

# Module Information

Module Identifier	<b>CS25710</b>
Module Title	<b>Mobile, Embedded and Wearable Technology</b>
Academic Year	<b>2014/2015</b>
Co-ordinator	<b><u><a href="mailto:nns@aber.ac.uk?subject=CS25710">Dr Neal Snooke (mailto:nns@aber.ac.uk?subject=CS25710)</a></u></b>
Semester	<b>Semester 2</b>
Pre-Requisite	<b><u>CS23710 (?m=CS23710)</u> or <u>CS25410 (?m=CS25410)</u></b>
Other Staff	<b><u><a href="mailto:nns@aber.ac.uk?subject=CS25710">Dr Neal Snooke (mailto:nns@aber.ac.uk?subject=CS25710)</a></u></b>

## Course Delivery

<b>Delivery Type</b>	<b>Delivery length / details</b>
Lecture	18 Hours.
Practical	5 x 2hr practicals

## Assessment

<b>Assessment Type</b>	<b>Assessment length / details</b>	<b>Proportion</b>
Semester Assessment	Course work: Design study for a wearable computer system.	50%
Semester Exam	2 Hours Written Exam	50%
Supplementary Exam	2 Hours Supplementary examination will take the same form, under the terms of the Department's policy.	100%

## Learning Outcomes

On successful completion of this module students should be able to:

Identify and analyse key technical limitations of mobile, wearable and embedded computer systems in particular applications and environments.

Evaluate and explain the likely usefulness of the use of a mobile or wearable computer system for particular applications and environments.

Calculate battery sizes, processing requirement, energy budgets, heat dissipation requirements and other key characteristics of mobile, wearable and embedded computer systems.

Identify and explain likely effectiveness of appropriate short to medium range communication mechanisms suitable for use by mobile, wearable and embedded computer systems in various environments.

Describe mechanisms and technologies useful for endowing mobile, wearable and embedded computer systems with context awareness.

Design mobile, embedded and wearable computer systems tailored to particular applications and environments.

## Aims

The module builds on the initial knowledge of computer systems gained in part one of the undergraduate degree schemes in computer science (CS10110 , CS15210) in order to provide a detailed knowledge of the techniques and possibilities opened-up through the use of such techniques in mobile, embedded and wearable computer systems.

## Brief description

The module covers issues pertinent to the uses, drawbacks, physical limitations and technological possibilities offered by mobile, embedded and wearable computer systems. This includes discussion of communication mechanisms, battery life, energy budgets, heat dissipation and the use of low-power and interrupt driven processing.

## Content

STUDENTS WILL BE REQUIRED TO MAKE BASIC USE OF THE C PROGRAMMING LANGUAGE DURING THE PRACTICAL ELEMENT OF THE COURSE. THOSE WHO HAVE NOT TAKEN CS23710 WILL BE PROVIDED WITH A GUIDED WORKSHEET TO ENABLE THEM TO APPLY THEIR JAVA KNOWLEDGE TO THE UNDERSTANDING AND MODIFICATION OF SIMPLE C PROGRAMS.

Introduction to mobile, embedded and wearable computers (2 lectures)

Definitions of the terms and what is particularly interesting, challenging and different about these types of technology. Outline of the key challenges for the technology. Brief discussion of characteristics of applications suitable to be addressed with this type of technology.

Existing applications (3 lectures)

Explanation of a number of existing applications of such systems and a technical analysis of their key properties with respect to the technology available and used in their construction. Detailed discussion of their advantage and limitations with respect to competitors and more conventional technology. Environmental limitations on their use and functionality will also be examined.

Fundamentals and effective application of the technologies (6 lectures and 2 practicals)

Examination of the key properties of a number of aspects of different available technologies and the pros and cons of particular usage patterns will be discussed. In particular the following will be addressed:

- i) battery technologies and properties of each,
- ii) processor technologies and mechanisms and their properties,
- iii) energy budgets and heat dissipation requirements for various types of systems
- iv) human-computer interface technologies and modes of interaction
- v) technologies for context awareness and sensing the environment.

## Communication mechanisms (3 lectures and 2 practicals)

A range of short to medium range communication mechanisms will be discussed and analysed with respect to their functional properties in the types of environment in which mobile, embedded and wearable computer systems are deployed. This will include examination of:

- i) Radio technologies including unlicensed low-power radio technology, mobile telephone technology and very low frequency radio signals
- ii) Infra-red and ultrasound communications
- iii) The possible uses and suitability of these technologies including ad-hoc networks and personal area networks

## System integration and overall design issues for wearable systems (3 lectures)

By focussing on a complete wearable computer system designed for a particular application and environment, a coherent set of constraints and demands for that application will be identified. This will then be developed over a small number of lectures into a set of possible solutions for that particular application.

## Wrap-up and reiteration of fundamentals (1 lecture, 1 practical)

An overview of the fundamentals of the course and their inter-relationship will be presented in order to leave the students with a coherent overall view of this area of technology.

## Module Skills

Skills Type	Skills details
Improving own Learning and Performance	The emphasis on discovering and reading texts and the work for the compulsory examination question will (through the seminars) help students to develop their individual learning skills
Problem solving	Thinking through and designing a wearable computer system involves the application of problem solving skills with a new set of constraints and demands. Novel and effective solutions will be encouraged and rewarded
Research skills	The use of printed and web resources will be expected and encouraged both in the development of coursework and in the semester/supplementary examination (a pre-specified compulsory question topic will be examined)

## Reading List

### General Text

Jones, Matthew (Jan. 2006) *Mobile Interaction Design* John Wiley & Sons Canada, Limited [Primo search \(http://primo.aber.ac.uk/primo\\_library/libweb/action/search.do?v1%28freeText0%29=Mobile+Interaction+Design+Jones%2C+Matthew&fn=search&vid=ABERU\\_VU1\)](http://primo.aber.ac.uk/primo_library/libweb/action/search.do?v1%28freeText0%29=Mobile+Interaction+Design+Jones%2C+Matthew&fn=search&vid=ABERU_VU1)

Ballard, B. (c2007.) *Designing the mobile user experience /Barbara Ballard.* John Wiley & Sons [Primo search \(http://primo.aber.ac.uk/primo\\_library/libweb/action/search.do?v1%28freeText0%29=Designing+the+mobile+user+experience+%2FBarbara+Ballard.+Ballard%2C+B.&fn=search&vid=ABERU\\_VU1\)](http://primo.aber.ac.uk/primo_library/libweb/action/search.do?v1%28freeText0%29=Designing+the+mobile+user+experience+%2FBarbara+Ballard.+Ballard%2C+B.&fn=search&vid=ABERU_VU1)

## Notes

This module is at CQFW (<http://wales.gov.uk/topics/educationandskills/qualificationsinwales/creditqualificationsframework/?lang=en>) Level 5