13
TEST#3. “Time-varying electromagnetic field and Maxwell’s equations”.

Week 14 – Thanksgiving break

Part 5. Electromagnetic waves in transmission lines.

Lecture 40. 11/27/12 (Tue) Week 15
Circuit models of transmission lines. The telegrapher’s equations. Wave solutions in a lossless transmission line in time domain and in frequency domain.

Lecture 41. 11/28/12 (Wed) Week 15

Lecture 42. 11/29/12 (Thu) Week 15
Primary and secondary parameters of the transmission lines. Power flow and loss on a transmission line.

Lecture 43. 12/04/12 (Tue) Week 16
Transforming properties of transmission line sections. Smith Chart.

Lecture 44. 12/05/12 (Wed) Week 16
Terminated transmission line. Transmission lines with open- and short-circuited terminations. Transmission lines with resistive and reactive terminations.

Lecture 45. 12/06/12 (Thu) Week 16
Review. Problem-solving practicum.

FINAL TEST (Test #4). – The week of 12/10/12 – 12/14/12

TEXTBOOK (MANDATORY)


OTHER BOOKS (OPTIONAL)

Fawwaz T. Ulaby, “Electromagnetics for Engineers”, Pearson Prentice Hall, 2005
