Multimedia
Module No: CM0340




About This Course

Aims of Module

- Single Module
  - Lectures — 2 Hours of Lectures weekly.
  - Tutorials
  - Labs — Multimedia Lab (C 2.10, Lab 4) 1 hour per student. **Weekly from week 2**.

Assessment:

- Exam 80%
- Coursework 20%




- Lecturer
  - Prof David Marshall
  - Email: Dave.Marshall@cs.cf.ac.uk
  - Office: S/2.20

Relationship with previous modules

- MATLAB will be used for examples and demos – basics covered in CM2202;
  - more practice in lab classes
- Difficult maths already covered in CM2202!




Course Material

http://www.cs.cf.ac.uk/Dave/Multimedia/

Course material will also be available on *Blackboard* (*Learning Central*).

- PDFs of Slides (Colour)
- Coursework material.
- PDF — Additional Notes.
- HTML based notes
- Lots of Links to other material
- Always under Development — More to be added

Info also on Learning Central

- **linked to above Web pages**




Outline of Course

- Basic grounding in issue surrounding multimedia,
- Multimedia data:
  - Digital audio, graphics, images and video, etc.,
  - Underlying concepts and representations of sound, pictures and video,
  - Audio/Digital signal processing fundamentals — filtering, audio synthesis **Follows on from CM0268**
- Data compression — JPEG/GIF, MPEG video and MPEG Audio.
  - Core data compression algorithms in JPEG/MPEG etc.
- Transmission and Integration of media.
- Multimedia applications: e.g. content based retrieval.




Practical Work

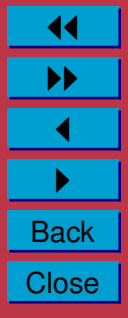
Assessed Coursework

A small assessed practical programming "mini-project" based on **Multimedia digital audio synthesis/signal processing**.

Important Dates:
Hand Out: Week 3
Hand In: Week 10

MATLAB Programming Examples and Coursework

All module lecture/tutorial examples and the programming elements of the coursework will use **MATLAB**.



Outline of Module Delivery (1)

Lectures

- Focus on main theory of module.
- Lots of Demos:
  - Essential help for Assessed Coursework
  - MATLAB Examples explained in depth
  - **Interactive** — Questions and Answers please.
- Time:
  - Monday 3-4 pm
  - Friday 12-1pm




Back
Close

Outline of Module Delivery (2)

Tutorials

- Revision of key aspects:
  Filtering, Frequency Space (Fourier Transform).
- Focus on practical/programming elements of module prior to Lab Class (Follows immediately after).
- Further Explanation of Lecture Demos.

All Lectures and Tutorial given by Lecturer

Tutorials: Weeks 1,2,4 and 8.

Outline of Module Delivery (3)

Lab Classes

- MATLAB programming help sessions
- Try out Lecture/Tutorial examples
- Extended reasoning and programming through Lab Worksheet Questions
- Build a solid basis for Assessed Coursework

Lab classes are in C/2.10, Weeks 2-10
Thursday 10-11AM

All lecture, tutorial and lab class material is examinable




Syllabus Outline

Topics in the module include the following:

- Introduction: Multimedia applications and requirements
- Multimedia data acquisition and formats: Audio, Graphics, Images and Video
- Audio/Video fundamentals including analog and digital representations, human perception, and audio/video equipment, applications.
- Digital Audio signal processing, Image/Video Processing.
- Digital Audio Synthesis: Basic audio synthesis techniques
- MIDI: Basic MIDI definitions, MIDI control of audio synthesis, MIDI and data compression (MPEG4)




Back
Close

Syllabus Outline (cont.)

- Audio and video compression
  - Lossy v. Lossless Compression
  - Information Theoretic Transform
    (Huffman Coding, Arithmetic Coding, LZW/GIF)
  - perceptual transform coders for audio/images/video
    (Fourier, DCT, Vector Quantization)
  - Image and video compression applications and algorithms:

    JPEG, H.263, MPEG Video, MPEG Audio,

- Multimedia applications
  - Content based multimedia retrieval (audio & video)



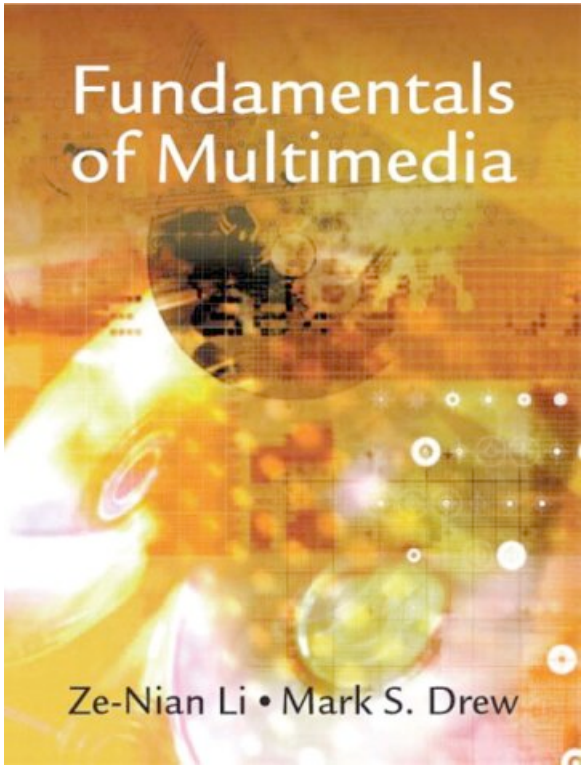

Recommended Course Book

Fundamentals of Multimedia
Ze-Nian Li, Mark S. Drew
Prentice Hall, 2003
(ISBN: 0130618721)

Decent coverage all major aspects of the course plus a lot more

No MATLAB Examples

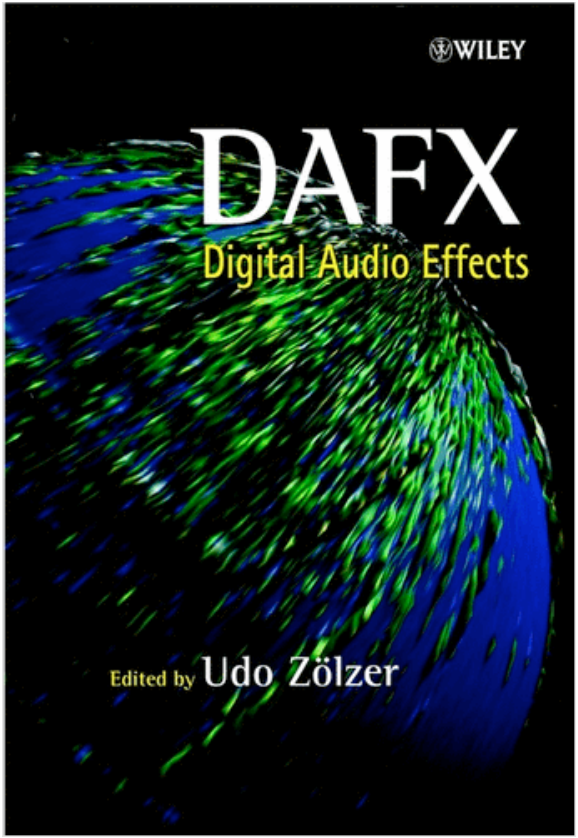
Copies in library



Other Texts Used In This Module: Practical MATLAB Based

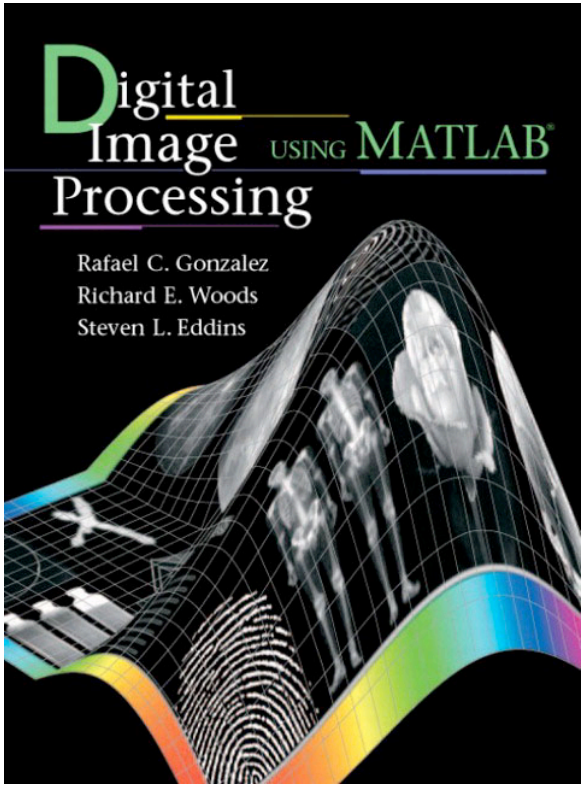
DAFX: Digital Audio Effects
Udo Zolzer
John Wiley and Sons Ltd , 2002
(ISBN-13: 978-0471490784)

Excellent coverage of audio signal processing effects and synthesis
plus a lot more
All MATLAB examples
Expensive but copies in library



Other Texts Used In This Module: Practical MATLAB Based

Digital Image Processing Using MATLAB
Rafael C. Gonzalez,
Richard E. Woods,
and Steven L. Eddins
Prentice Hall, 2004
(ISBN-13: 978-0130085191)

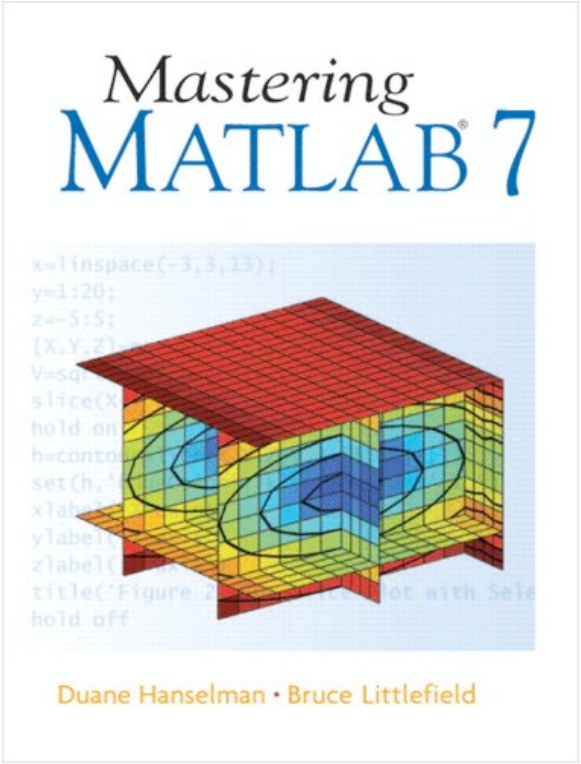


Excellent coverage of Image processing examples
plus a lot more
All MATLAB examples
Useful for CM0311 Image Processing
Copies in library

Other Texts Used In This Module: Practical MATLAB Based

Mastering MATLAB
Duane C. Hanselman and Bruce L. Littlefield
Prentice Hall, 2004
(ISBN-13: 978-0131857148)

Excellent coverage of Basic MATLAB programming
Copies in library

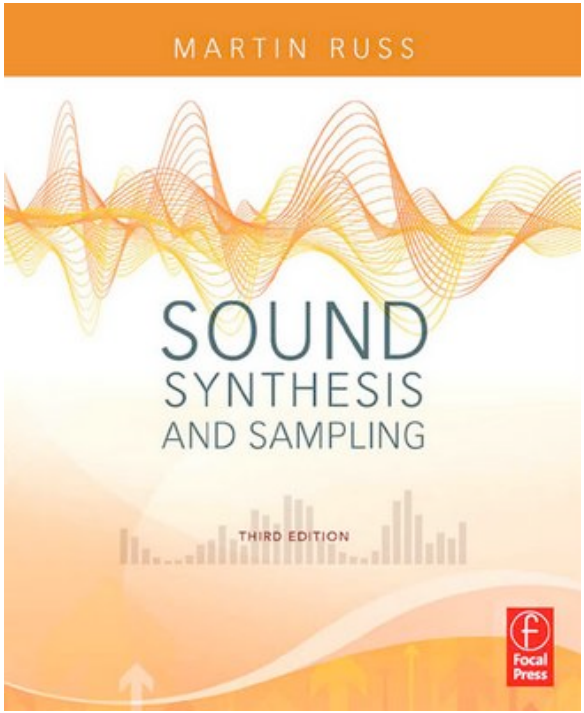


Other Texts Used In This Module: Audio Synthesis

Sound Synthesis and Sampling (Third Edition)
Martin Russ
Focal Press
(ISBN-13: 978-0240521053)

Good coverage of basic synthesis algorithms

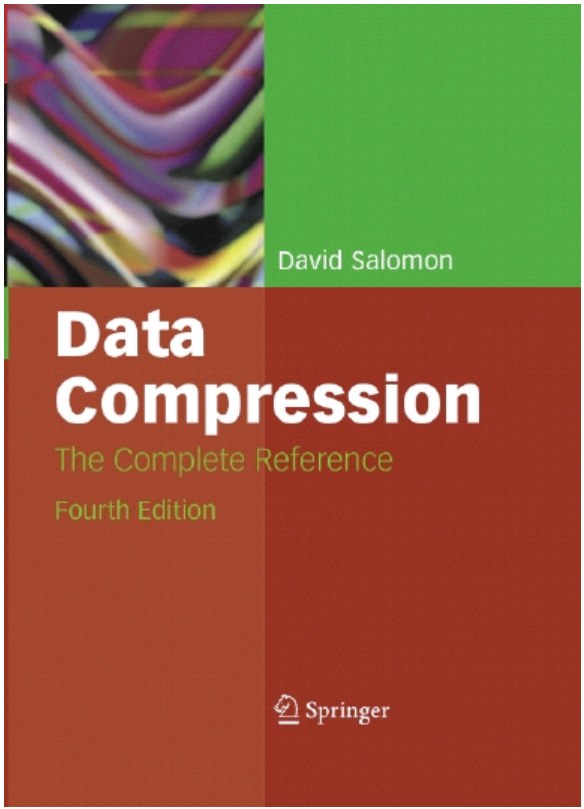
Copies in library



Other Texts Used In This Module: Compression Algorithms

Data Compression: The Complete Reference (Fourth Edition)
David Salomon
Springer-Verlag London, 2007
but (ISBN-13: 978-1846286025)

Comprehensive coverage of all compression algorithms and formats
Many more than covered in this course!
Expensive but Copies in library



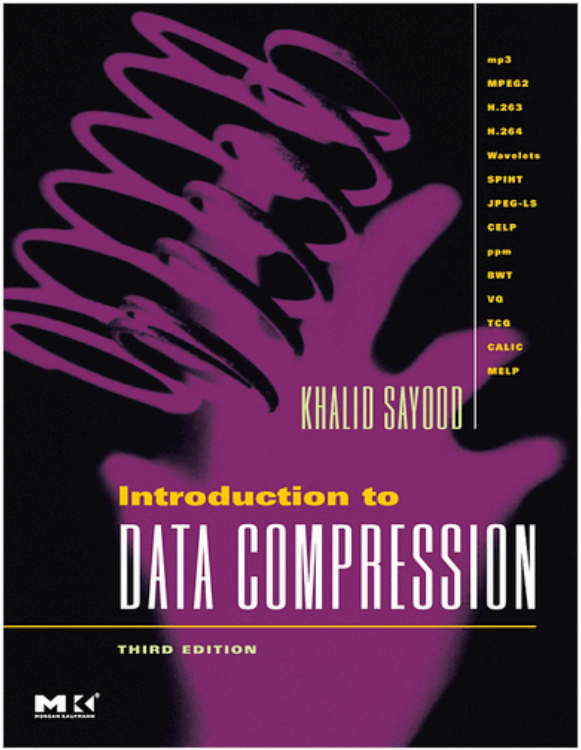
Other Texts Used In This Module: Compression Algorithms

Introduction to Data Compression (3rd Edition)
Khalid Sayood
Morgan Kaufmann, 2005
(ISBN-13: 978-0126208627)

Excellent coverage of all compression algorithms and formats

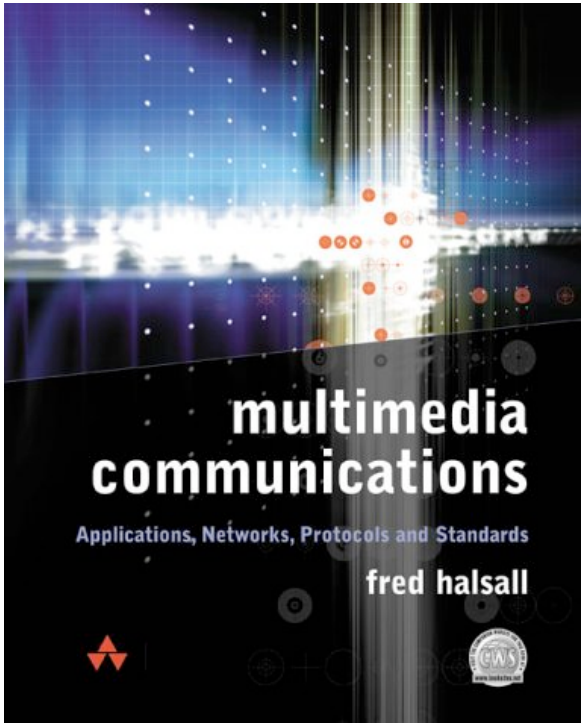
Example code but not MATLAB

Copies in library



Other Good General Texts

Multimedia Communications: Applications, Networks, Protocols and Standards, Fred Halsall, Addison Wesley, 2000 (ISBN 0-201-39818-4)



Other Good General Texts

The following books are highly recommended reading:

Digital Audio

- A programmer's Guide to Sound, T. Kientzle, Addison Wesley, 1997 (ISBN 0-201-41972-6)
- Audio on the Web — The official IUMA Guide, Patterson and Melcher, Peachpit Press.
- The Art of Digital Audio, Watkinson,Butterworth-Heinmann.
- Synthesiser Basics, GPI Publications.
- Signal Processing: Principles and Applications, Brook and Wynne, Hodder and Stoughton.
- Digital Signal Processing, Oppenheim and Schafer, Prentice Hall.




Back
Close

Digital Imaging/Graphics/Video

- *Digital video processing*, A.M. Tekalp, Prentice Hall, 2005.
- *Encyclopedia of Graphics File Formats*, Second Edition by James D. Murray and William vanRyper, 1996, O'Reilly & Associates.

Data Compression

- *The Data Compression Book*, Mark Nelson,M&T Books, 1995.