

Master Course Description

No: EE 135

Title: The Digital World of Multimedia

Credits: 4

[UW Course Catalog Description](#)

Coordinator: Mari Ostendorf, Professor of Electrical Engineering

Goals: To introduce lower-division undergraduate students to the systems side of electrical engineering and provide a basis for understanding the role of digital signal processing and communications in modern technology and its impact on society, as well as an awareness of ethical issues associated with signal modification. To provide a software-oriented design experience that gives a context for learning theory in later courses in EE. To provide an early opportunity for students to develop collaboration and communication skills.

Learning Objectives: Students who complete this course should be able to:

1. *Explain* the role and limitations of basic signal processing techniques such as sampling, frequency analysis and filtering
2. *Identify* technology that uses filtering, frequency analysis and/or modulation in its operation
3. *Read current technical literature and summarize key points and implications in written and oral communications*
4. *Apply* basic programming concepts within MATLAB to create and modify sounds and images

Textbook: none required

Reference Texts:

Engineering our Digital Future, by G. Orsak, S. Wood, S. Douglas, D. Munson, J. Treichler, R. Athale and M. Yoder, Prentice Hall, 2004.

Information Technology: Inside and Outside, by D. Cyganski and J. Orr with R. Vaz, Prentice Hall, 2001.

Prerequisites by Topic:

1. Students must be eligible to take calculus (MATH 124)
2. Some experience in computer programming, but not n

Topics:

1. Introduction to frequency [1 week]
2. Sampling [1 week]
3. Sound signal synthesis and modification [1 week]
4. Filtering [1 week]
5. Image synthesis and modification [1.5 weeks]
6. Lossy and lossless compression [1 week]
7. Coding for security and communications [1.5 weeks]
8. Digital video and networking [1 week]
9. Exam, review and project presentations [1 week]

Course Structure: The class meets for three 50 minute lectures a week, and one two hour (110 minute) lab section. The latter is usually administered by teaching assistants. Homework is assigned weekly, including at least one writing assignment (e.g. discussion of a column in the IEEE Signal Processing Magazine). One exam is given nominally at the ends of the 6th week, and collaborative quizzes are given in selected other weeks. A final project involves a written report and oral presentation describing a modern signal processing or communications technology.

Computer Resources: Lab sections will be held in Sieg232 computer teaching lab, using MATLAB. The computers need to be equipped with wireless cards and have microphones and cameras available for students to digitize signals. The lab is currently configured as needed.

Laboratory Resources: No departmental laboratory facilities other than the computer lab are used.

Grading: Suggested: Homework (20%), Labs (40%), Quizzes (5%), Exam (25%), Project report and presentation (10%). The grading scheme in any particular offering is the prerogative of the instructor.

Outcome Coverage:

(a) *An ability to apply math, science and engineering knowledge.* The homework and exams require direct application of mathematical, scientific, and engineering knowledge to successfully complete the course.

(c) *An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.* Students design software to create sounds signals and images; constraints are mainly related to intellectual property and software issues such as memory requirements and execution time.

(d) *An ability to function on multi-disciplinary teams.* All labs involve collaborative work, and students in the course typically have a range of backgrounds.

(e) *Identify, formulate and solve engineering problems.* Students apply concepts learned in lecture to homework problems and in implementation of computer lab exercises.

(g) *An ability to communicate effectively.* Students have multiple writing assignments, and are required to do oral presentations for the class and in a video conferencing scenario.

(h) *The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.* Students discuss the role of various technologies on society and ethical issues such as video monitoring, signal modification, digital rights, etc..

(i) *A recognition of the need for, and an ability to engage in life-long learning.* Students are given assignments that require reading current technical literature from survey-oriented IEEE magazines.

(j) *Knowledge of contemporary issues.* Guest lectures cover modern technology such as audio, image and video compression, and multimedia networking; some research topics are touched on.

Prepared By: Mari Ostendorf