Title (Units): **COMP 3060 Digital Media Computing (3,*2*,*2*)**

Course Aims: Students will learn basic properties of different types of digital media, namely audio, image and video in multimedia systems. Students will then learn the digital media data compression algorithms as well as their international standards. Data compression is the most important enabling technology that makes modern multimedia systems possible.

Prerequisite: COMP 1210 Data Structures and Algorithms
MATH 1140 Computational Mathematics

Learning Outcomes (LOs):
Upon successful completion of this course, students should be able to:

No.	Learning Outcomes (LOs)
	Knowledge
1	Describe different digital media applications and the importance of media compression
2	Explain and describe the fundamental concept of lossy and lossless compression.
3	Explain and describe the principle of audio, image and video compression algorithms and the current standards
	Professional Skill
4	Design and develop a digital media compression algorithm using existing available libraries.
	Attitude
5	Build up team spirit
6	Enhance self-learning capability

Calendar Description: This course introduces basic properties of different types of digital media, namely audio, image and video in multimedia systems. As data compression is the most important enabling technology that makes modern multimedia systems possible, data compression algorithms and the international standards of these digital media will be discussed.

Assessment:

No.	Assessment Methods	Weighting	Remarks
1	Continuous Assessment	30%	Students are required to develop a digital media project in a small group. 25% is allocated for the group project. The remaining 5% is allocated for assignment(s) and/or mid-term test.
2	Examination	70%	The final examination is designed to evaluate students' understanding in different parts. The questions will include fundamental, analytic and design types in order to distinguish different levels of understanding of digital media computing.

Assessment Rubrics:

Level of Achievement	Elaboration on Course Grading Description
Excellent (A)	The student's performance is outstanding in almost all the intended course learning outcomes.
Good (B)	The student's performance is good in most of the intended course learning outcomes.
Satisfactory (C)	The student's performance is satisfactory. It largely meets the intended course learning outcomes.
Marginal Pass (D)	The student's performance is barely satisfactory. It marginally meets the intended course learning outcomes.
Fail (F)	The student's performance is inadequate. It fails to meet many of the intended course learning outcomes.

Learning Outcomes and Weighting:

Content	LO No.
I: Multimedia Data Representation	1-4
II and III: Lossy and Lossless compression	2
IV- VII: Audio, image and video compression techniques and standards	3-4
Group Project	4-6

References:

Z Li and M S Drew, Fundamentals of Multimedia, Prentice Hall, 2004.

R Steinmetz and K Nahrstedt, Multimedia Fundamentals Volume 1: Media Coding and Content Processing, Prentice Hall, 2002.

Alistair Moffat and Andrew Turpin, Compression and Coding Algorithms, Kluwer Academic Publishers, 2002

Course Content in Outline:

Topic

I. Multimedia Data Representation
   A. Graphics and image
   B. Color in image and video
   C. Fundamental concepts in video
   D. Basics of digital audio

II. Lossless Compression Algorithms
   A. Basics of information theory
   B. Run-length coding
   C. Variable-length coding
   D. Hoffman coding
   E. Dictionary-based coding
   F. Arithmetic coding

III. Lossy Compression Algorithms
   A. Distortion measures
   B. Quantization
   C. Transform coding
   D. Wavelet-based coding

IV. Image Compression
   A. JPEG algorithm
   B. JPEG 2000 algorithm

V. Basic Video Compression Techniques
   A. Motion compensation
   B. Motion vectors
   C. Inter-frame coding
   D. Inter-frame coding

VI. Video Compression
   A. H.261 algorithm
   B. MPEG 1 algorithm
   C. MPEG 2 Algorithm
   D. Introduction to MPEG 4, MPEG 7

VII. Audio Compression
   A. PCM, DPCM, ADPCM
   B. Psychoacoustics
   C. MPEG audio compression algorithm