Electromagnetism 1

KONDO, Naoki

1. Course Description
Students will learn the followings in this course,
(1) The idea and mathematical expression of the sources and fields
(2) How to calculate electromagnetic quantities in fields and circuits.

2. Course Objectives
The goal of this course is to acquire knowledge and skills so as to be able to correctly calculate electromagnetic quantities in electromagnetic fields and circuits.

3. Grading Policy
You will be graded by your quiz results and submitted reports (total 50%) and final examination marks (50%). Quiz results and reports are returned within 2 weeks after submission.

4. Textbook and Reference
Textbook
Textbook is "Basics of Electromaginetism" by WADA Sumio (Japanese).
Supplementary English materials will be provided if necessary.

5. Requirements(Assignments)
Read the corresponding part of the text carefully and solve the example problems (˜3 hours).

6. Note
None.

7. Schedule
[1]   Electricity basics 1 (Current and battery, power consumption)
[2]   Electricity basics 2 (Ohm's law, Joule heat, units for electromagnetism)
[3]   Electric field and potential 1 (Coulomb's law, electric field and field lines, field examples)
[4]   Electric field and potential 2 (Gauss' laws and their applications)
[5]   Electric field and potential 3 (Electic energy and potential, electric field and potential of parallel plate electrodes)
[6]   Electric field and potential 4 (Force and stored energy in capacitors, conductors and electrostatic induction)
[7]   Direct current circuit 1 (Electric field in conductor and ohm's law, circuit basics)
[8]   Direct current circuit 2 (Direct/parallel connection, connection of sources)
[9]   Direct current circuit 3 (Kirchhoff's law and its applications)
[10]   Direct current circuit 4 (Capacitors)
[11]   Basics of magnetic phenomena 1 (Magnetic force and field, laws of magnetic phenomena)
[12]   Basics of magnetic phenomena 2 (Current model of magnets, strengths of magnetic field and force)
[13]   Basics of magnetic phenomena 3 (Ampere's law and its applications)
[14]   Basics of magnetic phenomena 4 (Lorentz force, electricity generation by mangetic force)
[15]   Basics of magnetic phenomena 5 (Power generators and motors)