UNSW AUSTRALIA

Course outline

Semester 1 2017

Never Stand Still | Engineering | Mechanical and Ma[illegible]

MECH9720

SOLAR THERMAL ENERGY DESIGN

Contents

1. Staff contact details

Summary of the course

Solar thermal energy is created when radiation from the sun is converted to heat energy (directly) or into electrical energy (indirectly) for applications in residential, industry, and commercial sectors. This course will give you an engineering perspective of how solar thermal technology is designed, constructed, and operated. The first section of the course deals with the characteristics of sunlight, along with some methods of analysis and measurement of solar radiation. The second section of the course covers the working principles of solar thermal technology (low and high tech) and gives you the general tools necessary to analyse heat and mass transfer within these devices. In the final section of the course, we will cover how these technologies can be integrated into systems including control, circulation, and storage. 21 948 2(d) 2 69 3 (r)-5.o[0.(r)-54-(i)240

This course is designed to address the below learning outcomes and the corresponding

4. Course schedule

Week

12	Effect of collector loop heat exchanger pipe losses. Storage, thermal stratification. CSP systems analysis.	Systems analysis
13	No lecture	*Assessment Discussions/ Exam preparation*
Stuvac	Review and revision. Day(s)/time(s) determined by student poll.	

5. Assessment

Assessment overview

Assessment	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Online Quizzes	1-5 questions per week	10%	1-4	Weekly Lecture/ Demonstration Topic	Weekly, via Moodle	Upon Quiz close	After the Quiz closes
PG 'Conference' Paper [X]	8 pgs. (w/ template)	10% = PG	2 and 3	See marking rubric.	Due Week 10, via Turnitin on Moodle	Week 12	Week 12
Solar Thermal Reports (2)[Y] = SAM Design Report, Lab Report	10 multiple choice	40% = 20%+20%	1-4	See marking rubric.	Due by Week 12, via Turnitin on Moodle (2)	Stuvac	Stuvac
Final exam	2 hours	50% = UG 40% = PG	1-4	All course content from weeks 2-12 inclusive.	Exam period, date TBC	N/A	Upon release of final results

X - Topics for the PG paper must be selected by week 6 – a sign-up sheet can be found on Moodle

Y - Assessment description for the Solar Thermal Report(s) can be found on Moodle.

You are assessed by way of a mid-session test, laboratory work, weekly tutorial questions and quizzes and an examination which involve both calculations and descriptive material. The postgraduate students will have an additional assignment of a report, written in conference paper format. These assessments test your grasp of the principals involved in the course, your progress in the learning objectives mentioned above, and are typical of the calculations you will be expected to perform as graduate mechanical engineers.

i) Online Quizzes 10% Due Weekly
ii) 'Conference' Paper (PG only) (10%) Due Week 10
iii)

Important points on these assessments:

- Deadline for absolute fail
    - Online quizzes (i) close just before the next week's lecture time, late submissions are not accepted.
    - For assignments (ii)-(iii) a 5% per day penalty will be deducted, which calculates out to 10 days until > 50% is not possible.
- Assessments (i)-(iii) should be marked and returned within 2 weeks of the due date.
- In order to pass the course, you must achieve an overall mark of at least 50%.

Assignments

Assignments and templates will be all available on Moodle from the beginning of the course. If deemed necessary, email clarifications and hints will be sent through Moodle, so please ensure you check the email designated by Moodle periodically during the session.

Presentation

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Examinations

This course has one 2-hour final exam. You must be available for it. Final examinations for each course are held during the University examination periods, which are June for Semester 1 and November for Semester 2.

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2

For further information on exams, please see the Exams section on the intranet.

Calculators

You will need to provide your own calculator, of a make and model approved by UNSW, for the examinations. The list of approved calculators is shown at student.unsw.edu.au/exam-approved-calculators-and-computers

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an "Approved" sticker for it from the School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

Special consideration and supplementary assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, see the School intranet, and the information on UNSW's Special Consideration page.

6. Expected resources for students

MECH9720 Course Notes*

Available for purchase from the Green Print Centre (Mathews Level 1, adjacent to the Post office).

*Needed to solve tutorial problems and follow along with lecture.

Suggested Readings:

Duffie J.A. & Beckman, W.A. **Solar Engineering of Thermal Processes**, Wiley 2013 [4th edition available from https://library.unsw.edu.au in the Wiley eBooks Collection]

Cengal, Y.A. and Ghajar, A.J., **Heat and Mass Transfer**, McGraw Hill, 2011

Gordon J. **Solar Energy: The State-of-the-Art**. Routledge, 2001

Standard I. 9806-1 (1994). Test Methods for Solar Collectors, Part.1.

Academic Journals: Solar Energy, J. Solar Energy Engineering, Applied Solar Energy, Renewable Energy, Renewable and Sustainable Energy Reviews.

Additional materials provided on the Moodle Site

This course has a website on UNSW Moodle which includes:

- copies of assignments (as they are issued, in case you missed the hand-out in class);
- lecture notes
- solutions to selected problems
- a discussion forum
- links to solar resources and other supplementary information

The discussion forum is intended for you to use with other students enrolled in this course. The course convenor and tutors will occasionally look at the forum, monitor the language used and take note of any frequently-asked questions, but may not respond to every question on the forum. If you want help from the convenor then direct contact through unsw.mech.9720@gmail.com or an office visit is preferred.

Recommended Internet sites

There are many websites giving lectures, papers and data on solar technology. Try searching for “solar thermal”, "solar hot water", "CSP", etc. YouTube has many entertaining (and sometimes very informative) videos related to solar thermal energy. Some examples will be given during lectu6(a)10.6(on s14.-r89 Tw 0C( )]T4/MCID 53(es)]TJ 0)1007Tw 13.62 0 Td ( )Tj E

Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include online quizzes and resources (including the adaptive lecture notes new in S1 2017!), new laboratory facilities, changes to the assessments, more worked problems during lecture, and additional feedback on progress throughout the course.

8. Academic honesty and plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. A]TJ 10Tf onlNSW stdeent-6.2(6(v)8.9(a(o)10.6(ur)-5.96(-6.ponsac)-2(i)6(bi10Tf onl))-6(i)2.6(t

9. Administrative matters

All students are expected to read and be familiar with School guidelines and polices, available on the intranet. In particular, students should be familiar with the following:

- Attendance, Participation and Class Etiquette
- UNSW Email Address
- Computing Facilities
- Assessment Matters (including guidelines for assignments, exams and special consideration)
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Student Support Services

Dr Robert A Taylor
1 February, 2017

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers