
Module Leader
Dr E Shwageraus [1]

Lecturers
Dr E Shwageraus, Mr A Roulstone and external lecturer Kemp

Timing and Structure
Lent term. 16 lectures & 4 examples papers. Assessment: 100% exam

Prerequisites
4M16

Aims
The aims of the course are to:

- provide an understanding of advanced systems, why they are being pursued, what are their advantages and their difficulties in becoming commercially viable designs.

Content
Further aims:

- What are the factors that are driving the development of advanced systems?
- Overview of fast reactor development & Gen IV reactor systems, including accelerator driven sub-critical reactors;
- Introduce the principles of fusion energy physics and the current status of research;
- Explain how the principles of fusion energy are to be applied for the design of future fusion energy systems;
- Re-cycle fuel studies, including reprocessing and re-fabrication;
- Status, issues and what would be needed to bring advanced reactor systems to a commercial standard with safety and economics as good as current Generation III+ designs

Fission Systems

- Design objectives, drivers & alternatives (1l)
- Advanced thermal systems – example high temperature gas reactor(2l)
- Fast neutron systems – including external Dr A Judd(4l)
- Lines of development(1l).
- Advanced Fuel cycles – from NNL(2l)

Fusion Systems

Introduction & Physics of fusion systems - Professor Steve Cowley CCFE (2l)
• Fusion reactions: cross sections and reactivity  
• Magnetic and inertial approaches to fusion  
• Equilibrium, transport, instabilities and power balance  

Physics & Materials - Dr R Kemp CCFE (2I)  

• Heating systems and current drive  
• Layout of a fusion power plant  
• Fusion reactor components and materials requirements  

Performance Safety and Design Dr R Kemp CCFE (2I)  

• Safety of a fusion  
• Radiological hazards and waste products  
• Fusion in the market and timescale to fusion  
• Designing a fusion power plant  

Booklists  

Please see the Booklist for Group I Courses [2] for references for this module.  

Examination Guidelines  

Please refer to Form & conduct of the examinations [3].  

Last modified: 02/10/2014 17:02  

Source URL (modified on 02-10-14): http://teaching.eng.cam.ac.uk/content/engineering-tripos-part-iib-4i11-advanced-fission-and-fusion-system-2014-15  

Links  
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