MODULE SPECIFICATION TEMPLATE

1 **The title of the module**
CO831 Mobile and Ubiquitous Computing

2 **The Department which will be responsible for management of the module**
School of Computing

3 **The Start Date of the Module**
September 2006

4 **The cohort of students (onwards) to which the module will be applicable.** 2009/10

5 **The number of students expected to take the module**
60-100

6 **Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Departments and Faculties regarding the withdrawal**
none

7 **The level of the module (eg Certificate [C], Intermediate [I], Honours [H] or Postgraduate [M])**
M

8 **The number of credits which the module represents**
15

9 **Which term(s) the module is to be taught in (or other teaching pattern)**
Autumn

10 **Prerequisite and co-requisite modules**
There are no specific prerequisites, but students taking it should normally have completed Stage 2 of a relevant programme.

11 **The programmes of study to which the module contributes**
Computer Science: all single and joint honours programmes
Applied Computing: all joint honours programmes,
Business Computing,
BEng Computer Systems Engineering,
plus Year-in-Industry variants.

12 **The intended subject specific learning outcomes and, as appropriate, their relationship to programme learning outcomes**
The module will contribute to the subject-specific learning outcomes detailed under the following headings in the appropriate programme specifications:

Knowledge and understanding

On completing the module, students should be familiar with and understand:

- the characteristics and limitations of hardware devices, communication and software infrastructures and environments used on small devices and in mobile and ubiquitous computing contexts [A1, A2, A3],
- current practice in mobile and ubiquitous computing contexts [A4],
- a range of professional and ethical issues, particularly those relating to security and privacy in mobile and ubiquitous computing [B6]

Intellectual Skills

On completing the module, students should be able to:

- undertake self-directed background research in the module topics [B9].
- synthesise information collected from a variety of sources, including other modules [B1, B3],
- discuss mobile and ubiquitous computing issues with their peers and with non-specialists [B2, D2],

Subject-specific skills

On completing the module, students should be able to

- specify, design, implement and evaluate context-aware solutions on distributed small devices in a ubiquitous computing environment [C1, C2, C3, C4].
- use a range of current tools and techniques in the construction and deployment of software for small devices and ubiquitous computing environments [C4, A2].

These will be achieved by building upon core elements of the programme. The module will extend students' skills, knowledge and understanding through exposure to a range of hardware devices, software tools and applications, network concepts and applications, and design, implementation and

evaluation issues that are specific to mobile and ubiquitous computing environments, and are not addressed in other parts of their programme.

13 **The intended generic learning outcomes and, as appropriate, their relationship to programme learning outcomes**

The module will contribute to the generic learning outcomes detailed under the following headings in the appropriate programme specifications:

Transferable skills

The module will extend IT skills to cover a rapidly growing area that is not addressed in other parts of their programme. In particular, students will extend their ability to make effective use of general IT facilities in a pervasive computing environment. The module will also contribute to development of

- self-management, adjust the pace and goals of their work to meet deadlines. [D5],
- oral and written communication [D2],
- Internet-based information retrieval [D3].

14 **A synopsis of the curriculum**

Mobile, Context Aware, Ubiquitous and Pervasive Computing
- Definitions
- Comparison with conventional computing environments

Devices: handheld, wearable, embedded, sensors
- Hardware and Software Characteristics
- Limitations and Constraints

Networks & Communications, main characteristics addressed at application level
- Wireless LANs
- Phone based
- Short range, Personal/Body Area Networks
- Ad hoc and p2p networking

Infrastructure issues
- Service/Device/Person discovery
- Location Based Services
- Sensor networks

Programming environments
- General overview
- Detailed examination and use of e.g. CLDC, MIDP, CDC Personal Profile

HCI issues
- Interacting with small devices
- Matching interaction modes to context
- Avoiding interaction

Ethical, Legal, Privacy and Security Issues
- Protecting highly personal information
- Threats to privacy and security

Opportunities for enhanced privacy and security

15 **Indicative Reading List**

This module covers a rapidly evolving topic for which few, if any, satisfactory books exist that cover more than a small part of the syllabus. However, there is a wealth of on-line material in the form of research papers, software documentation and tutorials, and news items. A module resources web page will provide links to a list of relevant material.

Key background articles:

M. Weiser. The Computer for the 21st Century, Scientific American, September 1991, 94-104.
M. Weiser, Some computer science issues in ubiquitous computing. Communications of the ACM, July 1993, 75-84.
G. W. Fitzmaurice, 'Situated Information Spaces and Spatially Aware Palmtop Computers', Communications of the ACM, 36, 7, 38-49, 1993.
R. Want, W. Schilit, N. Adams, R. Gold, K.Petersen, D. Goldberg, J. Ellis, M. Weiser. An overview of the PARCTAB ubiquitous computing experiment. IEEE Personal Communications. 1995 December; 2(6): 28-43.

Typical recent material (subject to change)

D. Salber, A. K. Dey and G. D. Abowd. ‘The Context Toolkit: Aiding the Development of Context-Enabled Applications’. CHI'99, Pittsburgh, PA, May 15-20,1999.
A. Harter, A. Hopper, P. Steggles, A. Ward, and P. Webster. ‘The Anatomy of a Context-Aware Application‘, 5th Annual ACM/IEEE International Conference on Mobile Computing and

Networking (Mobicom '99), Seattle, Washington, USA, August 15 - 20 1999.
J. Pascoe, D. R. Morse and N. S. Ryan, 'Developing Personal Technology for the Field', Personal Technologies vol 2, no 1, pp. 28-36, 1998.

16 **Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended learning outcomes**

150 study hours

- 30 contact hours
  - 22 lectures covering the above synopsis of the curriculum
  - 8 classes primarily used for introducing, discussing and developing experience with development tools
- 45 hours private study in parallel with taught material
- 30 hours spent on exercises and assessments

45 hours pre-exam revision

17 **Assessment methods and how these relate to testing achievement of the intended learning outcomes**

50% coursework: assessments will address understanding and practical skills in design, development and deployment in mobile and ubiquitous environments.

50% examination: examinations will address knowledge and understanding of the specific characteristics and limitations of mobile and ubiquitous environments, special considerations for design, development and deployment, and professional and ethical issues.

18 **Implications for learning resources, including staff, library, IT and space**

No additional resources required, reading materials will be available on-line.

19 **A statement confirming that, as far as can be reasonably anticipated, the curriculum, learning and teaching methods and forms of assessment do not present any non-justifiable disadvantage to students with disabilities**

As far as can be reasonably anticipated, no aspect of the module presents any non-justifiable disadvantage to students with disabilities

Statement by the Director of Learning and Teaching: "I confirm I have been consulted on the above module proposal and have given advice on the correct procedures and required content of module proposals"

.....	.....
Director of Learning and Teaching	Date

Statement by the Head of Department: "I confirm that the Department has approved the introduction of the module and will be responsible for its resourcing"

.....	.....
Head of Department	Date

Revised 15 November 2006.
August 2009