

Course name	Multimedia Networks (MMN)
--------------------	----------------------------------

Course ID:	40-873	Credits:	3	Program:	Graduate
Prerequisites:	Undergraduate courses; Signal and Systems, Multimedia Systems, and Computer Networks, Background in Computer Systems Performance Evaluation (e.g., Simulation, Experimental, or Analytical approaches), experience with Matlab and GNU/Linux.			Co-requisites:	-
Prepared by:	Hamid R. Rabiee, Ph.D.				

Aim

- The course is an advanced graduate level course that covers the concepts and principles that underlie the delivery of multimedia services and contents such as digital audio and video across modern packet-switched computer networks and wireless networks with the required quality of service.

Outline

1. **Overview of the course**
2. **Introduction**
 - a. **Media**
 - b. **Networking principles**
 - c. **IP networks**
 - d. **Multimedia networking**
3. **Fundamentals of Multimedia**
 - a. **Characteristics of Audio, Image and Video Signals**
 - b. **Audio Compression**
 - c. **Image Compression**
 - d. **Video Compression**
4. **Fundamentals of Next Generation Networks**
5. **Quality of Service**
 - a. **Principles (e.g. Admission Control and Shaping/Policing)**
 - b. **QoS Architecture (Integrated services; Differentiated services)**
 - c. **Traffic engineering (Fair Scheduling)**
 - d. **Flow and congestion control (Buffer Management)**
 - e. **Error Correction, Error Concealment**
6. **Multimedia over IP**
 - a. **IP multicast**
 - b. **Multimedia over Overlay networks**
7. **Multimedia Applications: Streaming (Real-time)**

8. **Multimedia Protocols**
 - a. **Signaling Protocols (SIP, H.323)**
 - b. **Streaming (Real-time) Protocols (RTP, RTCP)**

9. **Multimedia over Wireless/ sensor network**

10. **Multimedia Networking Applications**
 - a. **Digital TV**
 - b. **Voice Over IP**
 - c. **IPTV Audio/video Conferencing**

11. **Multimedia Network Security**
 - a. **Encryption**
 - b. **Digital signatures**
 - c. **Authentication**
 - d. **IP security**
 - e. **Digital watermarking**
 - f. **Secure media streaming**

12. **Content Networks**

13. **Multimedia Networks : Methodology Design**

14. **Hot Research Topics**

Evaluation Criteria

Based on Homework, Quizzes, Critical Reading, Project, Mid-Term and Final Exams. The grade will be determined by (You will learn how to use OPNET-SPGURU for design/simulation assignments: therefore attending the TA sessions is mandatory)

Homework:	30%
Quiz:	10%
Critical Reading:	10%
Mid-Term Exam:	25%
Final Exam:	25%
Project:	10%

References

Multimedia deals with a variety of different technologies and those technologies advance very quickly. Consequently, no single textbook exist that may cover all the topics we would like to cover in this course. Therefore, the course materials will be drawn from different resources including reference books, Internet, my own research and technical papers. Students are encouraged to study using class handouts, which will be posted on the course website and will cover all the course material needed. Additional material (such as selected articles, recent research papers) will be provided during the course. Selected chapters from the following text books will be used to complement the course material:

1. "Fundamental of Multimedia", by ZeNian Li and Mark Drew, Prentice-Hall, 2003.
2. "Computer Networking: A Top-Down Approach (4th edition)," by J. Kurose and K. Ross, Addison-Wesley, 2008.
3. "Quality of Service Control in High-speed Networks", by H.J. Chao, X. Guo, John Wiley and Sons, 2002.
4. "Multimedia over IP and Wireless Networks: Compression, Networking, and Systems", by M. Van der Schaar, P. Chou, Academic Press, 2007 .
5. "Digital Watermarking", by I.J. Cox, M.L. Miller, and J.A. Bloom, Morgan Kauffman Publishers/Academic Publishers, 2002.
6. "Information Hiding: Steganography and Watermarking-Attacks and Countermeasures", N.F. Johnson, Z. Duric, and S. Jajodia, Kluwer Academic Publishers, 2000.
7. "Standard Codecs: Image Compression to Advanced Video Coding" by Mohammed Ghanbari, Institution of Electrical Engineers (IEE), 2003.
8. "Video Processing and Communications" by Yao Wang, Joern Ostermann, and YaQin Zhang, Prentice Hall, 2002.
9. "Introduction To Multimedia Communications" by K. R. Rao, Z. S. Bojkovic, D. A. Milovanovic, WileyInterscience, 2006.
10. "QoS in Packet Networks ," by Kun I. Park, Springer 2005.
11. "Multimedia Communications, Directions and Innovations" by Gerry D. Gibson, Academic Press, 2001.
12. Multimedia Communications: Protocols and Applications, F. Kuo, W. Effelsberg, and J.Garcia-Luna-Aceves, Prentice Hall PTR, 2000.
13. The Art of Computer Systems Performance Analysis, R. Jain, Wiley Interscience, 1991.