

**SAN JOSE STATE UNIVERSITY  
DEPARTMENT OF ELECTRICAL ENGINEERING**

**Announcements (In reverse chronological order)**

**Course Information (Green Sheet)**

- COURSE:** EE263 - Digital Image Processing  
Lecture - Mon, Wed, 7:30-8:45 pm, ENG-340
- OBJECTIVES:** To study fundamental concepts of digital image processing, compression, communication and analysis, including modeling, algorithms, hardware components, and system architectures.
- PREREQUISITE:** EE210 or an undergraduate course in signal analysis; A background in linear algebra, probability, analytic geometry, and high-level language programming (e.g., C/C++, Matlab) is strongly recommended. Those with hardware background (including Verilog or VHDL) who want to apply their skills to multimedia, video, and digital image processing are welcome too.
- TEXTBOOK:** R.C. Gonzalez and R.E. Wood, Digital Image Processing, Addison-Wesley Pub Co, 2nd edition, 2002.
- REFERENCES:** A.K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, 1989.
- A. Rosenfeld and C.A. Kak, Digital Image Processing, vols. 1 and 2, 2<sup>nd</sup> ed., Academic Press, 1982.
- WEB SITE:** Class information, notices, course materials, FAQs (selected course-related e-mails between students and Prof. Choo) will be posted on the web: <http://www.engr.sjsu.edu/choo> (well, you are already here!). In addition, solutions to homework assignments will be available on the web. Students are urged to visit the web site at least twice a week.
- EVALUATION:** The weighting among exams, term project, and assignments will be:
- |              |     |
|--------------|-----|
| Midterm      | 25% |
| Endterm      | 25% |
| Term Project | 30% |
| Homework     | 20% |
- EXAMS:** There will be two 75-minute exams, both of which will be open-book and open-note.

**OFFICE HOURS:** The office hours are made available for questions about lectures and assignments and for discussion of grades assigned. If you need a help of the instructor, see him right after class or during his office hours (TBA). Use of e-mail is strongly recommended for other times, although appointments may be made for mutually convenient times.

**TERM PROJECT:** An important part of the course will be term project. This will in most cases consist of image processing algorithm implementation and demonstration on PCs or Unix workstations. Implementation may be either in software (C/C++ and/or Matlab) or in hardware (Verilog or VHDL) or both. Projects are to be done individually. An in-class presentation and demonstration of the project will be required at the end of the semester. A report describing the project is to be handed in at the conclusion of the presentation. Details about the projects, appropriate topics, method of approval, etc, will be distributed early into the semester. A 300-word proposal for term project will be due the last day of February.

### **LIST OF POSSIBLE TOPICS FOR TERM PROJECT**

1. Development a new algorithm for H.264 and implementation of the algorithm on the reference C code.
2. Verilog/VHDL modeling and simulation of 2D adaptive or nonlinear filters, such as Wiener filter.
3. Verilog/VHDL modeling and simulation of a motion estimation algorithm for H.264.
4. Verilog/VHDL modeling and simulation of arithmetic coding for H.264.
5. Matlab modeling of MPEG-4, JPEG-2000, or H.264.
6. Matlab modeling of morphological algorithms
7. Verilog/VHDL modeling of morphological algorithms
8. Assembly coding (Intel MMX or TI C6x) of a few key blocks of MPEG-4, JPEG-2000, or H.264 reference code for performance improvement and benchmarking
9. *Detailed* survey of image compression standards (MPEG-4, JPEG-2000, or H.264). More than 100 references should be collected and reviewed in detail.

**HOMEWORKS:** There will be 5 to 7 homework assignments throughout the semester. They will be due in class on the date specified on each assignment. Solution will be distributed in class after the homework reports are collected. Any late homework report is disqualified after the disclosure of the solution. Your homework will be given letter grades, not numeric grades, and will be returned in class. You may work with other students on the homework. Indeed, you are encouraged to do so. However, your report must be *original*. Homework reports which do not meet civilized standards of appearance and presentation will be returned without grading.

## Tentative Schedule

	<b>Topics</b>	<b>Remark</b>
<b>Week 1-2</b>	Introduction ; Image Formation, Image Transform (DFT, WHT, DCT, DWT, KLT), 2D Convolution, 2D Correlation	
<b>Week 3-4</b>	Image Enhancement and Restoration, Histogram Equalization, Smoothing, Sharpening, Filtering	
<b>Week 5-6</b>	Image Compression, Predictive Coding, Transform Coding, Vector Quantization, Subband Coding, Run-Length Coding, Huffman Coding, Arithmetic Coding	
<b>Week 7-8</b>	Image & Video Compression Standards; MPEG-2, H.264, JPEG-2000	
<b>Week 9-11</b>	Edge Detection & Connection, Image/Object Description & Representation, Image Understanding, Morphology, Neural Networks	
<b>Week 12-13</b>	Imaging & Video Hardware/Systems; Special Topics (e.g. Medical Imaging, etc.)	
<b>Week 14</b>	Term Project Presentation & Demo	