EEEN 4310 Signal Processing
Electrical Engineering Program, Department of Engineering
Fall 2019

A. COURSE INFORMATION

Course number/section: EEEN 4310.001
Class meeting time: Lec: MWF 10:00-10:50 a.m.
Class location: Lecture EN 214
Course Website: bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Ruby Mehrubeoglu
Office location: EN 222D
Office hours: MW 11:00 a.m. - 12:30 p.m., F 11:00 a.m. - 1:00 p.m. + by appointment
Telephone: 361-825-3378
e-mail: Ruby.Mehrubeoglu@tamucc.edu
Appointments: Please e-mail or call to make an appointment

C. COURSE DESCRIPTION

Catalog Course Description
This course introduces students to discrete time signals & systems, z-transform, discrete Fourier transform, flow graph and matrix representation of digital filters, digital filter design techniques and computation of the fast Fourier transform (FFT). MATLAB software package is heavily utilized in this course.

Extended Course Description
The students will work with software tools (MATLAB/Simulink) to practice applied concepts of digital signal processing, both in one and two dimensions; a final project will incorporate the learned concepts in a practical real-world problem.

D. PREREQUISITES AND COREQUISITES

Prerequisites
EEEN 3330 Control Systems I

Corequisites
N/A

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)
Optional Textbook(s) or Other References

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT
Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:
1. Represent discrete time signals in linear systems
2. Apply transforms (z-, Fourier, Laplace, wavelet, cosine, etc.) to design, implement and characterize filters or represent signals, as applicable
3. Incorporate programming tools and algorithms for signal representation and conditioning
4. Perform a critical review of a refereed journal article on applications of DSP concepts
5. Design and implement digital signal processing solutions and algorithms for a scientific/engineering problem/application

G. INSTRUCTIONAL METHODS AND ACTIVITIES
Methods and activities for instruction include the following: lectures, in-class assignments, webinars, team assignments, homework assignments that involve problems and MATLAB-based algorithms, quizzes, reports, and oral presentations.

H. MAJOR COURSE REQUIREMENTS AND GRADING

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL SCORE</th>
<th>FINAL GRADE</th>
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<tbody>
<tr>
<td>Homework and Quizzes</td>
<td>15</td>
<td>90 - 100 A</td>
</tr>
<tr>
<td>Exam #1</td>
<td>15</td>
<td>80 - 89 B</td>
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<tr>
<td>Exam #2</td>
<td>15</td>
<td>70 - 79 C</td>
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<tr>
<td>Journal Paper Critical Review</td>
<td>5</td>
<td>60 – 69 D</td>
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<tr>
<td>Final Project (Oral Presentation + Written Report)</td>
<td>25</td>
<td></td>
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<tr>
<td>Final Exam</td>
<td>25</td>
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<tr>
<td>TOTAL</td>
<td>100</td>
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# I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>WEEK: DATE</th>
<th>TOPIC (LEC)</th>
<th>CHAPTER(S)</th>
<th>ASSIGNMENTS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 08/26-08/30</td>
<td>Review of Syllabus and Safety and Security Procedures; Introduction to DSP; Linear Systems and Signals; REVIEW: Complex numbers, inner product, correlation.</td>
<td>Ch. 1 (S-W Park)</td>
<td>Chapter reading;</td>
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<td>2: 09/02-09/06</td>
<td>LABOR DAY HOLIDAY (9/2) System input/output representation; stable and causal systems; General Review of Laplace Transforms,</td>
<td>Ch. 1 (S-W Park)</td>
<td>Chapter reading; HW #1: Signal Representation (SLO 1)</td>
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<tr>
<td>3: 09/9-09/13</td>
<td>Discrete time signals; vector and signal analysis; Fourier series analysis; Fourier Transform</td>
<td>Ch. 2 (S-W Park)</td>
<td>Chapter reading</td>
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<tr>
<td>4: 09/16-09/20</td>
<td>Sampling; Discrete Fourier Transform; Convolution; Histograms and Probability Density Functions</td>
<td>Ch. 2 (S-W Park)</td>
<td>Chapter reading; HW #2: Fourier Transforms (SLO 1, 2)</td>
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<tr>
<td>5: 09/23-09/27</td>
<td>z-transforms and digital filters</td>
<td>Ch. 3 (S-W Park)</td>
<td>Chapter reading; Exam 1</td>
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<tr>
<td>6: 09/30-10/04</td>
<td>z-transforms and digital filters</td>
<td>Ch. 3 (S-W Park)</td>
<td>Chapter reading; HW #3: Z-Transforms (SLO 2)</td>
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<tr>
<td>7: 10/07-10/11</td>
<td>FFT and DCT</td>
<td>Ch. 4 (S-W Park)</td>
<td>Chapter reading;</td>
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<tr>
<td>8: 10/14-10/18</td>
<td>Filter Banks and Wavelet Transforms</td>
<td>Ch. 5 (S-W Park)</td>
<td>Chapter reading;</td>
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<tr>
<td>9: 10/21-10/25</td>
<td>Filter Banks and Wavelet Transforms</td>
<td>Ch. 5 (S-W Park)</td>
<td>Chapter reading; HW #4: implementing filters in MATLAB using transforms (SLO 3)</td>
</tr>
<tr>
<td>10: 10/28-11/01</td>
<td>Quantization, Noise, Modulation</td>
<td>Ch. 6 (S-W Park)</td>
<td>Chapter reading; Final Project Topic Selection and Approval; Exam 2</td>
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<td>11: 11/04-11/08</td>
<td>Oversampling, Data Compression, Shannon’s Information Theory, Huffman Coding</td>
<td>Ch. 6 (S-W Park)</td>
<td>Chapter reading; working on final project Critical Review – Oral Presentations and Report (SLO 4)</td>
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<td>12: 11/11-11/15</td>
<td>Application: Speech Processing</td>
<td>Ch. 7 (S-W Park)</td>
<td>Chapter reading; working on final project</td>
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<td>13: 11/18-11/22</td>
<td>Speech Processing</td>
<td>Ch. 7 (S-W Park)</td>
<td>Chapter reading; working on final project HW #5: Signal Conditioning using MATLAB; problems (SLO 1, 2, 3)</td>
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<tr>
<td>15: 12/02-12/04</td>
<td>Adaptive Filters</td>
<td>Ch. 8 (S-W Park)</td>
<td>Chapter reading; Final Project Presentations and Report (SLO 1, 2, 3, 5)</td>
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Final Exam Date*: Wednesday, December 11, 2019, 8:00 am – 10:30 pm

*subject to change $^\text{based on published final exam schedule}$
J. COURSE POLICIES

Attendance/Tardiness
You are advised to attend all lectures and laboratories. If you miss a class period, you are responsible for whatever is covered or announced during your absence. There will be no make-ups for oral presentations or quizzes. The students are expected to display responsible conduct in the classroom and laboratory, including but not limited to adhering to the rules and regulations, and respecting the instructor and fellow classmates.

Late Work and Make-up Exams
No makeup work will be allowed except in the case of a documented extreme emergency, or University-accepted excuse. Team presentations must be given by all team members. There are no makeups for missed presentations.

All assignments, both individual and team, must be uploaded by each student to Black Board online system as well as hard copies handed to the course professor in class by the due dates. Late assignments will only be accepted with penalty and with prior notification. There will be a 20 point deduction per late day from the total score of maximum 100 up to 5 days, after which a late assignment will not be accepted. Late assignments will not be accepted after the graded assignments are returned to class.

Extra Credit
Extra credit may be assigned at the discretion of the instructor.

Food in Class
Eating or drinking is strictly prohibited in the labs, and not permitted in the lecture rooms. Students with food or drink in visible sight will be asked to discard them, or leave the room. All signage regarding health and safety must be followed in the lecture rooms and laboratories.

Missed Exam
No makeup examinations will be given unless university-excused absence can be provided.

Participation
Students are expected to participate in the in-class and online exercises, discussions, and team work. Members not contributing to team assignments will not receive full credit for that team assignment.

Use of Electronic Devices
The use of cell phones, electronic devices, or computers for purposes other than those of the course objectives of the day is not permitted. Restricted activities include but are not limited to text messaging, twittering, talking on the phone, instgramming, browsing on the internet, and disrupting the classroom activities. Anyone displaying unsuitable classroom behavior will be asked to leave the classroom or the laboratory. Recording of part or all of the lecture or lab instruction and materials requires approval of the course instructor.
Safety
The safety of students, faculty, staff and visitors to the engineering laboratories is of paramount importance to the Mechanical Engineering and Engineering Technology programs. You must follow all safety procedures and use personal protective equipment as required in each laboratory and workshop. Any student who attempts to use equipment without authorization or violates any safety policy or regulation will be immediately removed from the laboratory.

K. COLLEGE AND UNIVERSITY POLICIES

• Academic Integrity (University)
  It is expected that university students will demonstrate a high level of maturity, self-direction, and ability to manage their own affairs. Students are viewed as individuals who possess the qualities of worth, dignity, and the capacity for self-direction in personal behavior.
  See Full University Policy at http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity

• Classroom/Professional Behavior
  Please follow the student handbook and the course policies outlined above.

• Deadline for Dropping a Course with a Grade of W (University)
  We hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

• Grade Appeals (College of Science and Engineering)
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the
grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Corpus Christi Hall 116.
  
  If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

The instructor reserves the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. The instructor will announce such changes in a timely manner during regularly scheduled lecture periods.