

Subject Description Form

Subject Code	COMP5425
Subject Title	Multimedia Coding and Networking
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	The students are recommended to have general knowledge about signals and systems
Objectives	<p>The objectives of this course are:</p> <ol style="list-style-type: none"> 1. to teach the students comprehensive and in-depth knowledge in multimedia coding and networking, including coding of speech, audio, image, and video signals and networking of multimedia data over both Internet and broadband wireless channels 2. to apply the knowledge learned in this class to solve real-life problems in speech coding, audio coding, image/video coding, as well as networked transport of various multimedia data.
Intended Learning Outcomes (Note 1)	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> (a) Develop and understand the insights into multimedia data types in speech, audio, image and video, in particular unique characteristics for each of these data type for efficient encoding and representation; (b) Develop and understand the special Quality of Service requirements for transporting multimedia data over both wired and wireless networks; (c) Acquire in-depth knowledge of the algorithmic principles for the encoding of multimedia signals as well as practical strategies designed to transport multimedia data when there are errors in networking; and (d) Apply multimedia coding and networking technologies learned in this course to develop working solutions for the technical problems encountered in practical scenarios.
Subject Synopsis/ Indicative Syllabus (Note 2)	<p>The content of the subject consists of three parts as follows, including both theoretical foundations and practical system designs:</p> <p><u>Part 1: Theoretical foundation of multimedia signal coding</u></p> <ol style="list-style-type: none"> (a) Speech generation and representation; (b) Audio generation and representation; (c) Image and video acquisition and representation; (d) Information theory basics, concept of entropy (e) Analog-to-digital conversion, signal quantization <p><u>Part 2: Theoretical foundation of networking and communications</u></p> <ol style="list-style-type: none"> (a) Basic layered concept for networking; (b) TCP/IP protocols, UDP protocols, Real-Time protocols (c) Networking Quality-of-Service (QoS) measures; (d) Network traffic shaping principles, multimedia transcoding; (e) Wireless networking principles, broadband networking; (f) Transport of multimedia data, multimedia networking QoS

	<p><u>Part 3: Practical multimedia coding and networking algorithms and designs</u></p> <p>(a) Speech encoding/decoding techniques and standards; (b) Audio coding techniques and standards; (c) Image coding techniques and standards; (d) Video coding techniques and standards; (e) Rate adaptative transmission of multimedia data; (f) Error protection of multimedia networking; (g) wireless networking of images and videos</p>																																																												
<p>Teaching/Learning Methodology</p> <p>(Note 3)</p>	<ol style="list-style-type: none"> 1. A total of 39 hours of classroom activities including lecture, tutorial, and seminars where applicable 2. Learning is supplemented by homework and tutorials 3. The students are assessed through assignments, project, midterm exam and final exam 																																																												
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p> <p>(Note 4)</p>	<table border="1" data-bbox="534 801 1484 1310"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1. Homework</td> <td>25</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Midterm Exam</td> <td>20</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Project</td> <td>20</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>4. Final Exam</td> <td>35</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td colspan="6"></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Homework: designed to assess the theoretic studies with respect to the understanding of relevant subject matters including new concepts, algorithms and techniques by proving answers to the assignment questions</p> <p>Midterm and final exams: designed to assess the overall performance of each student in grasping the concepts and algorithms learned in this course through both midterm and final exam</p> <p>Project: designed to assess students’ ability for problem solving through real case studies and algorithmic implementation of some prototype multimedia coding and networking systems for demonstration</p>							Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed						a	b	c	d			1. Homework	25	√	√	√				2. Midterm Exam	20	√	√	√				3. Project	20	√	√	√	√			4. Final Exam	35	√	√	√				Total	100%						
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<p>Student Study Effort Expected</p>	<p>Class contact:</p> <ul style="list-style-type: none"> ▪ Lecture ▪ Seminar/ Tutorial <p>Other student study effort:</p>						<p>33 Hrs.</p> <p>6 Hrs.</p>																																																						

	<ul style="list-style-type: none"> ▪ Homework 	39 Hrs.
	<ul style="list-style-type: none"> ▪ Projects 	26 Hrs.
	Total student study effort	104 Hrs.
Reading List and References	<p>A. <u>Required Textbook</u></p> <p>Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia, 3rd Ed., Springer, 2021 Edition (ISBNs: 978-3-03-062124-7, 978-3-03-062123-0)</p> <p>B. <u>Recommended Reading</u></p> <p>Jeng-Neng Hwang, Multimedia Networking: from Theory to Practice, Cambridge University Press, 2009 (ISBN 978-0-521-88204-0)</p> <p>C. <u>Recent Papers from Multimedia Journals and Conferences</u></p>	

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.