

## H8FMC: Fundamentals of Mobile Communications

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| <b>Module Code:</b>                                                          | H8FMC                                                                                                                                                            |
| <b>Long Title</b>                                                            | Fundamentals of Mobile Communications <b>APPROVED</b>                                                                                                            |
| <b>Title</b>                                                                 | Fundamentals of Mobile Communications                                                                                                                            |
| <b>Module Level:</b>                                                         | LEVEL 8                                                                                                                                                          |
| <b>EQF Level:</b>                                                            | 6                                                                                                                                                                |
| <b>EHEA Level:</b>                                                           | First Cycle                                                                                                                                                      |
| <b>Credits:</b>                                                              | 5                                                                                                                                                                |
| <b>Module Coordinator:</b>                                                   | CRISTINA HAVA MUNTEAN                                                                                                                                            |
| <b>Module Author:</b>                                                        | CRISTINA HAVA MUNTEAN                                                                                                                                            |
| <b>Departments:</b>                                                          | School of Computing                                                                                                                                              |
| <b>Specifications of the qualifications and experience required of staff</b> | <p>Master's degree or PhD in a computing or cognate discipline. May have industry experience also.</p> <p>Proposed Lecturer: Mr. Vikas Sahni, Dr. Paul Hayes</p> |
| <b>Learning Outcomes</b>                                                     |                                                                                                                                                                  |
| <i>On successful completion of this module the learner will be able to:</i>  |                                                                                                                                                                  |
| <b>#</b>                                                                     | <b>Learning Outcome Description</b>                                                                                                                              |
| LO1                                                                          | Assess the fundamental theory, concepts and principles behind wireless and mobile communications.                                                                |
| LO2                                                                          | Contrast different communication technologies used in wireless and mobile networks.                                                                              |
| LO3                                                                          | Evaluate and apply knowledge to a range of contexts and problems in the 'real world' of mobile communications.                                                   |
| LO4                                                                          | Specify, design and construct efficient and secure applications using Java's networking packages.                                                                |
| LO5                                                                          | Distinguish and evaluate security issues in wireless and mobile networks                                                                                         |
| <b>Dependencies</b>                                                          |                                                                                                                                                                  |
| <b>Module Recommendations</b>                                                |                                                                                                                                                                  |
| No recommendations listed                                                    |                                                                                                                                                                  |
| <b>Co-requisite Modules</b>                                                  |                                                                                                                                                                  |
| No Co-requisite modules listed                                               |                                                                                                                                                                  |
| <b>Entry requirements</b>                                                    |                                                                                                                                                                  |

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| Module Content & Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |                           |           |
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| Indicative Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                           |           |
| <b>Introduction to Wireless and Mobile Networking</b><br>• Introduction. • Definition of Terms. • History of Wireless Communication. • Wireless and Mobile Applications • Machine to Machine (M2M) Communication • Internet of Things (IoT)                                                                                                                                                                                                                                                          |                       |                           |           |
| <b>Wireless Network Applications</b><br>• Examine wireless technology and its applications • Assess wireless networking technologies • Review wireless network applications • Discuss the issues and constraints of a wireless network                                                                                                                                                                                                                                                               |                       |                           |           |
| <b>Wireless Transmission</b><br>• Frequencies Allocation • Regulations • Signal Propagation • Modulation of Digital Data • Narrowband and Wideband Modulation                                                                                                                                                                                                                                                                                                                                        |                       |                           |           |
| <b>Wireless LANs: Basics</b><br>• Infrastructure versus adhoc LANs • Project 802.11 • 802.11 MAC Layer • DCF versus PCF • CSMA versus CDMA • Scanning, Authentication and Association • Encryption, Handshaking, Fragmentation & Power Conservation • Hidden Station Problem                                                                                                                                                                                                                         |                       |                           |           |
| <b>Wireless LAN Standards</b><br>• IEEE 802.11 Wireless LAN Specification • IEEE 802.11b • IEEE 802.11a • IEEE 802.11g • IEEE 802.11as                                                                                                                                                                                                                                                                                                                                                               |                       |                           |           |
| <b>Bluetooth and Wireless PAN</b><br>• PAN Technologies • Bluetooth • Zigbee • RFID Technology                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                           |           |
| <b>Satellite Communication</b><br>• Positioning Systems and Technologies • Satellite Communication and Orbits • Global Positioning System (GPS) • Location-Based Services (LBS)                                                                                                                                                                                                                                                                                                                      |                       |                           |           |
| <b>Wireless Broadband</b><br>• 2nd Generation -GSM • 2.5 Generation -GPRS and EDGE • 3rd Generation - UMTS • HSPA • Business Drivers • Emerging Technologies and Standards • 4th Generation Technologies • WiMAX • Long-Term Evolution (LTE) • Integration and Convergence • Future Trends                                                                                                                                                                                                           |                       |                           |           |
| <b>Mobile IP Protocol</b><br>• Motivation and Requirements • Data Transfer using Tunneling • Encapsulation • Optimisation of Packet Forwarding • Reverse Tunneling • Mobile IP and IPv6 • Problems with Mobile IP • Mobility in Cellular Networks                                                                                                                                                                                                                                                    |                       |                           |           |
| <b>Security Issues</b><br>• Wireless Security Principles • Wireless LAN Threats • Wireless Authentication • 802.1X Security • GSM, UMTS and LTE Security • Secure Mobile Commerce • Browsing and Download Threats (Viruses etc.)                                                                                                                                                                                                                                                                     |                       |                           |           |
| <b>Network Programming 1</b><br>• Communication and Synchronisation • URLs and URIs: Description, URL and URI class, Communication with Server-side programs through GET, • URLConnections class: Opening URLConnections, Configuring the Connection Reading data from a Server, Reading the header, Writing data to a Server • TCP Sockets for Clients: Using Sockets classUsing ServerSockets class, Logging, Constructing Server Sockets, Getting information about Server Socket, Socket options |                       |                           |           |
| <b>Network Programming 2</b><br>Secure Sockets: Creating Secure Client Sockets, Creating Secure Server Sockets, Event Handlers, Configuring SSLServerSockets, Configuring SSLServerSockets • UDP Datagrams and Sockets: UDP Clients, UDP Servers The DatagramPacket Class, The DatagramSocket Class, Socket Options • Design, implementation and testing of mobile applications that use Sockets for Client-Server communication                                                                     |                       |                           |           |
| Assessment Breakdown                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                           | %         |
| Coursework                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                           | 40.00%    |
| End of Module Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                           | 60.00%    |
| Assessments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |                           |           |
| Full Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                           |           |
| Coursework                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                           |           |
| <b>Assessment Type:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Continuous Assessment | <b>% of total:</b>        | 40        |
| <b>Assessment Date:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | n/a                   | <b>Outcome addressed:</b> | 1,2,4     |
| <b>Non-Marked:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No                    |                           |           |
| <b>Assessment Description:</b><br>Assessment 1 (20%): Written assessment to assess the fundamental theory, concepts and principles behind wireless and mobile communications and apply the knowledge to contrast different communication technologies used in wireless and mobile networks. Assessment 2 (20%): Assessment for learners to demonstrate proficiency in specifying, designing and constructing efficient and secure applications using Java's networking packages.                     |                       |                           |           |
| End of Module Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                           |           |
| <b>Assessment Type:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Terminal Exam         | <b>% of total:</b>        | 60        |
| <b>Assessment Date:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | End-of-Semester       | <b>Outcome addressed:</b> | 1,2,3,4,5 |
| <b>Non-Marked:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No                    |                           |           |
| <b>Assessment Description:</b><br>End-of-Semester Final Examination                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                           |           |
| No Workplace Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |                           |           |
| Reassessment Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                           |           |
| <b>Repeat examination</b><br><i>Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.</i>                                                                                                                                                                                                                                                                                                 |                       |                           |           |
| <b>Reassessment Description</b><br>Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.                                                                                                                                                                                                                                                                                                  |                       |                           |           |

## H8FMC: Fundamentals of Mobile Communications

| Module Workload                      |                      |       |              |                                 |
|--------------------------------------|----------------------|-------|--------------|---------------------------------|
| Module Target Workload Hours 0 Hours |                      |       |              |                                 |
| Workload: Full Time                  |                      |       |              |                                 |
| Workload Type                        | Workload Description | Hours | Frequency    | Average Weekly Learner Workload |
| Lecture                              | No Description       | 24    | Per Semester | 2.00                            |
| Tutorial                             | No Description       | 12    | Per Semester | 1.00                            |
| Independent Learning                 | No Description       | 89    | Per Semester | 7.42                            |
| Total Weekly Contact Hours           |                      |       |              | 3.00                            |
| Workload: Part Time                  |                      |       |              |                                 |
| Workload Type                        | Workload Description | Hours | Frequency    | Average Weekly Learner Workload |
| Independent Learning Time            | No Description       | 89    | Every Week   | 89.00                           |
| Tutorial                             | No Description       | 12    | Every Week   | 12.00                           |
| Lecture                              | No Description       | 24    | Every Week   | 24.00                           |
| Total Weekly Contact Hours           |                      |       |              | 36.00                           |

| Module Resources                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
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| <i>Recommended Book Resources</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| <p>William Stallings. (2013), <i>Wireless Communications and Networks</i>, 2nd.</p> <p>Harold, E.R.. (2013), <i>Java Network Programming: Developing Networked Applications</i>, 4th Edition,. O'Reilly.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| <i>Supplementary Book Resources</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| <p>Forouzan, B.. (2012), <i>Data Communications and Networking</i>., 5th Edition. McGraw-Hill Education,.</p> <p>Forouzan, B.. (2010), <i>TCP/IP Protocol Suite</i>., 4th Edition.. McGraw-Hill Education,.</p> <p>Calvert. (2008), <i>TCP/IP Sockets in Java: Practical Guide for Programmers</i>, 2nd Edition. Morgan Kaufmann.</p> <p>Price, R.. (2006), <i>Fundamentals of Wireless Networking</i>., McGraw-Hill Higher Education.</p> <p>Jim Geier.. (2015), <i>Designing and deploying 802.11 wireless networks</i>, Indianapolis, IN; Cisco Press, p.600., [ISBN: 1587144301].</p> <p>Jan Høller...[et al.]. (2014), <i>From machine-to-machine to the Internet of things</i>, Amsterdam; Elsevier Academic Press, p.xix, 331 :, [ISBN: 012407684X].</p> |  |
| <i>This module does not have any article/paper resources</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| <i>This module does not have any other resources</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <b>Discussion Note:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |