THE UNIVERSITY OF ADELAIDE AUSTRALIA

Course Profile

ELEC ENG 2009 ENGINEERING ELECTROMAGNETICS

Note that this document includes some italicised explanatory text; this will not form part of a completed Course Profile, and is included here to demonstrate the content that could be captured in each section. This italicised text should be deleted before the completed Course Profile is released to students.

1. GENERAL COURSE INFORMATION

1.1 COURSE DETAILS

Course: Engineering Electromagnetics 2009
Coordinating Unit: School of Electrical & Electronic Engineering, Faculty of Engineering, Computer & Mathematical Sciences

Teaching Period: Semester2 Year: 2010 Mode: Internal
Level: Undergraduate
Location/s: North Terrace
Units: 3
Contact: Up to 3 hours per week

Prerequisites: Not applicable
Corequisites: ELEC ENG 2008
Incompatible: Not applicable
Assumed Knowledge: ELEC ENG1010, APP MTH 2201, PHYSICS 1100/1200
Restrictions: Available to BE(Avionics &El systems), BE(Computer Sys), BE(El &El), BE(Telecom), BE(Sustainable Energy – Electrical) & associated double degree students only
Quota: Not applicable

Course Description:

This course provides an introduction to electromagnetics. Topics include:

Static Fields

- Electrostatics: Coulomb's law, Electric scalar potential, Gauss' law, Conductors, Dielectrics, Capacitance, Energy, forces, pressure, and Applications of electrostatics.
- Magnetostatics: Magnetic field in a vacuum and in materials.

Slowly Time-Varying Fields and Applications

- Time Varying Electromagnetic Fields: Electromagnetic induction, Faraday's law, Inductance, Energy, forces and Magnetic circuits.
- Machines and Transformers: DC generator, DC motor, 3-phase induction motor.

Maxwell's Equations, Electromagnetic Waves and Applications

- Maxwell's Equations: Maxwell's equations, Retarded Potentials and The skin effect.
- Electromagnetic Waves: Uniform plane waves, Reflection and Refraction.
- Antennas: Transmitting and receiving antennas, Electric dipole antenna, Antenna directivity, Friss transmission formula and Antenna types.

1.2 COURSE STAFF

Course Co-ordinator & lecturer: Dr Behnam Jamali
Email: bjamali@eleceng.adelaide.edu.au
Office: N234
Phone: 8303 4119
Administrative Enquiries: N107, Office of the School of Electrical & Electronic Engineering

1.3 COURSE TIMETABLE

Lectures:

- Thursdays, 2-5pm, Benham Lecture Theatre, G10

Tutorials:

- Wednesday, 12-1pm, Engineering & Mathematics, EM205, Tutorial Room

Practicals:

- Tuesday 10-12am Engineering Nth, N221, Electronics Lab

Students are required to attend the listed Practical classes only.

The full timetable of all activities for this course can be accessed from the Course Planner at http://access.adelaide.edu.au/courses/search.asp?year=2010

2. LEARNING OBJECTIVES

2.1 COURSE LEARNING OBJECTIVES

1. Understand Static Electric and Magnetic Fields.
2. Use Coulomb's law to solve electrostatic problems.
3. Use Gauss' law to calculate electric field density and intensity.
4. Explain Electric scalar potential.
5. Understand properties of Conductors and dielectrics.
6. Explain and calculate capacitance and self inductance of different structures.
7. Calculate energy, forces and pressure as result of static electric and magnetic fields.
8. Apply principles learned to practical applications of electrostatics.
9. Explain differences in magnetic field in a vacuum and Magnetic fields in materials.
10. Study Quasi-Static Slowly Time-Varying Fields and Applications.
11. Sketch time varying Electromagnetic Fields.
12. Explain Electromagnetic induction.

13. Use Faraday's law to solve Magnetic circuits.
14. Explain and understand self Inductance.
15. Calculate Energy and forces of Magnetic circuits.
16. Apply the first principles to solve magnetic circuits for Machines and Transformers.
17. Understand DC generator, DC motor, 3-phase induction motor.
18. Solve Maxwell's Equations of Electromagnetic.
19. Know how to derive Waves equations.
20. Explain how to calculate electromagnetic problems of real life applications.
21. Understand Retarded Potentials.
22. Know the reason and effects of the skin effect.
23. Sketch and calculate waves equations for Uniform plane waves.
24. Calculate Reflection and Refraction factors.
25. Understand the theoretical principles of simple antennas structures.
26. Know how the measure and be able to use the terminologies such as Antenna directivity, efficiency and gain.
27. Understand and use reciprocity theorem.
28. Calculate the relation between the Transmitting and receiving power using Friss transmission formula.
29. Use Matlab software to simulate electric and magnetic circuits.

This course explores electromagnetic phenomena in modern applications, including wireless communications, circuits, components, microwave communications and radar, antennas, motors, and power generation and transmission. Fundamentals covered include: electrostatic and magnetostatic; quasistatic and dynamic solutions to Maxwell's equations; waves, radiation, and reflection and refraction; directivity, gain and efficiency of antennas; forces, power, and energy of magnetic circuits.

2.2 UNIVERSITY GRADUATE ATTRIBUTE(S)

{The table below must be completed by areas so that each learning objective is mapped to the appropriate university-level Graduate Attributes. It is not necessary to address every attribute in every course – delete those attributes that do not apply}

This course will provide students with an opportunity to develop the Graduate Attribute(s) specified below:

UNIVERSITY GRADUATE ATTRIBUTE	COURSE LEARNING OBJECTIVE(S)
Knowledge and understanding of the content and techniques of a chosen discipline at advanced levels that are internationally recognised.	All
The ability to locate, analyse, evaluate and synthesise information from a wide variety of sources in a planned and timely manner.	5, 13, 21-25, 33-35
An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems.	5-6, 12-13, 20-25, 31-35
Skills of a high order in interpersonal understanding, teamwork and communication.	

A proficiency in the appropriate use of contemporary technologies.	36
A commitment to continuous learning and the capacity to maintain intellectual curiosity throughout life.	5, 12-13, 20-23, 25, 33-35
An awareness of ethical, social and cultural issues within a global context and their importance in the exercise of professional skills and responsibilities.	

3. LEARNING RESOURCES

3.1 REQUIRED RESOURCES

1. Popovic and Popovic “Introductory Electromagnetics”, Prentice Hall, 2000

3.2 RECOMMENDED RESOURCES

The following textbook is recommended only:

1. Sadiku, "Elements of Electromagnetics", Saunders College Publishing, Second Edition

3.3 ONLINE LEARNING

This course uses MyUni exclusively for providing resources, such as lecture notes, assignment papers, sample solutions, discussion boards, ... etc. It is strongly recommended that the students make intensive use of these resources for this course. Link to MyUni login page: https://myuni.adelaide.edu.au/webapps/login/

4. TEACHING & LEARNING ACTIVITIES

4.1 TEACHING & LEARNING MODES

This course relies on lectures as the primary delivery mechanism for the material. Tutorials supplement the lectures by providing exercises and example problems to enhance the understanding obtained through lectures. Practicals are used to provide hands-on experience for students to reinforce the theoretical concepts encountered in lectures. Continuous assessment activities provide the formative assessment opportunities for students to gauge their progress and understanding.

4.2 WORKLOAD

The information below is provided as a guide to assist students in engaging appropriately with the course requirements.

Activity		Contact Hours	Workload Hours
Practical	2 sessions	6	18
Lectures	24 lectures	24	72

Tutorials	6 tutorials	6	24
Continuous Assessments	3 tests	3	12
TOTAL		39	126

Note: Workload Hours include Contact Hours in addition to private study time requirements.

4.3 LEARNING ACTIVITIES SUMMARY

Activity	Sessions	Title
Lectures	1-4	Electrostatics
	5-6	Magnetostatics
	7	Test 1 Revision
	8-11	Electromagnetic
	12	Test 2 Revision
	13-16	Maxwell's Equations & EM Waves
	17-22	Antennas & Practical Applications
	23	Test 3 Revision
	24	Exam Revision
Tutorial	1-2	Electrostatics, Magnetostatics
	3-4	Electromagnetic
	5-6	EM Waves & Antennas
Practical	1 & 2	Antennas

scheduled learning activities for this course e.g. title of each lecture/theme of group of lectures

4.4 SPECIFIC COURSE REQUIREMENTS

Students are required to have access to Matlab software. This is available at various facilities such as the CATS suite or the undergraduate computer labs of the School of Electrical & Electronic Engineering. It is the individual student's responsibility to ensure his or her access to these facilities at appropriate times is available.

5. ASSESSMENT

The University's policy on Assessment for Coursework Programs is based on the following five principles: 1) assessment must encourage and reinforce learning; 2) assessment must measure achievement of the stated learning objectives; 3) assessment must enable robust and fair judgements about student performance; 4) assessment practices must be fair and equitable to students and give them the opportunity to demonstrate what they have learned; and 5) assessment must maintain academic standards (see: http://www.adelaide.edu.au/policies/700/)

5.1 ASSESSMENT SUMMARY

Assessment activity	Type	Weighting	Due date	Learning objective addressed
Tutorials	Formative	5%	Weeks 2, 4, 6, 8, 10, 12	All
Tests	Summative	15%	Weeks 7,12 & 23	All
Exam	Summative	70%	End of semester	All

Practical	Formative	10%	TBA	All

Please note that the Examination and Tests are worth a total of 85%: There will be 3 tests each worth 5%. Your test marks could count up to 15% of your final grade.

The overall grade for the exam, tests and tutorials will be scaled down to 90% and then combined with your practical mark worth 10% to obtain a mark out of 100%.

5.2 REQUIREMENTS

The examination and the tests are prescribed summative assessment components and students must sit at least two of the three tests. Further, students must achieve a mark of at least 40% in the final examination, otherwise the maximum final mark that will be awarded is 44 (Fail).

In addition, if students fail to complete the major part of any of the listed assessment components their assessment will be deemed to be incomplete and they will be assigned a final mark of no more than 44F.

5.3 ASSESSMENT DETAIL

The tutorial papers require students to submit written responses to selected sets of problems. The submissions may contain any of the following: written answers, mathematical derivations, sketches, graphs and print-outs from appropriate software packages. There will be 8 separate tutorials, each will be awarded a mark on a 0-5 scale based on effort. Assessment of the tutorials will occur in the Tutorial classes.

There are three 50 minute closed book tests in the course. The tests will require students to submit short written responses to a set of questions under examination conditions. Each test will be worth up to 15% to the overall assessment.

The practical needs to be conducted during the designated laboratory sessions as listed in Section 1.3 Course Timetable. Students will be required to submit a written report to the practical work, which is assessed. The sole practical report will be worth 10% of the overall assessment.

5.4 SUBMISSION

All written submissions to formative assessment activities (tutorials) will be submitted in the tutorial classes. No late submissions are accepted for the formative assessment activities.

5.5 COURSE GRADING

Grades for your performance in this course will be awarded in accordance with the following scheme: MS6

MS6

Grade	Mark	Description
HD	85-100	High Distinction
D	75-84	Distinction
C	65-74	Credit
P	50-64	Pass
CP	45-49	Conceded Pass

F	0-44	Fail

Further details of the grades/results can be obtained from:
http://www.adelaide.edu.au/student/exams/results.html

Grade Descriptors are available which provide a general guide to the standard of work that is expected at each grade level (see: http://www.adelaide.edu.au/policies/700/)

Final results for this course will be made available through Access Adelaide (https://access.adelaide.edu.au/sa/login.asp)

6. STUDENT FEEDBACK

The University places a high priority on approaches to learning and teaching that enhance the student experience. Feedback is sought from students in a variety of ways including on-going engagement with staff, the use of online discussion boards and the use of Student Experience of Learning and Teaching (SELT) surveys as well as CEQ surveys and Program reviews.

SELTs are an important source of information to inform individual teaching practice, decisions about teaching duties, and course and program curriculum design. They enable the University to assess how effectively its learning environments and teaching practices facilitate student engagement and learning outcomes. Under the current SELT Policy (http://www.adelaide.edu.au/policies/101/), course SELTs are mandated and must be conducted at least once every 2 years. Feedback on issues raised through course SELT surveys is made available to enrolled students through various resources (e.g. MyUni). In addition aggregated course SELT data can be found at: http://www.adelaide.edu.au/clpd/selt/aggregates

7. STUDENT SUPPORT

Academic Support	Maths, writing and speaking skills	http://www.adelaide.edu.au/clpd/students
Counselling Service	Personal counselling for issues affecting study	http://www.adelaide.edu.au/counselling_centre
International Student Care	Ongoing support	http://www.international.adelaide.edu.au/support/isc
Student Care	Advocacy, confidential counselling, welfare support and advice	http://www.auu.org.au/site/page.cfm?u=69
Students with a Disability	Alternative academic arrangements	http://www.adelaide.edu.au/disability

	Alternative Examination Arrangements Policy	http://www.adelaide.edu.au/policies/63
	Reasonable Adjustments to Teaching & Assessment for Students with a Disability Policy	http://www.adelaide.edu.au/policies/64

8. POLICIES & GUIDELINES

This section contains links to relevant assessment-related policies and guidelines. All University Policies can be obtained from: http://www.adelaide.edu.au/policies

Assessment for Coursework Programs	http://www.adelaide.edu.au/policies/700
Cheating in Examinations and Related Forms of Assessment	http://www.adelaide.edu.au/policies/1963
Copyright	http://www.adelaide.edu.au/policies/2643
Examinations	http://www.adelaide.edu.au/policies/465
Plagiarism	http://www.adelaide.edu.au/policies/230
Student Grievance Resolution Process	http://www.adelaide.edu.au/student/grievance/
Unsatisfactory Academic Progress by Coursework Students	http://www.adelaide.edu.au/policies/1803