Module Descriptor

Title	Advanced Wireless Networking Technologies		
Session	2025/26	**Status**	Published
Code	COMP11058	**SCQF Level**	11
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Qi Wang		

Summary of Module

In pursuit of pervasive, cost-effective and high-quality applications and services from anytime, any access network and any smart devices, wireless networking technologies have been experiencing rapid and major changes and gained substantial advances and momentum worldwide in recent years. Evolutionary or revolutionary progress has been achieved at various levels from the perspective of a reference wireless networking protocol stack. For instance, mobile video applications now account for over 50% of total global mobile data traffic. The underlying networking protocols such as mobility management, medium access control and access networks of complementary coverage and capabilities also keep being developed to match the ever-increasing demands in terms of quality of service and experience. Up-to-date, systematic and insightful knowledge and understanding of these latest developments is essential for analysing, planning and deploying smart networks by leveraging and integrating such knowledge and understanding. This module covers the following key aspects of advanced wireless networking technologies, following a top-down approach with a focus on the data link layer and above:

- Wireless applications chapter addresses video over wireless Internet Protocol (IP) networks, with the latest video codecs highlighted.
- 4G chapter focuses on LTE and LTE-Advanced standards.
- 5G chapter presents applications, enabling technologies and related standards in 5G mobile networks.
- Self-organising networking chapter presentes autonomous network management for 5G networks.
- Enterprise Mobility Management (EMM) chapter discusses Mobile Device Management and Mobile Application Management technologies in a business context.
- Wireless local-area networks chapter introduces the latest WiFi standards and enterprise-class wireless/mobile solutions.
- This module will work to develop a number of the key 'I am UWS' Graduate Attributes to make those who complete this module: Universal • Critical Thinker • Ethically-minded • Research-minded Work Ready • Problem-Solver • Effective Communicator • Ambitious Successful • Autonomous • Resilient • Driven

Module Delivery Method	On-Campus[1] ☐	Hybrid[2] ☐	Online[3] ☒	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☐ Paisley	☒ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Demonstrate a systematic, comprehensive understanding of the state-of-the-art concepts, principles, technologies, methodologies, processes, architectures, and standards for up-to-date wireless (including mobile) networking technologies/systems.
L2	Interpret and critically analyse wireless network protocols and other networking information
L3	Demonstrate critical evaluation of wireless networks and the performance of wireless applications with well-defined metrics.
L4	Demonstrate a critical awareness of the capabilities of current and latest wireless networking technologies at, or informed by, the forefront professional practice and research, especially the planning, deployment and management of enterprise-level wireless networks.
L5	Investigate and analyse the requirements and criteria for an integrated wireless networking system given an application or business scenario, and recommend suitable design, development and deployment strategy considering technology-business alignment and performance-cost trade-off.

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	**During completion of this module, there will be an opportunity to achieve core skills in:**
Knowledge and Understanding (K and U)	**SCQF 11** SCQF11 Students will learn systematic, detailed knowledge and acquire critical understanding of various wireless networking concepts, theories, principles and technologies, especially the latest standards in wireless applications and systems of different protocol layers. They will

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

	be familiar with the key technical features, capabilities, functions, processes and applicability, advantages and disadvantages in a specific wireless technology, terminology and conventions of a range of wireless systems and solutions. They will obtain knowledge and understanding of the commercial and economic context of the technology evolution, and issues related to the operation, management, maintenance of wireless systems. They will also carry out a critical literature and technical review to meet the partial requirements for their written assignment.
Practice: Applied Knowledge and Understanding	**SCQF 11** SCQF11 Students will gain in-depth, comprehensive understanding and critical awareness of knowledge of wireless networking technologies, and the ability to apply this in planning, deploying, evaluating and managing wireless/mobile solutions. They will also develop capabilities to apply a range of standard and specialised wireless networking research skills, tools/software, devices and related techniques in response to business requirements for their written assignments and laboratory tasks. In addition, innovation and creativity is encouraged in students' written assignments in designing solutions to address practical business/application requirements.
Generic Cognitive skills	**SCQF 11** SCQF11 To complete their written reports and laboratory tasks, students will first build skills to integrate information and apply knowledge from various sources including technology advances informed by research and industry. . Furthermore, they will develop capabilities to apply critical analysis, performance evaluation and system integration to forefront wireless networking issues, and skills to critically review, consolidate and extend knowledge, skills and thinking to solve practical wireless networking problems.
Communication, ICT and Numeracy Skills	**SCQF 11** SCQF11 Working in interacting groups for the labs, students will develop technical communication skills with peers and the lecturer. They will also develop the ability to write formal technical reports and documentation. The lectures/tutorials on Medium Access Control (MAC) theories, wireless network site survey etc. will develop their numeracy skills through various calculations. The numerical performance analysis and evaluation will require them to undertake critical evaluations of numerical and graphical data gathered from real-life wireless applications. The labs will develop advanced ICT skills through using standard and specialised wireless networking tools/applications and devices such as Wireshark, VirtualBox/VirtualPC, Wi-Fi routers and WiMAX base stations and client equipment.
Autonomy, Accountability and Working with Others	**SCQF 11** SCQF11 Each student in each group will be responsible of finding and summarizing information about the assigned task in their laboratory tasks. Students will elect a coordinator and develop a sense of accountability/responsibility to the group members. Each student will conduct an independent, in-depth off-line research to complete his/her individual written assignment, thereby developing autonomy and initiative in such professional activities. The written assignment also requires each student to make informed judgement on technology-business alignment. In addition, he/she will critically reflect on the planning/designing process and his/her own PDP development through this module and how his/her employability has been improved.

Prerequisites	Module Code	Module Title
	Other	
Co-requisites	Module Code	Module Title

Learning and Teaching

In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.

The module will be delivered by means of lectures, tutorials and practical lab work aimed at developing the knowledge and skills required to confidently manage a wireless/mobile network. The lectures will introduce various types of wireless/mobile technologies with a focus on enterprise-class wireless local area networks and develop the essential tasks involved in the design and implementation of wireless networking and mobile computing technologies while the follow-on lab work will enable students to put into practice what they have learned. The tutorial sessions will help consolidate both the lecture material and the skills practiced during the lab work. The delivery plan is as follows.

Indicative Lecture Topics:

Module introduction

Wireless applications: Part I

Wireless applications: Part II

Wireless wide-area networks: Part I

Wireless wide-area networks: Part II

Self-organising networking

Enterprise Mobility management

Wireless local-area networks

Module revision session

Indicative Lab/Tutorial Topics:

Tutorial on quantifying wireless application performance

Tutorial on mobile networking and application protocol analysis

Lab on wireless application

Lab on mobile networking protocol analysis

Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	24
Tutorial / Synchronous Support Activity	12
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152

Please select	
Please select	
TOTAL	200

Indicative Resources

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Castaneda, H. et al. (2006) The Business Case for Enterprise-Class Wireless LANs. Cisco Press.

IEEE Xplore digital library. (2016) [Online] Available: http://ieeexplore.ieee.org/Xplore/home.jsp [Accessed: 12 Feb 2016].

Sanders, C. (2011) Practical Packet Analysis: Using Wireshark to Solve Real-World Network Problems. 2nd Edition. No Starch Press.

Varshney, U. (2012) 4G Wireless Networks. IT Professional. Vol. 14(5), pp. 34-39.

VirtualBox. (2016) [Online] Available: https://www.virtualbox.org/ [Accessed: 12 Feb 2016].

VLC media player. (2016) [Online] Available: http://www.videolan.org/index.html [Accessed: 12 Feb 2016].

Wireshark packet analyser. (2016) [Online] Available: http://www.wireshark.org/ [Accessed: 12 Feb 2016].

Wong, D. (2012) Fundamentals of Wireless Communication Engineering Technologies. Wiley.

EU 5G PPP Architecture Working Group, "5G PPP View on 5G Architecture", June/July 2016, available at https://5g-ppp.eu/white-papers/.

GSMA. (2014) Understanding 5G: Perspectives on Future Technological Advancements in Mobile. Dec 2014, https://gsmaintelligence.com/research/?file=141208-5g.pdf&download [Accessed: 12 Feb 2016].

Ohm, J. and Sullivan, G.J. (2013). High Efficiency Video Coding: The Next Frontier in Video Compression [Standards in a Nutshell], IEEE Signal Processing Magazine, vol.30, no.1, pp.152-158.

(N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will login to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify the Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

Equality and Diversity
The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code. Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Computing**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Business & Applied Computing
Moderator	J Alcaraz Calero
External Examiner	A Esfahani
Accreditation Details	
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	1.14

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
This written assignment is an individual report, accounting for 60% of the total marks for this module. The purpose of this assessment is to achieve the corresponding learning outcomes set in the module's descriptor with a focus on L02 and LO3: • L2. Interpret and critically analyse wireless network protocols and other networking information. • L3. Demonstrate critical evaluation of wireless networks and the performance of wireless applications with well-defined metrics. Each student will produce a formal, individual academic report in the format of reporting solutions for a series of practical tasks aligned to the labs in this module, together with associated questions. The report will demonstrate the knowledge and skills learnt especially in relation to the above learning outcomes. The report must contain evidence of practical work using the tools from the labs in completing tasks that are similar to those in the labs.

In addition, the report requests a student to perform necessary off-line research to extend knowledge and skills in order to fulfil additional related practical tasks or answer corresponding questions. The report also gives a student the opportunity to define a task based on his/her own interest and explore the solution to it.

Assessment 2

This written assignment is an individual report, accounting for 40% of the total marks for this module. The purpose of this assessment is to achieve the corresponding learning outcomes (LOs) set in the module's descriptor with a focus on L01, L04, and LO5:

• L1. Demonstrate a systematic, comprehensive understanding of the state-of-the-art concepts, principles, technologies, methodologies, processes, architectures, and standards for up-to-date wireless (including mobile) networking technologies/systems.

• L4. Demonstrate a critical awareness of the capabilities of current and latest wireless networking technologies at, or informed by, the forefront professional practice and research, especially the planning, deployment and management of enterprise-level wireless networks.

• L5. Investigate and analyse the requirements and criteria for an integrated wireless networking system given an application or business scenario, and recommend suitable design, development and deployment strategy considering technology-business alignment and performance-cost trade-off.

Each student will produce a formal, individual academic report in the theme of business-technology alignment for a smart wireless/mobile networking solution.

The report requests a student to demonstrate a deep understanding and practical application of the theories and technologies learnt and perform off-line research and design for a selected practical and significant business application scenario using advanced wireless networking and mobile computing technologies.

It requires self-critical evaluation of the effectiveness and commercial risks (including security/privacy management) of the proposed technologies, and critical review of current problems, concerns and constraints and future development directions.

Innovation such as innovative/creative application or integration of new technologies will be highly encouraged.

Assessment 3

(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed.

(ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Component 1

Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Report of practical/ field/ clinical work	☐	☒	☒	☐	☐	60	0

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Design/ Diagram/ Drawing/ Photograph/ Sketch	☒	☐	☐	☒	☒	40	0

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	hours

Change Control

What	When	Who
Attendance, EDI and External Examiner updated	22/01/2025	A Adamson