Engineering Tripos Part IIB, 4C3: Electrical and Nano Materials, 2017-18

Module Leader

Dr J H Durrell [1]

Lecturers

Dr J Durrell, Prof J Robertson and Dr S Hofmann

Timing and Structure

Michaelmas term. 16 lectures. Assessment: 100% exam.

Aims

The aims of the course are to:

- introduce undergraduates to a range of modern electrical materials and devices emphasising their processing, properties and limitations. The course will concentrate on materials technology of specific relevance to the electronics industry.

Objectives

As specific objectives, by the end of the course students should be able to:

- appreciate the range and diversity of modern electronic materials.
- understand a variety of bulk and thin film process requirements of these materials.
- identify specific materials for specific electrical/electronic/magnet applications.
- appreciate the key properties of electrical materials.
- recognise the limitations of modern electrical materials for specific applications.
- apply a range of materials in circuit applications.
- understand how to control materials properties and microstructure at the nanoscale.

Content

Bulk Materials, Properties and Applications (6L, Dr J Durrell)

- Magnetic fields in materials (2L);
- Bulk superconductors (1.5L);
- Pyroelectrics and their application as i.r. sensors (1.5L);
- Piezoelectrics (1L);

Thin Film Technology (4L, Dr S Hofmann)

- Vacuum Science and Technology (1L); (kinetic theory of gases,vacuum requirements/systems)
- Deposition Techniques (1.5L) (evaporation, MBE, sputtering, CVD, ALD)
- Thin Film and nano-metrology (1.5L); (scanning/transmission EM,XRD, scanning probe techniques,XPS, RBS, SIMS).
Microcircuits (6L, Professor J Robertson)

- Materials issues in devices (2L); (transistors, contacts, interconnects);
- Circuit limitations (1.5L); (electromigration and device miniaturisation);
- Advanced materials (2.5L); (semiconducting and display devices).

Booklists

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

Examination Guidelines

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

UK-SPEC

The UK Standard for Professional Engineering Competence (UK-SPEC) [4] describes the requirements that have to be met in order to become a Chartered Engineer, and gives examples of ways of doing this.

UK-SPEC is published by the Engineering Council on behalf of the UK engineering profession. The standard has been developed, and is regularly updated, by panels representing professional engineering institutions, employers and engineering educators. Of particular relevance here is the 'Accreditation of Higher Education Programmes' (AHEP) document [5] which sets out the standard for degree accreditation.

The Output Standards Matrices [6] indicate where each of the Output Criteria as specified in the AHEP 3rd edition document is addressed within the Engineering and Manufacturing Engineering Triposes.

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