

# Multimedia Communications

## **Purpose:**

The goal of “multimedia communications” course is to provide a comprehensive coverage of principles of multimedia communications, including leading algorithms for various applications. Enabling media processing and networking technologies are first introduced. Then, the application space is explored. This course is designed as a two-semester course, which will be taught in two consecutive semesters.

## **Audience:**

Graduate students. Advanced undergraduate seniors with good mathematical background should be able to follow the course as well.

## **Credit Hours:**

3 credit hours per semester.

Multimedia Communications-I: 3 credits

Multimedia Communications-II: 3 credits

## **Instructors:**

Yucel Altunbasak, Nikil S. Jayant

## **Textbook:**

No required textbook. Handouts will be given.

## **Evaluation Process:**

There will be a exam, one final, and one course project per semester.

Exam: 30%

Final: 30%

Project: 40%

# **OUTLINE**

## **PART-I**

### **1 REPRESENTATION**

1. Introduction to Analog/Digital Audio
2. Introduction to Analog/Digital Images
3. Introduction to Analog/Digital Video

### **2 MEDIA COMPUTING**

4. Media Streaming Software Architecture-1
5. Media Streaming Software Architecture-2
6. Video/Audio Hardware Architectures

### **3 MEDIA ANALYSIS**

7. Speech Analysis
8. Image Analysis
9. Video Analysis

### **4 PRINCIPLES OF MEDIA COMPRESSION**

10. Redundancy and Irrelevancy
11. Quantization

12. Information Theory Models
13. Lossless Coding

## **5 SPEECH AND AUDIO COMPRESSION**

14. Speech Coding-I
15. Speech Coding-II
16. Audio coding

## **6 STILL-IMAGE COMPRESSION**

17. Transform Coding - DCT
18. Transform Coding - Subband Coding
19. Still Image Compression Standards
20. Compression of Graphics

## **7 VIDEO COMPRESSION**

21. Inter-frame Compression Methods-1 (MC+DCT)
22. Inter-frame Compression Methods-2 (Wavelet-based)
23. Video Compression Standards -I (MPEG-1)
24. Video Compression Standards -II (MPEG-2)
25. Object-Based Coding and MPEG-4 (MPEG-4)
26. Video Conferencing Standards: H.261, H.263, H.263 V2

## **8 MEDIA PROCESSING**

- 27. Standards Conversion
- 28. Filtering
- 29. Reconstruction and Restoration
- 30. Resolution Enhancement
- 31. Audio Transcoding
- 32. Video Transcoding

## **PART-II**

## **9 MEDIA USER INTERFACES**

- 33. Audio-Visual User Interfaces
- 34. Automatic Speech Recognition
- 35. Text-to-Speech Synthesis
- 36. Recognition of Handwriting and Gestures
- 37. Text-to-Face Synthesis

## **10 TECHNOLOGIES OF MULTIMEDIA COMMUNICATIONS**

- 38. Models of Communication Channels and Networks
- 39. Broadband Technologies: Modem Technologies
- 40. Wireless Multimedia Standards
- 41. Graphics Streaming: Virtual Worlds

- 42. Multimedia over IP: Multicast, RTP/RTCP, Packetization
- 43. Multimedia over Broadband Networks: Video-on-Demand
- 44. Networking issues: QoS and scalability
- 45. Error Concealment in Media Streaming

## **11 MULTIMEDIA APPLICATIONS**

- 46. TV Broadcasting: MPEG-1, MPEG-2 Transport level and HDTV Grand Alliance System
- 47. Conferencing Systems: ITU-T H.320, H.323, H.324
- 48. Data Conferencing: T.120
- 49. Electronic Commerce: Indexing and Watermarking
- 50. Tele-collaboration: Distance Education and Home Networking