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<th><strong>Module Code</strong></th>
<th>CS4031</th>
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<tr>
<td><strong>Module Name</strong></td>
<td>Mobile Communications</td>
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<tr>
<td><strong>Module Short Title</strong></td>
<td>N/a</td>
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<td><strong>ECTS weighting</strong></td>
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<td><strong>Semester/term taught</strong></td>
<td>Michaelmas Term</td>
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| **Contact Hours** | Lecture hours:22  
Lab hours:  
Tutorial hours:11  
Total hours:33 |
| **Module Personnel** | Meriel Huggard & Marco Ruffini |

### Learning Outcomes

When students have successfully completed this module they should be able to:

- recognise and discriminate between the different cognate requirements of mobile communication technologies.
- assess and document the infrastructure and functionality of a mobile telecommunications network.
- demonstrate key competencies with dynamically evolving technological innovations.
- describe, plan and implement innovative mobile communications services.
- hold and clearly articulate an informed technical opinion.
- appraise and evaluate the social, cultural and ethical implications of pervasive communications technologies.
- communicate solutions to mobile communications problems clearly and coherently, using appropriate, precise technical language.

### Module Learning Aims

Effective wireless communication is the key enabling technology for realising the emerging ubiquitous computing vision. Mobile Communications is a module which imbues the next generation of professional computer scientists with a cognisance and awareness of both the capabilities and limitations of modern mobile devices. In this module students being by learning about the underlying principles of wireless transmission and how these underpin the design of wireless communication networks. This material forms a platform for the subsequent analysis, assessment and implementation of a wide variety of modern wireless communication systems.

Critical appraisal of recent publications in IEEE and ACM journals is used to enhance each student’s ability to communicate effectively through the written medium.

This module aims to:

- provide students with a sound technical basis in current and emerging mobile communications technologies.
- require students to derive and implement solutions to problems in the mobile communications domain.
- encourage students to develop and refine their technical writing and critical appraisal skills in a supportive environment.
- equip students with the capabilities to realize innovative solution platforms from minimal problem domain specifications.
Specific topics addressed in this module include:

1. An Introduction to Pervasive and Ambient Computing
2. Wireless Transmission
   a. Frequencies for transmission
   b. International Regulations and Regulatory Authorities
   c. Signals
   d. Antennas
   e. Signal Propagation
   f. Multiplexing
   g. Modulation
3. Medium Access Control
4. SDMA, FDMA, TDMA, CDMA
5. Spread Spectrum
6. Radio Network Planning
7. Current and Next Generation Mobile Telecommunications Systems
   a. GSM and GPRS
   b. Services, System architecture, Radio Interface, Protocols, Hand-over, Security
   c. 3G systems (UMTS, HSDPA)
   d. 4G and Beyond (LTE, LTE advanced, EPS)
   e. 5G
8. Wireless Wide Area Networking
   a. IEEE802.16
9. Wireless Local Area Networking
   a. IEEE802.11 a/b/g/n/ac
10. Wireless Personal Area Networking
    a. Bluetooth/IEEE802.15.1
    b. IEEE802.15.4
11. Ad-hoc Networking & Wireless Sensor Networks
    a. Ad-hoc Networks
    b. Ad-hoc Routing protocols
    c. Wireless Sensor Platforms
    d. Wireless Sensor Power, Routing and Discovery Protocols
12. Location Based Services/Positioning
    a. GPS (Carriers, Messages, Pseudo-Random Code, Code/CARRIER Phase)
    b. Differential GPS, WAAS, LAAS, EGNOS, Galileo
    c. Network positioning (Cell-ID, CGI, E-CGI, AOA, TOA, OTD, EOTD, A-GPS)
13. Cognitive Networks
    a. Software Defined Radio
    b. Cognitive radio
    c. Dynamic Spectrum Access

Recommended Reading List


The lecture notes provided are supplemented with suitable reading material from appropriate IEEE and ACM journals.

Module Pre Requisite

Module Co Requisite

Assessment Details

Exam: 80%
Coursework: 20%

There will be two coursework assignments. One to be completed during the first six weeks of the module and a second will take place across the final five weeks of the module.
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