

**Brooklyn College**  
**Department of Computer and Information Science**

**CISC 3630 [52] Multimedia Computing**

3 hours 3 credits

Surveys the interrelationship of state-of-the-art communication, and computer technology. Hardware, software and system design issues in the multimedia presentation of information. Multimedia standards. Audio and video compression techniques. Hypermedia database systems. Programming and the use of multimedia authoring systems. Survey of representative hypermedia applications.

**Textbooks**

- Multimedia: Making it Work, 7th edition, Tay Vaughn, McGraw Hill, 2006
- Johnson, Steven M, *Macromedia Director 8 Shockwave Studio (Complete)*, Course Technology, 2001.

**Required Projects**

- PowerPoint Project
- HTML Project
- Director Project
- Portfolio

**Syllabus**

- I. Introduction
  - A. Uses of multimedia information
  - B. Historical background
- II. Survey of hardware
  - A. Graphic boards and accelerators
  - B. Sound boards
  - C. Video capture boards
  - D. Magnetic and optical storage devices
  - E. DVD (macrovision, VOBs, ripping techniques)
- III. Survey of software
  - A. Graphic standards
  - B. Music computer formats
  - C. Video computer standards
  - D. Gaming
  - E. Authoring Systems
- IV. Multimedia Platforms (QuickTime, MCI, Video for Windows, Activemovie, Direct-X)
- V. Multimedia Programming (Java, Active-X, MCI, Windows Foundation Classes)
- VI. The creative process: hardware, software, development team and methodology
- VII. Media Types – Media Objects (Implementations and methods)

- A. Text
  - 1. Encoding – ASCII, Unicode
  - 2. Formatting – in-line (.dot notation, HTML, SGML)
  - 3. Page description languages – Adobe pdf
- B. Image
  - 1. bit mapped vs. vector based representations
  - 2. Color Space Representations – RGB, CMY, HSU
  - 3. CLUTs
  - 4. color depth and resolution
  - 5. Image File Formats BMP, GIF, JPEG, PNG, TIFF
  - 6. Editing tools and effects (pixel methods, masking, morphing, etc.)
- C. Graphics – Internal and external modeling techniques, mapping, lighting, viewing and rendering
- D. Audio
  - 1. The physics of sound
  - 2. Sound fields, the environment and acoustics – multi-channel/surround sound
  - 3. quantization and sampling rate
  - 4. The Nyquist theorem
  - 5. Audio formats
  - 6. Digital encoding (PCM, ADPCM, A-law/ $\mu$ -law)
  - 7. Digital Audio Effects & Filtering
- E. Music – MIDI, SMDL
- F. Video – analog, digital and broadcast
  - 1. Luminance and Chrominance representations
  - 2. Fields, frames and interlacing
  - 3. Color encoding (Camera, transmission and receiver: RGB, YUV, YIQ, YCbCr)
  - 4. RF, Composite, S-Video and Component video
  - 5. NTSC and HDTV
  - 6. Editing techniques (traditional vs. NLE systems)
  - 7. Transitions, keying, and scaling
  - 8. Storage and distribution
- G. Animation – Modeling & Rendering
- H. Video Conferencing
- I. Other Media types (speech, digital ink, virtual reality)
- VIII. Multimedia and the Internet
  - A. WWW
  - B. Web browsers
  - C. HTML, VRML, CGI, Active-X and Java
- IX. System survey (multimedia examples taken from science, entertainment, gaming, etc.)
- X. Design issues
  - A. System design issues
  - B. Implementation issues
  - C. Usability evaluation
- XI. Compression Techniques
  - A. Requirements
  - B. Basic information theory
    - 1. Entropy vs. energy
    - 2. Shannon's equation
    - 3. entropy vs. source encoding

- C. General Purpose compression algorithms
  1. Run Length Encoding
  2. Relative Encoding
  3. Huffman Coding
  4. Arithmetic Coding
  5. Lempel-Ziv Coding
- D. Intraframe compression algorithms
  1. Sub-sampling
  2. Course quantization
  3. Vector quantization
  4. Transform encoding
- E. Interframe Compression algorithms
  1. Sub-sampling
  2. Difference coding
  3. Block based difference coding
  4. Block based motion compensation
- F. JPEG and the DCT
- G. MPEG file structure and I-, P-, B-frames
- H. Practical compression techniques
  1. mp3,
  2. Div-X, MPEG-4
  3. DVD, VCDs DVD (macrovision, VOBs, ripping techniques)

## Bibliography

- Buford, J. F. K., *Multimedia Systems*, Addison Wesley, Massachusetts, 1994.
- Fluckiger, F., *Understanding Networked Multimedia*, Prentice Hall, New Jersey, 1995.
- Gross, Phil, *Macromedia Director 8 & Lingo Authorized*, Macromedia Press, 2000
- Manuel, Mathew, *Macromedia Director Workshop*, Hayden Books, 1999.
- Mischel, J., *Proceedings: Hypertext '87, Proceedings: Hypertext '89*, ACM Press, New York.
- Shneiderman B. and G. Kearsley, *Hypertext Hands-On!*, Addison Wesley, Massachusetts, 1989.
- Steinmetz, R. and K. Nahrstedt, *Multimedia: Computing, Communications & Applications*, Prentice Hall, New Jersey, 1995.
- Tittel, E. and S. James, *HTML for Dummies*, IDG Books, Foster City, CA, 1995.
- Gibbs, S. J. and D. C. Tsichritzis, *Multimedia Programming*, Addison Wesley, Massachusetts, 1995.
- Van Hoff, A., S. Shaio and O. Starbuck, *Hooked on Java*, Addison Wesley, Reading, MA, 1996.
- Selected reading from: *PC Magazine*