The University Of Sheffield.

Electronic & Electrical Engineering.

EEE119 DIGITAL SYSTEM ENGINEERING
Credits: 20

Course Description including Aims

This module introduces the basic principles underlying the design of electronic systems. The ideas are discussed mainly in the context of digital design which cannot be undertaken realistically without some level of system thinking and planning. Other areas of system design will be used to illustrate and reinforce the idea that system design ideas apply to many fields beside digital design. The module will also introduce some of the computer based tools used by system designers for simulation and verification. This unit aims to:

1. provide students with an understanding of the design of modern electronic hardware and software systems. Modern electronic systems are now so complicated that unmanaged and unstructured approaches to their design leads to ineffective, poor and costly systems. This module introduces students to structured and managed methods that support design and implementation processes and which will enable students to carry out projects successfully.
2. Provide students with an understanding of modern digital systems.
3. Develop the fundamental skills required for the analysis and design of digital systems.

Outline Syllabus

Introduction and motivation. Design flows and the management of processes. Requirement capture. Introduction to design notations. ***Introduction to implementation*** and hardware/software co-design. Examples of hardware and software implementation. ***Introduction to verification***, validation and test. Modelling of systems. ***Boolean Algebra*****:** basic principles, fundamental theorems. ***Logic Expressions*****:** analysis and synthesis techniques with examples. ***Combinational Logic*****:** simple gates and derived combinational circuits. ***Number Systems*****:** bases, coding, simple binary arithmetic, arithmetic logic circuits. ***Sequential Logic*****:** flip-flops and registers. ***Synchronous Sequential Design*****:** state diagrams, state transition tables, counters, finite state machines (Mealy/Moore). ***Hardware Description Languages***: Verilog descriptions of simple combinational and sequential circuits. ***Memory***: ROM, RAM, FLASH. ***Timing issues*****:** delays, set-up/hold time, metastability. ***Modelling and analysis of systems:*** Using mathematical models for analysis and design of system and predicting reliability. ***Legislation and regulations:*** introduction to some of the regulations governing EEE inc. WEEE & EMC.

Time Allocation

30 lectures and 24 problem solving classes in semester 1 and 2, 18 hours of labs and 125 hours of independent study.

Recommended Previous Knowledge

Entry qualifications.

Assessment

Laboratory assignment – 33%, 3 hour examination, answer 4 questions from 6 – 67 %.

Recommended Books

Morris Mano, M	Digital Design	Prentice-Hall
Crowe & Hayes-Gill	Introduction to Digital Electronics	Arnold
Floyd, T L	Digital Fundamentals	Prentice-Hall
Gajski, D D	Principles of Digital Design	Prentice-Hall
Katz, R H / Borriello G	Contemporary Logic Design	Pearson International
Sommerville, I	Software Engineering	Addison Wesley
Sage, A	Systems Engineering	John Wiley
Blanchard B & Fabrycky W	Systems Engineering and Analysis	Prentice Hall
Aslaken, E & Belcher, R	Systems Engineering	Prentice Hall

Objectives

By the end of the module a successful student will be able to:

1. Understand the need to use a structured and well managed approach for the design of electronic systems.
2. Demonstrate knowledge and understanding of the design and implementation process from requirements capture through to verification, validation and test.
3. Model a simple system and will be able to design and implement a digital simulation of a simple hardware or software system.
4. Show awareness of legislation governing the development, deployment and disposal of electronic systems
5. Demonstrate an elementary grasp of quality standards such as ISO9000 and their place in the design process.
6. Exploit Boolean algebra theorems and manipulation techniques, and use the techniques to analyse or generate simple combinational networks.
7. Analyse and design simple sequential circuits using state diagrams and state tables.
8 Understand binary number representations and to be able to design simple arithmetic circuits.
9. Appreciate the relevance of hardware description languages in the design process and to understand simple digital components described in Verilog.
10. Anticipate the problems in practical circuit implementations stemming from the limitations of devices and the chosen technology.
11. Use Matlab to write programs to undertake system modelling.
12. Demonstrate an understanding of the regulations and legislation application to some EEE.