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EEE105

“Electronic Devices”

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Introduction

Aims and Objectives

Motivation

Lectures and this Module

Examination

My Role

Aims, Objectives

- Review physical properties and conduction processes of metals, insulators, semiconductors
- Understand the operation of a semiconductor p-n diode and its design and use in wide ranging applications
- Understand the operation of a semiconductor transistor (bipolar junction transistor)

Course Content

- 1-4 – Crystals, Conductors, Insulators, Capacitors
- 5-9 – Semiconductors – doping, electrons, holes
- 10-14 – p-n junction
- 15-19 – BJT
- 20 - Review - past paper discussion

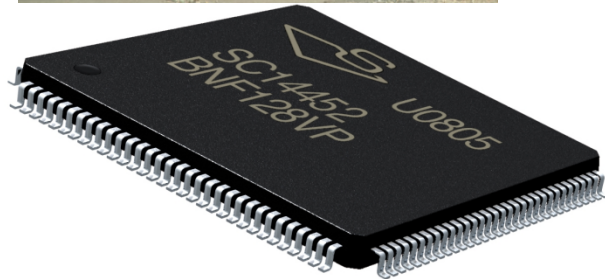
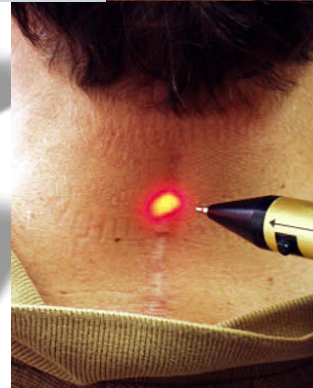


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Chips with Everything !

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Difficulties of this course.....

- This course aims to allow the student to understand the measured properties (e.g. current-voltage characteristics) of resistors, diodes, transistors
- It is highly conceptual -Invisible particles moving inside a “black box” structure through physical processes which are new to the student
 - Electrostatics, Quantum mechanics, Statistical mechanics
- Many new ideas, phrases and much new vocabulary

Why this course is useful

- Like all Y1 courses – important for future studies – analogue and digital electronics, more advanced semiconductor devices (2nd, 3rd, 4th year), 1st & 2nd Year Labs, 3rd and 4th year projects, PhD?
- It is a very important area of engineering and technology
 - Future employment – company/university

Policy

- Spare handouts will be thrown away after each lecture – I will not have copies if you miss the lecture
- Tutorials – attend and complete question sheets to receive marks – starts W3
- I am available outside these times by appointment – email me for a meeting time
- No queues of students wanting exam hints 1 day before the exam please!

What is a Module?

The University requires that it
is ~100 hours of work!

So that results in...

- Lectures = 24
- Tutorials = 10
- Exam = 2
- Total Contact Time = 36

~60 hours of study
on your own...

Self Study – My Advice

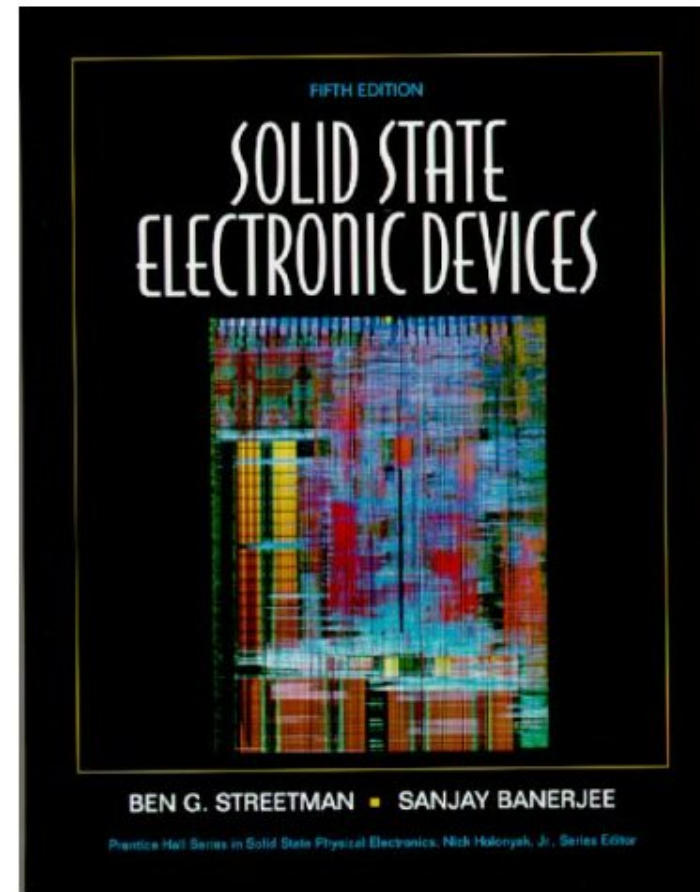
- **When**
- Try to spread the pain over a large time period – a few hours per week during term time, following the points introduced in the lectures and trying the tutorial sheets before the tutorial session
- **How**
- Do problem sheets, read books, web (earlier in term), look at old exam papers and solutions (later in term)

Recommended Textbooks

One stop shop –
Streetman & Banerjee

See books with similar
classmark in library

When using books – work
out what you don't know and
browse books in library to
answer your needs



Assessment

- Exam - 70%
- Mid-term test – 5%
- Tutorials – 25%
- Question sheets distributed at tutorial on Wednesday at 9AM
- Work through in tutorial and submit completed sheets the following week
- Tutorials start Week 3

My Role

- I am not your teacher - Big difference between A-level and Degree
 - You need to be able to work out what you don't know
 - I help in explaining and exploring concepts
 - I help in working through problems in tutorial
 - I am a small component in your learning in this module
- Do not be surprised if I say ;
- “Have you read any books on this subject ?”
- “Would you like me type it into Google for you?”

Attend Lectures or Not?

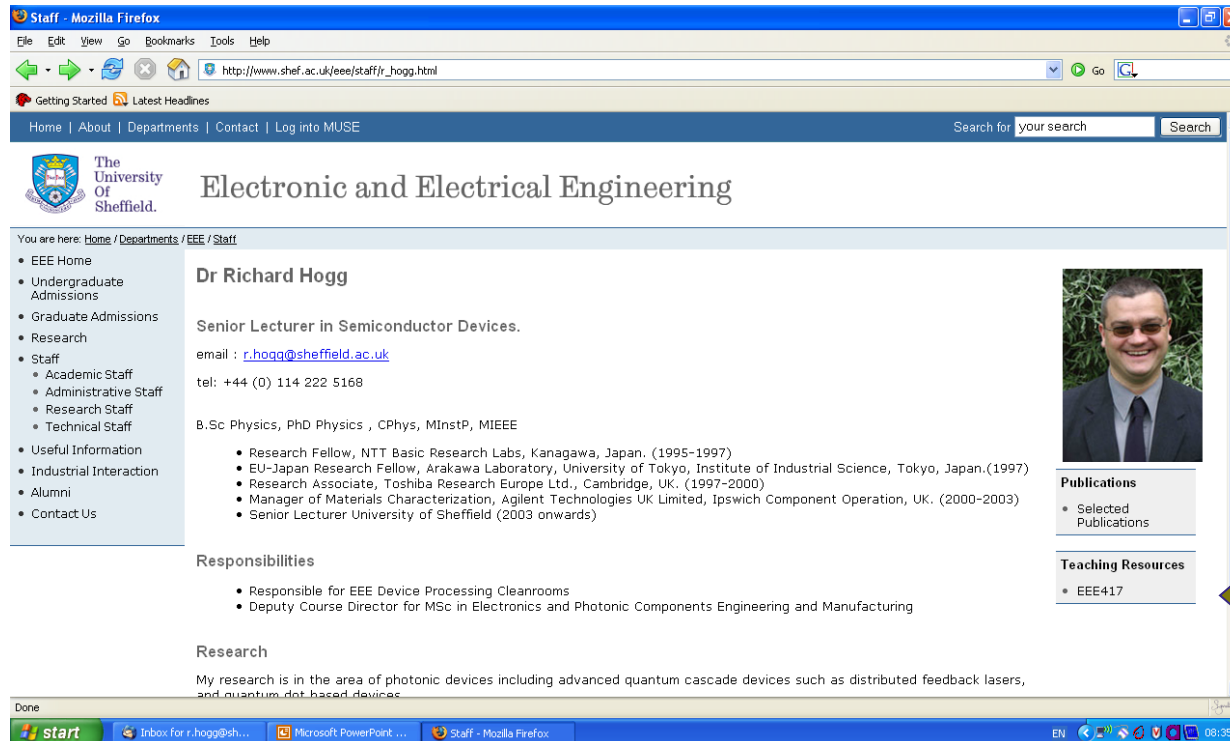
- I **strongly** suggest you do so
- Good exam performance directly correlates to good attendance
- But ultimately;
- You are all adults not children
- Sometimes you'll be ill / drunk / in the wrong bed / etc.
- I get paid if you're here or not !
- If you are ill – inform your tutor. We need to know ASAP.

In Lectures

- Try to sit as far in the row as possible – the lecture theaters hold just a few more than the cohort
- Please don't chatter – It puts me off only a little bit, but I feel it's rude to other students
- **Please ask questions**
- Make notes ! The handouts aren't a text book!
- Take spare notes if your friend can't make it
- If you don't follow my (Yorkshire) English – just ask

University Web Resources

<http://hercules.shef.ac.uk/eee/teach/resources/eee105/eee105.html>



The screenshot shows a Mozilla Firefox browser window displaying the University of Sheffield's Electronic and Electrical Engineering (EEE) staff page for Dr Richard Hogg. The page layout includes a navigation menu on the left, a main content area with a profile picture, and a right sidebar with links to publications and teaching resources. The browser's address bar shows the URL http://www.shef.ac.uk/eee/staff/r_hogg.html. The taskbar at the bottom shows the Windows Start button and several open applications, including an email client and Microsoft PowerPoint.

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B.Sc Physics, PhD Physics , CPhys, MInstP, MIEEE

- Research Fellow, NTT Basic Research Labs, Kanagawa, Japan. (1995-1997)
- EU-Japan Research Fellow, Arakawa Laboratory, University of Tokyo, Institute of Industrial Science, Tokyo, Japan.(1997)
- Research Associate, Toshiba Research Europe Ltd., Cambridge, UK. (1997-2000)
- Manager of Materials Characterization, Agilent Technologies UK Limited, Ipswich Component Operation, UK. (2000-2003)
- Senior Lecturer University of Sheffield (2003 onwards)

Responsibilities

- Responsible for EEE Device Processing Cleanrooms
- Deputy Course Director for MSc in Electronics and Photonic Components Engineering and Manufacturing

Research

My research is in the area of photonic devices including advanced quantum cascade devices such as distributed feedback lasers, and quantum dot based devices.

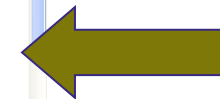
Publications

- Selected Publications

Teaching Resources

- EEE417

Click here



Other Resources

- Wikipedia / Google – try a few key words

