MONASH University

ECE4053

Electrical Energy-Generation and Supply

Unit Guide - on campus

Second Semester, 2007

Faculty of Engineering

ECE4053 Electrical Energy-Generation and Supply

Unit Guide – on campus

*Second Semester, **2007***

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Unit Outline

Unit synopsis

This unit aims to develop an understanding of the structure and operation of electrical power systems using different resources, and considering their environmental impacts. It covers current and future energy scenarios for the world and Australia. This requires an understanding of the basic concepts and modelling of electrical power systems, including techniques for power flow and fault analysis, control of voltage, frequency, harmonic distortion, and system stability. Methods are presented to identify and clear faults, maximise power system economy and estimate the capital cost as well as unit price of electricity ($/kWh) using various energy conversion technologies.

Engineers Australia generic attributes

The Engineers Australia Policy on Accreditation of Professional Engineering Programs – requires that all programs ensure that their engineering graduates develop to a substantial degree the generic attributes listed below. Listed below are the activities in this unit that will help you to achieve these attributes.

Note: that not all graduate attributes are relevant to each unit.

Generic Attribute	Activities used in this Unit to Develop Generic Attributes
a) ability to apply knowledge of basic science and engineering fundamentals;	Solution of tutorial exercises, execution of laboratory and simulation tasks.
b) ability to communicate effectively, not only with engineers but also with the community at large;	
c) in-depth technical competence in at least one engineering discipline;	Lecture attendance and reading the recommended texts. Tutorial participation. Laboratory and Simulation tasks.
d) ability to undertake problem identification, formulation and solution;	Solution of tutorial exercises, execution of laboratory and simulation tasks (e.g. operation of a model power system).
e) ability to utilise a systems approach to design and operational performance;	Simulation tasks (e.g. load flow) which illustrate the operation of a power system as a whole.
f) ability to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member;	
g) understanding of the social, cultural,	Lecture attendance and tutorial

global and environmental responsibilities of the professional engineer, and the need for sustainable development;	participation (e.g. Content covering Australian energy production, future energy scenarios, etc.).
h) understanding of the principles of sustainable design and development;	Lecture attendance and tutorial participation (e.g. Content covering Australian energy production, future energy scenarios, etc.).
i) understanding of professional and ethical responsibilities and commitment to them; and	
j) expectation of the need to undertake lifelong learning, and capacity to do so.	

Workload

Lectures	3 hours
Laboratory	2 hours
Tutorial	1 hours
Private study	6 hours (consisting of individual and group assignment work, lecture revision, and additional researching and reading)
Total per week	12 hours

All laboratory classes are compulsory, even for repeating students.

Unit relationships

Prerequisites	
Corequisites	ECE3051 or ECE3502
Prohibitions	ECE4503, ECE4507, ECE5507, ECE5053, ECE5503

Continuous improvement

Monash is committed to ‘Excellence in education’ and strives for the highest possible quality in teaching and learning. To monitor how successful we are in providing quality teaching and learning Monash regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through Unit Evaluation Surveys. It is Monash policy for every unit offered to be evaluated each year. Students are strongly encouraged to complete the surveys as they are an important avenue for students to “have their say”. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

Faculties have the option of administering the Unit Evaluation survey online through the my.monash portal or in class. Lecturers will inform students of the method being used for this unit towards the end of the semester.

Previous Student Evaluations of this unit
If you wish to view how previous students rated this unit, please go to http://www.monash.edu.au/unit-evaluation-reports/

Over the past few years the Faculty of Engineering has made a number of improvements to its units as a result of unit evaluation feedback. Some of these benefits include tutor/demonstrator training, improved objectives and better feedback mechanisms.

Immediate feedback for us

Feedback is welcome at any time throughout the semester. Please use email to send it to the unit co-ordinator, or in person.

This unit is being taught for the first time.

You may wish to use the open ended questions in the unit evaluation to provide written feedback on your experience of this and whether it has been helpful to you during this semester.

Teaching and Learning Methods

Communication, participation and feedback

Monash aims to provide a learning environment in which students receive a range of ongoing feedback throughout their studies. In this unit it will take the form of group feedback via practice classes, individual feedback, peer feedback, self-comparison, verbal and written feedback, discussions in class, as well as more formal feedback related to assignment marks and grades. Students are encouraged to draw on a variety of feedback to enhance their learning.

Unit schedule

Week	Lecture	Tutorial	Lab	Assignment activity
1	1 – 3: Energy resources, energy chain, and energy conversion processes		Laboratory Safety Briefing 35 / G02	
2	4 – 6: Overview of the world and Australian energy production, future energy scenarios	Energy resources : Supply and Demand	1. Mini-Grid, Distributed Generation	
3	7 – 9: Fundamentals of energy supply, direct and indirect energy conversion	Energy efficiency	2. Building Integrated Photo-Voltaic (BIPV)	
4	10 – 12: Non-renewable (fossil, nuclear) and	Life Cycle Assessment	3. Wind Power	

	(fossil, nuclear) and renewable (photovoltaic, wind, hydro, biomass) sources of energy for electricity generation	Assessment (LCA) of energy generating		
5	13 – 15: Environmental impact of electricity generation, electrical energy storage technologies	Assessment of the environmental impacts of energy generating systems	4. Solar PV and WT	
6	1. Power Systems Analysis Fundamentals 2. Load Flow Analysis 3. Load Flow Analysis	Solar PV Energy Systems	5. Grid Connected PV	
7	1. Load Flow Analysis 2. Network Voltage Control 3. Symmetrical Component Theory	Fundamentals of Power Systems Analysis	6. Load Flow	
8	4. Symmetrical Component Theory 5. Fault Calculations 6. Fault Calculations	Load flow analysis	7. Three Phase Transformers 8. Faults	
9	7. Transient Stability 8. Transient Stability 9. Oscillatory Stability	Fault Calculations	7. Three Phase Transformers 8. Faults 11. Model Power System	
10	10. Frequency Control 11. Frequency Control 12. HVDC Systems	Transient and Oscillatory Stability	7. Three Phase Transformers 9. Transient Stability No. 1 11. Model Power System	
Mid-semester break				
11	13. Protection Systems 14. Protection of Radial Systems 15. Protection of Meshed Systems	Frequency Control	9. Transient Stability No. 1 10. Transient Stability No. 2 11. Model Power System	
12	16. Electricity Markets and Economics 17. Electricity Markets and Economics 18. Operational Control	Protection	9. Transient Stability No. 1 10. Transient Stability No. 2 11. Model Power System	
13	**REVISION**	REVISION		

Unit Resources

Prescribed texts

Recommended texts

Reading

Hadi Saadat, “Power System Analysis”, 2nd edition, McGraw Hill, 2002.
D. Glover and M. Sarma, “Power System, Analysis & Design”, 3rd edition, Brooks/Cole publishing, 2002.
B M Weedy and BJ Cory, “Electric Power Systems”, 4th edition, John Wiley, 1998.
A R Bergen, V Vittal, “Power Systems Analysis”, 2nd edition, Prentice Hall, 2000.
J J Grainger, W D Stevenson Jr, “Power System Analysis”, McGraw Hill, 1994.
Gilbert, M. Masters, “Renewable and efficient electric power systems”, IEEE, Wiley Inter-science; 2004.

Required software (and/or hardware) (optional)

Equipment and consumables required or provided (optional)

Study resources

Monash University Studies Online (MUSO)

All unit and lecture materials are available through the MUSO (Monash University Studies Online) site. You can access this site by going to:

a) http://muso.monash.edu.au or

b) via the portal (http://my.monash.edu.au).

Click on the **My Units** tab, then the **Monash University Studies Online** hyperlink

In order for your MUSO unit(s) to function correctly, certain programs may need to be installed such as Java version 1.4.2. This can easily be done by going to http://www.monash.edu.au/muso/support/students/downloadables-student.html to update the relevant software.

You can contact the MUSO helpdesk by:

Phone (+61 3) 9903-1268 or 9903-2764

Operational hours (Monday – Thursday) – local time

Australia: 8 am to 10 pm (8pm Non Teaching period)

Malaysia: 6 am to 8 pm (6 pm Non Teaching period)

Operational hours (Friday) – local time

Australia: 8 am to 8 pm

Malaysia: 6 am to 6 pm

Operational hours (Saturday-Sunday) – local time (Teaching and Exam Period Only)

Australia: 1 pm to 5 pm

Malaysia: 11 am to 3 pm

Further information can be obtained from the following site
http://www.monash.edu.au/muso/support/index.html

Assessment

Assessment tasks

Examination: (3 hrs), 70% . Continuous assessment: 30%. Students must achieve a mark of 45% in each of these components and an overall mark of 50% to achieve an overall pass grade.

The unit coordinator reserves the right to moderate the assessments given by the individual tutors. This process will occur at the end of the semester.

Week	Submission Date	Activity	Value %
5		Mid semester test No. 1	7.5
11		Mid semester test No. 2	7.5
		Laboratory tasks throughout semester	15
		Total continuous assessment	**30**
		Exam (3 hours)	70
		Total assessment	**100%**

Assessment details and criteria

Assessment Task 1:
Mid semester test No. 1
Details of task: There will be two mid-semester tests, held in week 5 and in week 11. The first test will cover all materials taught in the first five weeks of the course. Each test will contribute 7.5% of the final mark.
Criteria for Assessment task 1:

Assessment Task 2:
Mid semester test No. 2
Details of task: The second test will cover all materials taught from week six to week ten. Each test will contribute 7.5% of the final mark.
Criteria for Assessment task 2:

Assessment Task 3:
Laboratory tasks throughout semester
Details of task: The laboratory tasks for weeks 2-6 will be held in 35/220, and will involve simulation studies. Assessment will be based on laboratory reports which must be written for each task.

The laboratory tasks for weeks 7-12 will be held in 35/G02 and 35/G13. Assessment for these tasks will occur in the lab session itself, and will be based on preparatory work for the laboratory, and the quality of results obtained during the laboratory class. Results must be recorded in a laboratory note-book. Students must have attended a laboratory safety briefing to be allowed to enter the power laboratory (G02). This briefing will be held in week 1. See also Appendix C in the Department's Undergraduate Handbook.

All laboratory classes are compulsory even for repeating students. Laboratory reports will not be marked if the student fails to attend the laboratory sessions.

Criteria for Assessment task 3:
As above

Plagiarism

Plagiarism involves passing off as your own, work that is not your own.

This comes in three main forms.

1. **Copying another student's work** - Just don't do it!

2. **Collaborating with another student on work required to be done individually**.
- Before working collaboratively, make sure that you are allowed to collaborate and only collaborate to the extent allowed.

3. **Copying material from other sources, including web sites, without adequate acknowledgement.**

- Any quote of a complete sentence or longer MUST be enclosed in quotation marks, and immediately followed by the reference. In general, quotations of more than a few

sentences should not be used. Students should digest the information and then write about it in their own words. A reference to the source of the ideas must still be included.

- Any copied image must be acknowledged in the figure legend. Modified figures must be acknowledged as "modified from.....".

- Copying material from the web is a growing problem. Fortunately the same search engines that allow students to find information are also very good at allowing markers to detect copied submissions.

Plagiarism will not be tolerated. Any assignment clearly showing plagiarism will be immediately disallowed, ie awarded zero marks. First offences may, and multiple offences will, lead to disciplinary action.

Hard copy assignment submissions

Students: You must keep a copy of your assignment in electronic format. We suggest you keep a print out also.

Electronic submission of assignments in MUSO

How it works

1. If Electronic Submission has been approved for your unit, use only the MUSO assignment submit tool. Do not submit files attached to email. Log into MUSO http://muso.monash.edu.au and select the unit for which you wish to submit work.

2. Unless you have made prior arrangement s with your lecturer, only the following file formats will be accepted: .doc, .rtf, .txt, .pdf, .html

3. It is essential you adhere to the following format for the naming of the file you wish to submit:
   a) It MUST contain your Authcate name.
   b) There must be NO SPACES in the filename.

4. You will receive a confirmation message within MUSO once you have successfully submitted your assignment within the electronic dropbox.

5. Comments and grading of your assessment will be communicated to you either by MUSO, email, or post.

Instructions for submitting an assignment electronically using MUSO

1. Click on the Assignments icon on the relevant unit homepage. The Assignments screen displays.

2. Click on the assignment title for which you wish to submit your work.

3. Click on the **Add Attachments** button.

4. To locate your file, click on the **Upload File** button. The Upload File menu will appear.

5. Locate the assignment file you wish to upload by clicking on the **Browse** button.

6. Select the file and click on the **Open** button. The Upload File for Assignment screen appears with your uploaded file displayed.

7. Click on the **Save** button.

8. You will see a green tick next to your uploaded file. To confirm this is the file you wish to upload, click the **Add Selected** button.

9. Click on the **Submit** button. You'll see a confirmation window when your assignment has been successfully submitted.

10. To return to the MUSO homepage, click on the **Continue** button.

The rules
By submitting your assignment electronically you are deemed to have accepted these rules.

1. Late assignments will not be accepted electronically as the mailbox will be disabled at 5.00pm on the due date.

2. You must keep a copy of your assignment in electronic format. We suggest you keep a print out also.

3. The cover page of your assignment must set out your name, student number, topic, tutor's name and a declaration that says "I [insert your name] declare that this assignment is entirely my own work and that it has not been submitted for assessment in any other unit. I have kept a copy of this assignment. This project contains no material that has been accepted for the award of any other degree or diploma in any educational institution and, to the best of my knowledge and belief, it contains no material previously published or written by another person, except where due reference is made in the text of the project."

4. Remember that, just as for hard copy submissions, you should arrange your study /workload so as to allow plenty of time for last minute hitches. Computer problems/ busy servers will NOT be an excuse for an extension. Do not leave electronic submission of your assignment to the last minute.

Assignment coversheet

All assignments need to be submitted with a signed coversheet.

The coversheet is accessible on the departmental web site at:
http://www.ecse.monash.edu.au/teaching/covr_sht.doc