H9TIT: Technologies for Internet of Things

Module Code:	H9TIT
Long Title	Technologies for Internet of Things APPROVED
Title	Technologies for Internet of Things
Module Level:	LEVEL 9
EQF Level:	7
EHEA Level:	Second Cycle
Credits:	5
Module Coordinator:	CRISTINA HAVA MUNTEAN
Module Author:	Cheryl Cooney
Departments:	School of Computing
Specifications of the qualifications and experience required of staff	

Learning Outcomes	
On successful completion of this module the learner will be able to:	
#	**Learning Outcome Description**
LO1	Demonstrate comprehensive knowledge of underlining technologies that support Internet of Things (IoT) and the M2M communications
LO2	Investigate the M2M communications, and critically assess the issues that exist and the proposed solutions
LO3	Integrate the wireless technologies to create innovative IoT applications and services
LO4	Design and develop simulation scenarios for IoT applications using network simulator software tools.

Dependencies
Module Recommendations
No recommendations listed
Co-requisite Modules
No Co-requisite modules listed

Entry requirements	

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Module Content & Assessment

Indicative Content
Internet of Things (IoT) Principles and Fundamentals (20%) • From Internet to Internet of Things: opportunities, challenges, demand for new services • IoT enablers: energy, intelligence, communication, integration of smart devices, standards • IoT architectures, networking and communications • RFID technology, smart sensors and sensor networks • IoT Services and applications
Mobile Communication Principles (10%) • Basic networking principles such as layered architecture, connection-oriented vs. connectionless service, TCP/IP protocol suite, • Summary of major issues differentiating wireless and wired networks: • Mobility, handover, connectivity.
Machine-to Machine (M2M) Communication (20%) • M2M market (e.g. Healthcare, transportation, energy, etc.) and its analysis • Usage models and potential customers • M2M high level architecture • Examples of deployed M2M services (e.g. Smart Telemetry, Surveillance and security, Vending Machines, eHealth) • M2M Security issues and solutions (e.g. public key, smart card)
Wireless Technologies enabling IoT (30%) • Wireless communication modes: Infrastructure and ad-hoc • Emphasis on MAC and PHY layer issues • QoS and Mobility support • Wireless PAN: principles, protocols(e.g. Bluetooth, ZigBee) • Wireless LAN: principles, characteristics, protocols (e.g. 802.11, Wi-Fi) • Wireless MAN: , principles, characteristics, protocols(e.g. WiMax) • Application layer protocols: CoAp, HTTP, MQTT. • IoT Standardization: challenges and issue (e.g. Interoperability, Security and Privacy, Device and Systems Management, Device/Object Identity, etc); standardisation efforts in CASAGARAS, W3C, ANEC, etc.
Simulation of wireless networks and IoT application and services (20%) • Introduction on network simulator tools (e.gNS-3, Contiki, LTE-SIM, OMNET,OPNET) • Design, modelling and simulation of wireless networks enabling IoT using network simulator tools. • Design and implementation of simulation experiments deploying IoT and M2M applications/services

Assessment Breakdown	%
Coursework	30.00%
End of Module Assessment	70.00%

Assessments

Full Time

Coursework

Assessment Type:	Practical (0260)	**% of total:**	30
Assessment Date:	n/a	**Outcome addressed:**	3,4
Non-Marked:	No		

Assessment Description:
Practical work will be conducted throughout the semester to assess the learner's skills in terms of design, model and implement a simulation scenario for a given case study IoT service, using an appropriate network simulator package. Practical work will involve working in a team.

End of Module Assessment

Assessment Type:	Terminal Exam	**% of total:**	70
Assessment Date:	End-of-Semester	**Outcome addressed:**	1,2,3,4
Non-Marked:	No		

Assessment Description:
End-of-Semester Final Examination

No Workplace Assessment

Reassessment Requirement

Repeat examination
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.

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Module Workload

Module Target Workload Hours 0 Hours

Workload: Full Time

Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	No Description	1	Per Semester	0.08
Tutorial	No Description	1	Per Semester	0.08
Independent Learning Time	No Description	8.5	Per Semester	0.71
			Total Weekly Contact Hours	0.17

Workload: Part Time

Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	No Description	1	Per Semester	0.08
Tutorial	No Description	1	Per Semester	0.08
Independent Learning Time	No Description	8.5	Per Semester	0.71
			Total Weekly Contact Hours	0.17

Module Resources

Recommended Book Resources

David Boswarthick, Omar Elloumi, Oliver Hersent. (2012), M2M Communications: A Systems Approach, 1st Edition. Wiley.

Daniel Wong. (2012), Fundamentals of Wireless Communication Engineering Technologies (Information and Communication Technology Series, Wiley-Blackwell.

Supplementary Book Resources

William Stallings. (2010), Data and Computer Communications, 9/E,, Prentice Hall.

Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stephan Avesand, Stamatis Karnouskos, David Boyle. (2014), From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition. Academic Press.

This module does not have any article/paper resources

Other Resources

[Online Documents], NS-3,
http://www.nsnam.org

[Online Documents], Bluetooth Tutorial,
http://www.palowireless.com/infotooth/tu torial.asp, 113, 0,

[Online Documents], The Nuts and Bolts of WiMAX,
http://www.embedded.com/columns/technica linsights/201802589?cid=RSSfeed_embedded _news, 114, IEC, 0,

Discussion Note:	