Minnesota State University Moorhead

PHYS 370: Electromagnetic Theory

A. COURSE DESCRIPTION

Credits: 4

Lecture Hours/Week: 4

Lab Hours/Week: 0

OJT Hours/Week: *.*

Prerequisites: None

Corequisites: None

MnTC Goals: None

Advanced study of electromagnetism including algebra and calculus of vectors, electrostatics in a vacuum and in dielectric materials, magnetostatics in nonmagnetic and magnetic materials, Maxwell's Equations and electromagnetic waves.

B. COURSE EFFECTIVE DATES: 06/01/1995 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Review of Vector Analysis and Vector Calculus
2. Electrostatics
3. The Electric Potential and Work
4. Conductors
5. Special Techniques including Boundary Value Problems via Separation of Variables
6. Electric Fields in Matter
7. Polarization and Electric Displacement
8. Magnetostatics
9. The Vector Potential in Magnetism
10. Magnetic Fields in Matter
11. Electrodynamics
12. Maxwell's Equations
13. Electromagnetic Waves

D. LEARNING OUTCOMES (General)

1. Apply the mathematical techniques from vector and differential calculus to electromagnetic problems.
2. Understand not only the mathematical rules but the physical concepts behind the vector field, the divergence and curl of a vector field, and the delta function.
3. Understand mathematical techniques for solving various classes of electrostatics and magnetostatics problems.
4. Explain the origin of electric fields in relation to electric charges.
5. Relate the electric field to the electric potential and the work done by the motion of electric charges in that potential.
6. Describe the relationship between moving electric charges and magnetic fields and how they interact.
7. Develop the skills of a physicist: checking units, limiting cases, developing conceptual and mathematical skills.

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

   None

F. LEARNER OUTCOMES ASSESSMENT

   As noted on course syllabus

G. SPECIAL INFORMATION

   None noted