
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].

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Links
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