CS 4551 – Multimedia Software Systems

Spring 2020

Instructor: Dr. Yi Zhao (email: yzhao52@calstatela.edu)

Office Location/Hours
E&T A308B, Tuesday/Thursday 3:00 – 4:00 pm

Class Room/Meetings
FA 321, Tuesday/Thursday 12:15 – 1:30 pm

Prerequisite
CS 3112 (Data Structures and Algorithms)

Course Description

Course Objectives/Outcomes
The Student Learning Outcomes that are addressed by the course are:

- SLO #1. Students will be able to apply concepts and techniques from computing and mathematics to both theoretical and practical problems.
- SLO #2. Students will be able to demonstrate fluency in at least one programming language and acquaintance with at least three more.
- SLO #3. Students will have a strong foundation in the design, analysis, and application of many types of algorithms.
- SLO #5. Students will have the training to analyze problems and identify and define the computing requirements appropriate to their solutions.
- SLO #6. Students will have the training to design, implement, and evaluate large software systems working both individually and collaboratively.

Other outcomes of instruction: At the end of the course, students will be able to

1. Describe the current multimedia data types (images, video, audio, graphics etc.).
2. Identify with the requirements and the algorithms for multimedia systems.
3. Implement efficient design solutions and established standards for multimedia.
4. Gain programming experiences in multimedia processing.
5. Develop a multimedia software system related to video (audio) codec, multimedia database, or other multimedia software application on network.

COURSE MATERIALS

Textbook
Handouts and reading materials (technical papers) provided by the instructor.

Reference
Other Equipment / Material Requirements (Optional)
You are required to access lecture materials on CSNS learning management system. You will need to have an up-to-date browser, operating system and Adobe Acrobat Reader software on your computer. Documents in this course will be available to you in PDF form.

Computer Requirements
You are required to use your computer (a desktop or laptop) to complete project assignments. Your computer should have Java development kit installed. You are required to submit your assignments (programs or documents) via CSNS learning management system. You are required to install an image viewer for PPM file formats such as Irfanview to view sample image test data. Check the ITS Helpdesk Student Resources page for available software.

COURSE POLICIES
You are not allowed to have make-up exams, late submissions, or incompletes. Your classroom participation and attendance will count towards your final grade. See the grading policy below. Your classroom participation are your discussions with your peers and presentations for the classroom activities. Your attendance will be checked in the beginning of every class. To be considered in attendance, you must be present in the class for at least one half of the class time. If you missed classes more than 4 times, you will not receive any credit for participation or attendance. If you missed classes more than 7 times (25% of the classes), you will receive a F.

No cell phone usage is allowed during the class/exams.

Course Structure
This course is to be conducted entirely face-to-face lectures. You will participate in the course using a CSNS learning management system.

ASSIGNMENT AND GRADING POLICIES
Throughout the course, you are required to complete three to four projects (aka homework assignments). Each project is an out of class project and it is designed to be completed in one week or 10 days based on the recommended schedule and topics. Projects are to be suitable for scaffolding. Extra credit assignments will be available for some assignments throughout the term. Extra credit will account for up to 10% of the total grade. Unless the instructor specifies for each particular assignment, late submissions or make-up exams are not allowed. In case of emergency, contact the instructor.

Grading Criteria
- Participation & Attendance 5%
- Homework/Projects 30%
- Midterm Exam 30%
- Final Exam 35%

Grading Scale
<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90% and above</td>
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<tr>
<td>B</td>
<td>70% and below 90%</td>
</tr>
<tr>
<td>C</td>
<td>60% and below 70%</td>
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<tr>
<td>D</td>
<td>50% and below 60%</td>
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<tr>
<td>F</td>
<td>Below 50%</td>
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Grades for each assignment will be emailed via CSNS as soon as grading is finished. Any grading issues must be communicated through email with the instructor. Please do not post any grading concerns in a discussion forum.

**COURSE COMMUNICATION**

The Instructor will make every effort to communicate frequently with students through announcements and postings within the CSNS site. Post any questions or comments you have about the course content and/or requirements in the CSNS course forum. Questions of a more personal nature can be sent to the Instructor via email.

**HELPFUL STUDENT RESOURCES**

**Technical Resources**
Information on CSULA technical support resources for students: [Technical Support](#)

**Student Support Services**
Information on CSULA student support resources for students: [Student Services](#)

**Academic Support Services**
Information on CSULA academic support resources for students: [Academic Support](#)

**COURSE & UNIVERSITY POLICIES**

**Student Handbook**
Information on student rights and responsibilities, academic honesty, standards of conduct, etc., can be found in Schedule of Classes for the current quarter visit the Cal State LA Schedule of Classes Information under Policies and Procedures.

**Dropping and Adding**
Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. Students should be aware of the current deadlines and penalties for adding and dropping classes by visiting the GET home page. (Registrar news and information)

**Americans with Disabilities Act (ADA)**
Reasonable accommodation will be provided to any student who is registered with the Office of Students with Disabilities and requests needed accommodation. For more information visit the Office for Students with Disabilities home page.

**Academic Honesty/Student Conduct**
All work you submit must be your own scholarly and creative efforts. Any act of using ideas, words, or work of another person or persons as if they were one’s own is considered as cheating. Cheating will not be tolerated. Cheating on any assignment or exam will be taken seriously. All parties involved will receive a grade of F for the course and be reported to the University Official. Check Appendix E - Student Conduct / Student Conduct Procedures to see student code of conduct in Cal State LA.
**COURSE SCHEDULE**

This schedule is subject to change. Any changes will be notified in the class room and via email and CSNS. Up-to-date schedule is maintained on CSNS.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Assignments/Activities</th>
</tr>
</thead>
</table>
| 1    | Introduction to Multimedia.  
  • Definition of multimedia  
  • Taxonomy of multimedia  
  • Media formats  
  • Issues and Applications | |
| 2    | Digital Data Acquisition  
  • Basic signal processing  
  • Digitization  
  • Sampling  
  • Quantization (Scalar and Vector) | |
| 3    | Coding Theory  
  • Need for compression  
  • Lossless and lossy compression techniques. | HW1 |
| 4    | Lossless Compression Methods  
  • Entropy coding | |
| 5    | Lossless Compression Methods  
  • Dictionary based coding  
  • Arithmetic coding  
  • Differential coding | |
| 6    | Review of Lossless Compression Methods | Review of Topics for the midterm exam (Q&A) |
| 7    | Introduction to Lossy Compression Basics for Images  
  • Color problem, color response, Tri-Stimulus vectors, color space  
  • Transform coding | Midterm |
| 8    | Lossy Compression Standards – Image (JPEG) | HW2 |
| 9    | Lossy Compression Standards – Image (JPEG 200) | |
| 10   | Introduction to Lossy Compression Basics for Video  
  • Modality of video  
  • Motion compensation | |
| 11   | Lossy Compression Standards – Video (ISO Standards) | HW3 |
| 12   | Lossy Compression Standards – Video (MPEG Standards) | |
| 13   | Audio Compression Techniques and Standards  
  • Characteristics of sound and audio signals  
  • Sound compression techniques  
  • Audio compression standards | |
<table>
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<th>Week</th>
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<tbody>
<tr>
<td>14</td>
<td>Lossy Compression Standards – Graphics</td>
<td>HW4</td>
</tr>
<tr>
<td>15</td>
<td>Recent compression technology</td>
<td>Review of Topics for the final exam (Q&amp;A)</td>
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<tr>
<td>Final</td>
<td></td>
<td>Prepare for Class: You are required to review lecture slides, your midterm exam, and sample questions for the final exam.</td>
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