

Subject Description Form

Subject Code	EIE589
Subject Title	Wireless Data Network
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	The students are expected to have some basic knowledge about IP networks.
Objectives	<ol style="list-style-type: none"> 1. To introduce the fundamental issues, concepts, and design principles in wireless data networks and systems. 2. To understand the key concepts towards 4G and 5G Wireless and the convergence of cellular network and the Internet 3. To introduce Low-Power Wide-Area Networks for Internet of Things (IoT) 4. To understand software defined network and network function virtualization.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p>(1) Professional/academic knowledge and skills</p> <ol style="list-style-type: none"> a. Understand network topology, layered architecture and protocols of current and emerging wireless data network systems and their standards. <p>(2) Attributes for all-roundedness</p> <ol style="list-style-type: none"> b. Communicate effectively. c. Think critically and creatively. d. Assimilate new technological development in related field.
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. Internet standards <ol style="list-style-type: none"> 1.1. IETF work on IPv6 and transition from IPv4 to IPv6 1.2. IPv6 prefix allocation, DNSSEC 1.3. Internet mobility 1.4. IPv6 security 2. Cellular Networks: 4G towards 5G Wireless <ol style="list-style-type: none"> 2.1. Overview of cellular networks standards 2.2. Radio Access Network: key concepts in 3GPP Long Term Evolution (LTE) 2.3. Core Network: 3GPP Evolved Packet Core (EPC) 2.4. Connection and session management 2.5. 5G Wireless 3. Low-Power Wide-Area Networks for IoT <ol style="list-style-type: none"> 3.1. Overview of long range communications at a low bit rate among things 3.2. Protocols in non-licensed band: LoRa, Sigfox 3.3. 3GPP Protocols in licensed band: LTE-M, EC-GSM, NB-IoT 4. Software defined network and Network virtualization <ol style="list-style-type: none"> 4.1. Distributed versus centralized routing control 4.2. Software defined network 4.3. Virtualization in information technology and networking 4.4. Service function chaining

Teaching/Learning Methodology	<p>Internet and Wireless networks are taught with emphasis on fundamental understanding of the architecture, components, and protocols. The fundamentals of Internet are taught with IPv6 protocols defined in Internet Engineering Task Force (IETF). The latest developments towards 5G Wireless standards are explained. New concepts of software defined network and network function virtualization will be presented together with emerging cellular network designs and standards. These examples will help students not only to learn the theoretical material but also to understand the practical issues. The students will be able to understand the challenges associated with the latest generations of wireless networks and get an insight into new techniques under development.</p>																																	
	Teaching/Learning Methodology		Intended Subject Learning Outcomes																															
		a	b	c	d																													
Lecture		✓																																
Tutorial		✓		✓																														
Case study		✓	✓	✓	✓																													
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1"> <thead> <tr> <th data-bbox="430 699 768 835" rowspan="2">Specific assessment methods/tasks</th> <th data-bbox="768 699 922 835" rowspan="2">% weighting</th> <th colspan="4" data-bbox="922 699 1458 793">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th data-bbox="922 793 1052 835">a</th> <th data-bbox="1052 793 1182 835">b</th> <th data-bbox="1182 793 1312 835">c</th> <th data-bbox="1312 793 1458 835">d</th> </tr> </thead> <tbody> <tr> <td data-bbox="430 835 768 903">1. Midterm test</td> <td data-bbox="768 835 922 903">40%</td> <td data-bbox="922 835 1052 903">✓</td> <td data-bbox="1052 835 1182 903">✓</td> <td data-bbox="1182 835 1312 903">✓</td> <td data-bbox="1312 835 1458 903">✓</td> </tr> <tr> <td data-bbox="430 903 768 970">2. Final examination</td> <td data-bbox="768 903 922 970">60%</td> <td data-bbox="922 903 1052 970">✓</td> <td data-bbox="1052 903 1182 970">✓</td> <td data-bbox="1182 903 1312 970">✓</td> <td data-bbox="1312 903 1458 970">✓</td> </tr> <tr> <td data-bbox="430 970 768 1039">Total</td> <td data-bbox="768 970 922 1039">100%</td> <td data-bbox="922 970 1052 1039"></td> <td data-bbox="1052 970 1182 1039"></td> <td data-bbox="1182 970 1312 1039"></td> <td data-bbox="1312 970 1458 1039"></td> </tr> </tbody> </table> <p data-bbox="430 1050 1471 1123">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p data-bbox="430 1134 1471 1207">Assignments let students review the taught materials, do further reading for deeper learning and apply the learnt materials to solving circuit design problems.</p> <p data-bbox="430 1218 1471 1291">Case study requires the student to do further reading, search for information, keep abreast of current development, give a presentation and write a report.</p>						Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				a	b	c	d	1. Midterm test	40%	✓	✓	✓	✓	2. Final examination	60%	✓	✓	✓	✓	Total	100%				
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Total	100%																																	
Student Study Effort Expected	Class contact:																																	
	▪ Lecture/Tutorial		33 Hrs.																															
	▪ Case study – presentations and discussions		6 Hrs.																															
	Other student study effort:																																	
	▪ Lecture: further reading, doing homework /assignment		72 Hrs.																															
	Total student study effort		111 Hrs.																															
Reading List and References	<ol style="list-style-type: none"> <li data-bbox="430 1732 1471 1837">1. “5G System Design”, Wan Lei, Anthony C.K. Soong, Liu Jianghua, Wu Yong, Brian Classon, Weimin Xiao, David Mazzaresse, Zhao Yang, Tony Saboorian, Springer, 2020 <li data-bbox="430 1837 1471 1900">2. “5G Mobile Communications”, Wei Xiang, Kan Zheng, Xuemin (Sherman) Shen, Springer, 2017 <li data-bbox="430 1900 1471 1963">3. “Wireless Communications: Principles, Theory and Methodology,” Keith Q.T. Zhang, Wiley, 2016 <li data-bbox="430 1963 1471 2003">4. “Data Communications and Networking”, Behrouz A. Forouzan, McGraw-Hill, 																																	

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	5. 3GPP standards: http://www.3gpp.org
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	6. IETF rfc in IPv6 and transition from IPv4 to IPv6: http://tools.ietf.org/html/rfcxxxx
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