EEEN 4310 Signal Processing
Electrical Engineering Program, Department of Engineering
Fall 2020

A. COURSE INFORMATION

Course number/section: EEEN 4310.001
Class meeting time: Lec: MWF 10:00-10:50 a.m.
Class location: Lectures: online (synchronized); Exams/Presentations: RFEB 214
Course Website: bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Ruby Mehrubeoglu
Office location: RFEB 222D
Office hours: MW 11:00 a.m. - 12:30 p.m., F 11:00 a.m. - 1:00 p.m. + by appointment (online)
Telephone: 361-825-3378
e-mail: Ruby.MehrubeogluATtamuccDOTedu
Appointments: Please e-mail 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>20</td>
<td>90 - 100</td>
</tr>
<tr>
<td>Exam #1</td>
<td>15</td>
<td>80 - 89</td>
</tr>
<tr>
<td>Exam #2</td>
<td>15</td>
<td>70 - 79</td>
</tr>
<tr>
<td>Journal Paper Critical Review</td>
<td>4</td>
<td>60 – 69</td>
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<tr>
<td>Final Project (Oral Presentation + Written Report)</td>
<td>21</td>
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<tr>
<td>Final Exam</td>
<td>25</td>
<td></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>
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</thead>
<tbody>
<tr>
<td>1: 08/19 - 08/21</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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<tr>
<td>2: 08/24 - 08/28</td>
<td>System input/output representation; stable and causal systems; General Review of Laplace Transforms,</td>
<td>Ch. 1 (S-W Park)</td>
<td>HW #1: Signal Representation (SLO 1)</td>
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<tr>
<td>3: 08/31 - 09/04</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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<td>4: 09/09 - 09/11</td>
<td>LABOR DAY HOLIDAY (9/7) Sampling; Discrete Fourier Transform; Convolution; Histograms and Probability Density Functions</td>
<td>Ch. 2 (S-W Park)</td>
<td>HW #2: Fourier Transforms (SLO 1, 2)</td>
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<tr>
<td>5: 09/14 - 09/18</td>
<td>z-transforms and digital filters</td>
<td>Ch. 3 (S-W Park)</td>
<td>Chapter reading;</td>
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<tr>
<td>6: 09/21 - 09/25</td>
<td>z-transforms and digital filters</td>
<td>Ch. 3 (S-W Park)</td>
<td>HW #3: Z-Transforms (SLO 2) Exam 1 (FACE-TO-FACE)</td>
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<tr>
<td>7: 09/28 - 10/02</td>
<td>FFT and DCT</td>
<td>Ch. 4 (S-W Park)</td>
<td>Chapter reading;</td>
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<tr>
<td>8: 10/05 - 10/09</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: 10/12 - 10/16</td>
<td>Filter Banks and Wavelet Transforms</td>
<td>Ch. 5 (S-W Park)</td>
<td>HW #4: implementing filters in MATLAB using transforms (SLO 3)</td>
</tr>
<tr>
<td>10: 10/19 - 10/23</td>
<td>Quantization, Noise, Modulation</td>
<td>Ch. 6 (S-W Park)</td>
<td>Chapter reading; Final Project Topic Selection and Approval; Critical Review – Oral Presentations and Report</td>
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<td>11: 10/26 - 10/30</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 (SLO 4) Exam 2 (FACE-TO-FACE)</td>
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<td>12: 11/02 - 11/06</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: 11/09 - 11/13</td>
<td>Speech Processing</td>
<td>Ch. 7 (S-W Park)</td>
<td>Chapter reading; working on final project</td>
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<td>15: 11/23</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

$§$ based on published final exam schedule
J. COURSE POLICIES

COVID-19
Face Coverings—Face coverings (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Extra masks will be made available if needed.

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, instragamming, 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.

Diversity and Inclusion Statement
An engineer is expected to develop solutions to a problem at hand. Engineering problems are not unique, and, particularly in workforce settings, they are typically not solved by single individuals. Engineering problems require commitment from individuals who work in diverse teams to accomplish a unified project goal. You will be teaming up with fellow students in your class for the final project in this course. Diversity in teams and team assignments is an asset that is expected and respected in this course and reflects the diversity in the classroom. Everyone is expected to be inclusive of individuals from different backgrounds and with different ways of thinking in the classroom, online and offline. Diversity of backgrounds brings, among other things, diversity of thought and diversity of solutions to problems which generate multiple options to choose from when determining the optimum solution to a problem. Diversity and inclusion are key to individual success as well as successful team projects in the global work environment, and is a requirement in this course. RM

K. COLLEGE AND UNIVERSITY POLICIES

- **Academic Integrity (University)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either
(a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  I 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/](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.C0.03, 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 required 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.C0.03, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://academicaffairs.tamucc.edu/rules_procedures/assets/13.02.99.c0.03_student_grade_appeals.pdf](http://academicaffairs.tamucc.edu/rules_procedures/assets/13.02.99.c0.03_student_grade_appeals.pdf). 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 (361) 825-5816 or visit Disability Services 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.

http://disabilityservices.tamucc.edu/

• Civil Rights Complaints
Texas A&M University-Corpus Christi is committed to fostering a culture of caring and respect that is free from discrimination, relationship violence and sexual misconduct, and ensuring that all affected students have access to services. For information on reporting Civil Rights complaints, options and support resources (including pregnancy support accommodations) or university policies and procedures, please contact the University Title IX Coordinator, Sam Ramirez (Samuel.ramirez@tamucc.edu) or Deputy Title IX Coordinator, Rosie Ruiz (Rosie.Ruiz@tamucc.edu) x5826, or visit website at Title IX/Sexual Assault/Pregnancy.

• Limits to Confidentiality. Essays, journals, and other materials submitted for this class are generally considered confidential pursuant to the University's student record policies. However, students should be aware that University employees, including instructors, are not able to maintain confidentiality when it conflicts with their responsibility to report alleged or suspected civil rights discrimination that is observed by or made known to an employee in the course and scope of their employment. The instructor must report allegations of civil rights discrimination, including sexual assault, relationship violence, stalking, or sexual harassment to the Title IX Coordinator if you share it with her.

• These reports will trigger contact with you from the Civil Rights/Title IX Compliance office who will inform you of your options and resources regarding the incident that you have shared. If you would like to talk about these incidents in a confidential setting, you are encouraged to make an appointment with counselors in the University Counseling Center.

• 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.