

### Subject Description Form

<b>Subject Code</b>	EIE4435
<b>Subject Title</b>	Image and Audio Processing
<b>Credit Value</b>	3
<b>Level</b>	4
<b>Pre-requisite</b>	EIE3312 Linear Systems or EIE3103 Digital Signals and Systems
<b>Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	To provide a broad treatment of the fundamentals in image and audio processing.
<b>Intended Subject Learning Outcomes</b>	<p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand the fundamentals of image and audio signal processing and associated techniques.</li> <li>2. Understand how to solve practical problems with some basic image and audio signal processing techniques.</li> <li>3. Have the ability to design simple systems for realizing some multimedia applications with some basic image and audio signal processing techniques.</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. Present ideas and findings effectively.</li> <li>5. Learn independently.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Image processing</u> <ol style="list-style-type: none"> <li>1.1 Fundamentals of digital image: Digital image representation and visual perception, image sampling and quantization.</li> <li>1.2 Image enhancement: Histogram processing; Median filtering; Low-pass filtering; High-pass filtering; Spatial filtering; Linear interpolation, Zooming.</li> <li>1.3 Image coding and compression techniques: Scalar and vector quantizations; Codeword assignment; Entropy coding; Transform image coding; Wavelet coding; Codec examples.</li> <li>1.4 Image analysis and segmentation: Feature extraction; Histogram; Edge detection; Thresholding.</li> <li>1.5 Image representation and description: Boundary descriptor; Chaincode; Fourier descriptor; Skeletonizing; Texture descriptor; Moments.</li> </ol> </li> <li>2. <u>Audio processing</u> <ol style="list-style-type: none"> <li>2.1 Fundamentals of digital audio: Sampling; Dithering; Quantization; psychoacoustic model.</li> <li>2.2 Basic digital audio processing techniques: Anti-aliasing filtering; Oversampling; Analog-to-digital conversion; Dithering; Noise shaping; Digital-to-analog Conversion; Equalisation.</li> <li>2.3 Digital Audio compression: Critical bands; threshold of hearing; Amplitude masking; Temporal masking; Waveform coding; Perceptual coding; Coding techniques: Subband coding and Transform coding.</li> <li>2.4 Case Study of Audio System/Codecs: MP3; MP3-Pro; CD; MD; DVD-Audio; AC-3; Dolby digital; Surround; SRS Surround system; Digital Audio Broadcasting, etc.</li> </ol> </li> </ol>

	<b>Laboratory Experiments:</b> <ol style="list-style-type: none"> <li>1. Image processing techniques</li> <li>2. Image compression</li> <li>3. Audio compression</li> <li>4. Psychoacoustic behaviour</li> </ol>																																																																
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	Laboratory sessions	Students are required to conduct some laboratory works, and produce the written reports; The accuracy and presentation of the report will be assessed; the emphasis is on assessing the students' ability to apply knowledge and skills learned in lectures, and their ability to relate the taken data and results to the most relevant theory.
<b>Student Study Effort Expected</b>	<b>Class contact (time-tabled):</b>	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	<b>Other student study effort:</b>	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	<b>Total student study effort:</b>	<b>105 Hours</b>
<b>Reading List and References</b>	<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. R.C. Gonzalez and R.E. Woods, <i>Digital Image Processing</i>, 2<sup>nd</sup> ed., Prentice-Hall, 2002.</li> <li>2. Ken C. Pohlmann, <i>Principles of Digital Audio</i>, 4<sup>th</sup> ed., McGraw-Hill, 2000.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Ze-Nian Li and Mark S. Drew, <i>Fundamentals of Multimedia</i>, Pearson Prentice-Hall, 2004.</li> <li>2. M. Mandal, <i>Multimedia Signals and Systems</i>, Kluwer Academic Publishers, 2003.</li> </ol>	
<b>Last Updated</b>	January 2018	
<b>Prepared by</b>	Dr Chris Chan	