

**CSCI 576 – Multimedia Systems Design, Spring 2022**  
**Mondays 6:00-9:20, SGM 124** Website - <https://courses.uscden.net>

**Instructor: Parag Havaladar**

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Office Hours: after class, and by email appt.

**Teaching Assistant(s):**

Please see first lecture slides for TA contact and office hours

**Course Objective:**

This course covers the state-of-the-art technology for multimedia systems. We will study different media types images, video, audio, graphics etc and how they are used to create multimedia content and systems, algorithms and standards to compress and distribute them via networked systems to variety of end clients. This includes issues related to

- Content creation - media capture and representation, methods to assemble media types to create multimedia content.
- Compression / Storage - We will also study the generic/specific algorithms for compressing media including well known ITU/ISO standards to represent compressed elementary streams - JPEG, JPEG2000, MPEG1, MPEG2, MPEG4, H.261,263, 264, HEVC, mp3, AAC, Dolby, THX. Atmos.
- Distribution – Aspects of wired and wireless network distribution, Quality of Service, Priority Queuing, Wireless Protocols and Streaming, End to End architectures with varying network traffic - MPEG-DASH, Apple's HLS, Adobe HDS. We will also look at digital rights management of distributed multimedia (watermarking & encryption). Also included will be recent protocols - MPEG-DASH, Apple's HLS, Adobe HDS

The course's goal is also to explain the design of distributed end-to-end multimedia systems that take the some or all the above components to create modern applications - Visual Effects Pipeline, Digital Cinema Distribution Pipeline, Multimedia Data Classification, Natural Language Queries for multimedia analysis, Multimodal analysis of media, Stereoscopic and Holographic display technologies, Stereoscopic content creation pipelines, Virtual/Augmented Reality etc. Some of the lectures have traditionally been held at the Institute for Creative Technologies (ICT), USC's multidisciplinary research institute. Depending on planning and scheduling at ICT, some of these topics will covered, but I hope to provide examples and illustrations showcasing recent industry progress in these fields by inviting guest lectures from experts in research and industry.

**Prerequisites:**

There are no special prerequisites necessary, but it is imperative that you have

- Good Programming Skills (you should be comfortable with programming)
- Basic Math Skills taught in undergraduate engineering
- It will be helpful (but not necessary) if you have some background in any of the following - signal and image processing, graphics, video processing, audio processing, networking protocols. All necessary material will be introduced in the course.

## Course Requirements:

You will be evaluated on exams, assignments and projects.

One mid term exam (35% of your grade) –

Assignments, projects and class participation (65% of your grade)

- 2 to 4 theory + programming assignment (35% of your grade)
- Projects due in final exam week. (30% of your grade)

## Textbooks:

Required textbook : *Multimedia Systems – Algorithms, Standards and Industry Practices.*  
by Parag Havaladar and Gerard Medioni

Available in the USC book store or online. Additional material (such as selected articles, recent research papers) will always be provided during the course.

Here are a few books that cover some parts of the course material. I am providing this list only for reference:

- Ze Nian Li , Mark S. Drew, *Fudamentals of Multimedia*, Prentice Hall, 2004
- S.V. Raghavan, S.K. Tripathi, *Networked Multimedia Systems: Concepts, Architecture, and Design*. Prentice Hall, 1998
- F. Kuo, W. Effelsberg, J.J. Garcia-Luna-Aceves, *Multimedia Communications: Protocols and Applications*. Prentice Hall PTR, 1998
- David S Taubman, Micheal W. Marcellin, *JPEG 2000 – Image Compression, Fundamentals, Standards and Practice*, Kluwer Academic Publishers 2002
- Mohammed Ghanbari, *Video Coding – An Introduction to Standard Codecs*. The Institution of Electrical Engineers (IEE), London, UK, 1999.
- A. Puri, T. Chen (eds.), *Multimedia Systems, Standards, and Networks*. Marcel Dekker, 2000
- Ming-Ting Sun, Amy R. Reibman (eds.), *Compressed Video over Networks*. Marcel Dekker, 2000
- Marin Bosi and Riach E. Goldberg, *Introduction to Digital Audio Coding and Standards*, Kluwer Academic Publishers 2003
- Foley, Van Dam, Feiner, Hughes, *Computer Graphics – Principles and Practice*, Second Edition. Addison-Wesley – 1990.

## Academic Integrity

The [USC Student Conduct Code](#) prohibits plagiarism. All USC students are responsible for reading and following the [Student Conduct Code](#), which appears in the SCampus. Although we encourage discussions among students, all work submitted for the class is to be done individually, unless an assignment specifies otherwise. Some examples of what is not allowed by the conduct code: copying all or part of someone else's work, and submitting it as your own; giving another student in the class a copy of your assignment solution; consulting with another student during an exam. If you have questions about what is allowed, please discuss it with the instructor. Violations of the Student Conduct Code will be filed with the Office of Student Conduct, and [appropriate sanctions](#) will be given.

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