Module Registrar: Dr Paul Tuohy
paul.tuohy@strath.ac.uk

Taught To (Course): MSc Power Plant Engineering

Other Lecturers Involved: Prof Donald MacKenzie, Industry Speakers.

Credit Weighting: 10
Semester: 1 (day release)

Assumed Prerequisites: none
Compulsory class
Academic Level: 5

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Groupwork</th>
<th>External</th>
<th>Online</th>
<th>Project</th>
<th>Assignments</th>
<th>Private Study</th>
<th>Total</th>
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Educational Aim

The student will gain a clear overview of the key components and systems of the modern conventional power plant and develop a critical understanding of the purpose and integration of those components and systems that are required for safe and efficient operation. The module includes coverage of the fundamental principles of thermodynamics and their implications for power generation. Students will learn of appropriate parametric tools for energy systems analysis and develop skills in their application. The module will have significant industrial input to ensure that material is in line with state-of-the-art professional practice.

Learning Outcomes

On completion of the module the student is expected to be able to

LO1 Recognise the underpinning engineering principles of operation and carry out thermodynamic power cycle performance analysis for modern power generation systems.

LO2 Understand the current power generation industry economic, political, technical and environmental context and challenges and have an appreciation of how these challenges may change in future.

Syllabus

The module will teach the following:

- Introduction to power plant systems
- Power plant economics
- Power plant components and systems
- Overview of boiler technologies, turbines and balance of plant
- Thermodynamics: properties and states, equilibrium, reversibility, heat and work, First and Second Laws, property tables and diagrams, Carnot cycle, entropy, isentropic efficiency.
- Psychrometry: psychrometric properties, psychrometric chart
- Engineering cycles: thermal power generation, efficiency and work ratio, steam power, gas turbine, nuclear fission and fusion, vapour compression and absorption refrigeration.
- Use of engineering software for thermodynamics and power plant system analysis
- Emissions, regulatory framework
- Overview of effluent handling
- Nuclear technologies
- Power plant case studies.

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1: Recognise the underpinning engineering principles of operation and carry out thermodynamic cycle performance analysis for modern power generation systems.

LO2: Understand the current power generation industry economic, political, technical and environmental context and challenges and have an appreciation of how these challenges may change in future.

C1: Essay Assignment exploring current, mid-term and long term political, environmental, economic and technical challenges faced by power generation industry in both developed and developing economies.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

12 Principles of Assessment and Feedback
(on Learning & Teaching web pages: www.strath.ac.uk/learnteach/informationforstaff/staff/assessfeedback/12principles/)

Please state briefly how these are incorporated in this module.

Expectations: The modelling tutorials and modelling assignments are aligned and this is communicated to the students so that the students have clear expectations that by attempting the tutorials they will develop skills required for the assignments. Students are told that although the subject can appear daunting at the outset it is possible to achieve very good results once the analysis techniques are mastered.

Group learning and feedback: The course is delivered so that each lecture topic is followed by a tutorial. At the start of each tutorial the solution to the previous tutorial is presented. The students are asked to work in buzz groups of 3 to attempt the tutorial questions. The students get the opportunity in tutorial to discuss the approach and analysis steps and compare the tutor's solution to their own. Tutorial solutions (software and explanations) and all lecture materials are made available to students on Myplace to allow private reflection.

Student directed learning: The last tutorial after the main lecture topics have been covered is open for the students to suggest the topics they would like to be covered. The essay assignment allows the students scope for picking the developed and developing country of their choice (e.g. India, China...).

Opportunities for closing gaps: The feedback from the tutorials allows students to address gap areas ahead of assignments.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

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<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
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<tr>
<td>LO1, LO2</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

Coursework / Submissions deadlines: Both to be submitted by End November.

Resit Assessment Procedures: 2hr examination in August Diet

PLEASE NOTE: Students need to gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet.

Recommended Reading
A fundamentals course text book is supplied but students may find it useful to consult a supporting text book for an alternative perspective, suitable text books include:

Additional Student Feedback
(Please specify details of when additional feedback will be provided)

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<td><strong>Course Director Signature:</strong> P Strachan</td>
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<td><strong>Date of Last Modifications:</strong> 28 August 2014</td>
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## Module Timetable

**Module Code:** ME924  
**Module Title:** Power Plant Systems

**Brief Description of Assessment:**  
Assessment through 2 assignments 1. Modelling Power plant systems using EES software, 2. Essay on industry challenges.

**Assessment Timing:**  
Indicate on the table below the Start/Submission dates for each Assignment/Project and the timing of each Exam/Class Test(s).

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