George Mason University  
Electrical and Computer Engineering Department  
ECE 201: Introduction to Signals and Systems  
Syllabus  
Fall 2018

Professor:  Dr. Kathleen E. Wage (section 001)  
Nguyen Engr. Bldg., Room 3217  
703-993-1579  
kwage@gmu.edu

Class:  Tues./Thurs.  10:30-11:45am  
ENGR 1101

Office hours:  Monday 2:30-4:00pm (in Rm 3202)  
Tuesday 1:30-2:30pm (in Rm 3202)

Prerequisites:  Grade of C or better in ECE 101 and MATH 114


Other Required Materials:  i>clicker (version 2 required) or i>clicker reef subscription;  
http://www.iclicker.com

Course Overview
This course introduces students to key concepts in electrical and computer engineering (ECE). In particular students will learn the fundamental role played by sinusoidal and complex exponential signals for connecting the time and frequency domains. They will also learn properties of signal processing systems, such as linearity and time invariance. This course is designated as a *Discovery of Scholarship* course by the Office of Student Scholarship, Creative Activities, and Research (OSCAR). To fulfill its Discovery-level goals, this course will introduce students to scholarship, both as a general concept, and as done at Mason by students and faculty. They will also learn about the OSCAR program and opportunities for undergraduates to participate in research. By the end of the semester students will understand how knowledge of ECE is generated and disseminated through scholarship, and the importance of scholarship to society.

The workload for this course consists of the following: two class meetings and one laboratory session per week. Class time is divided between short lecture segments on key concepts and in-class group exercises. Students are expected to do the assigned reading prior to coming to class so that they are adequately prepared to participate in the interactive problem-solving sessions. The course grade is based on performance on the readiness assessment tests, in-class problems, weekly homework assignments, laboratory projects, in-class examinations, and a comprehensive final examination. The remainder of this handout describes the course requirements in more detail.

Learning Outcomes
By the end of the course the successful ECE 201 student will achieve a number of desired learning outcomes:

- Student will demonstrate a working knowledge of complex arithmetic, including a visual understanding of the complex plane and the ability to use graphs to explain complex number calculations.

- Student will be able to apply mathematical techniques and concepts in order to analyze basic signals and systems. For example, the student will be able to determine the frequency of a sinusoid from either a graph or an equation.

- Given information about a system, the student will be able to assess whether it is linear, time-invariant, and causal.

- Student will be able to assess a problem and determine the best approach to solve it, e.g., determine whether to solve it using time domain or frequency domain methods.
• Student will be able to select a sampling frequency that guarantees that signals will not be aliased.

• Student will be able to plot the spectrogram of a signal.

• Student will be able to find the output of an LTI system using convolution of time domain signals, or multiplication of discrete-time Fourier transforms

• Student will distinguish between personal beliefs and evidence and will construct logical solutions to problems based on evidence.

• Student will be able to analyze information and make judgements about the validity of that information. For example, the student will be able to assess the accuracy and merits of a solution to a problem.

• Student will understand the research methods used in a discipline. Research requires critical thinking, the ability to learn independently, and the ability to assess one’s own understanding of a topic. The student will build critical thinking skills through solving engineering problems. The student will exercise their learning and self-evaluation skills through weekly homework reflections, culminating in a semester summary document.

**Class Meetings**
It is assumed that you will attend all of the classes, though attendance will not be formally recorded. If missing a class is absolutely unavoidable, you should check with your classmates to obtain the notes for that day and check the Blackboard site to obtain any handouts. If homework is due, you are responsible for turning it in prior to class time.

Class meetings will combine short lectures on key points in the material with collaborative problem solving sessions. I feel that the time spent on the problems is much more educational than watching a lecture for the entire period. Responses to in-class problems will be submitted via i>clicker. More information about i>clicker use can be found below. The shortened lecture puts a responsibility on you to be prepared for class by completing the reading the night before. In our experience, students who come prepared to this type of class find that they understand more about the material and homework problems than if they had attended a traditional lecture. Students who are not prepared are more lost and confused than they are in traditional classes. Homeworks and exams may include topics that are in the reading but not covered in lecture, so again, it is important to keep up with the reading to do well in the course.

Cell phones, tablets, laptops and other devices may only be used for class activities, e.g., answering questions via the iclicker app. Engaging in activities not related to the course (e.g., gaming, email, chat, etc.) will result in a significant deduction in your in-class problem grade.

**Preparation for Class**
You are required to come to class prepared. As you progress in your career as an engineer, it is essential that you acquire the skill of reading a book to learn necessary information about a technical problem. In your professional life, you will have to solve many problems that are not taught in classes here, and engineering textbooks or journals will be your only resource. This course will provide an opportunity for you to develop your technical reading skills. In addition to doing the assigned reading prior to lecture, it will be essential for you to review the material covered in the previous lectures. To motivate you to do the necessary preparation, the first activity in each class will be a Readiness Assessment Test (RAT). Your grade on these RATs will be 5% of your final grade for the class. The RATs will be submitted using the i>clicker. Note that the lecture schedule has a complete list of reading assignments for the semester. The homework assignment may provide additional guidance about how to prepare for the following week’s classes.

**i>clickers**
This course will use i>clickers, a classroom response system, to facilitate the in-class problems. The i>clicker system provides immediate feedback about overall class understanding, which can lead to class discussion to clarify misconceptions and common mistakes. You are expected to purchase either an i>clicker2
device (version 2 required) or an iClicker Reef subscription (which can be used from a smartphone, tablet, or laptop). Further instructions about registering your iclicker/account will be posted on the Blackboard page.

**Homework**
There will be regular homework assignments (problem sets). These will be distributed via the Blackboard page. You are expected to do ALL the assigned problems. In making up the exams and in assigning a final grade, we will assume that you have worked ALL the problems. Most exams will include one problem very similar to one of the homework problems. Thus, there will be a very immediate benefit to doing the homework completely and diligently. Each homework will also include the reading to prepare for the following week’s classes. Again, you are required to do this reading before the class meets. **Homeworks must be turned in via Blackboard before midnight on the day they are due. Late homeworks will not be accepted, as this would prevent prompt posting of the solutions.** To submit handwritten homework in Blackboard, it must be scanned and saved as a single file. Scanning software must be used – photos of homework solutions are not acceptable. Note that at the end of the term, we will drop the lowest homework grade from your overall homework score. Additional guidelines for the homework are posted on the website.

**Laboratory**
Please see the laboratory syllabus distributed by the Teaching Assistant in charge of your lab section.

**Online Materials**
All course materials will be available via the Blackboard site.

**Office Hours**
Office hours are a time for you to get help with homework, help in understanding the assigned reading, or answers to any other questions about ECE 201 material or the ECE program. See the Blackboard page for a complete listing of office hours. Feel free to attend the office hours of any member of the ECE 201 teaching staff.

**Exams**
There will be two in-class exams during the semester and one comprehensive final exam during exam week. The dates of the exams are given below.

- Exam 1: Tuesday, October 2, 2018 10:30-11:45am
- Exam 2: Tuesday, November 6, 2018 10:30-11:45am
- Final Exam: Tuesday, December 18, 2018 10:30am-1:15pm

The exams will be given in the usual classroom. As noted above, it is likely that most of the exams will include a problem which is very similar to one of the homework problems. All of the quizzes and exams are closed book. No calculators or other electronic devices are allowed.

**Course Grade**
The final grade in the course is based on our best assessment of your understanding of the material and the quality of your work during the semester. The exams, problem sets, laboratory projects, and other assignments are combined with the following rough weighting to give a preliminary final grade:

- Exam 1 17.5%
- Exam 2 17.5%
- Final Exam 25%
- Laboratory Grade 20%
- Homework 10% (lowest score will be dropped)
- Readiness Assessment Tests (RATs) 5% (lowest score will be dropped)
- In-class problems 5% (lowest score will be dropped)
A student requesting a grade change for any assignment must provide the instructor with the following within 2 class periods after the work is returned: the assignment and a paragraph describing why you feel you should receive additional points for the work. Note that in some cases, it is possible that what you wrote for the assignment indicated a better understanding of the problem than you actually possess. If the paragraph you submit indicates that you don’t understand the problem as well as the grader thought you did, then your score may be reduced.

**Academic Integrity**

GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. All ECE 201 students are expected to abide by the George Mason University Honor Code and the rules outlined below. Any reasonable suspicion of an honor code violation will be reported.

Three fundamental principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, factual information, graphs or figures from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Note that paraphrased material must also be cited. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see a member of the teaching staff.

You will be working as a group during all the in-class interactive problem-solving sessions. You are also encouraged to collaborate on the homework assignments. Talking to other students, explaining your ideas and questioning their ideas, is a great way to learn. However, you must write up your own solution for the homework problems. In doing this, you **MUST** identify at the top of the assignment any students you collaborated with to complete the assignment. In signing your own name to the assignment, you are certifying that the work reflects your own understanding of the problems. Simply copying someone else’s answer is not working collaboratively, and is not permitted.

The same rules that apply to homeworks also apply to the lab assignments. Moderate discussion of ideas on the projects is permitted, but copying code or lab reports is explicitly forbidden.

The examinations are strictly your own effort, and we will be looking for consistency between the homework performance and the exam performance on those exam problems closely related to the problem sets.

**Reposting of Course Material to Other Websites**

The course materials (lecture notes, homeworks, projects, exams, solutions, and anything else posted on the course website) are copyrighted. You may not upload them to any other website or share them with any on-line or off-line test bank.

**GMU Email Accounts**

Students must use their Mason email account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information.

**Office of Disability Services**

If you are a student with a disability and you need academic accommodations, please see the professor and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. http://ods.gmu.edu

**Other Useful Campus Resources:**

- COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): (703) 993-2380; http://caps.gmu.edu
- LEARNING SERVICES: SUB I, Room 3129; (703) 993-2380; https://learningservices.gmu.edu
• UNIVERSITY LIBRARIES Ask a Librarian http://library.gmu.edu/ask

• WRITING CENTER: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu

• UNIVERSITY POLICIES The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.
# ECE 201: Introduction to Signals and Systems
## Fall 2018 Schedule

<table>
<thead>
<tr>
<th>Lec#</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Reading</th>
<th>Problem Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T 8/28</td>
<td>Introduction to DSP</td>
<td>Chapter 1, Syllabus</td>
<td>1</td>
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<tr>
<td>2</td>
<td>R 8/30</td>
<td>Complex numbers</td>
<td>Appendix A.1-A.5</td>
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<tr>
<td>3</td>
<td>T 9/4</td>
<td>Sinusoidal signals</td>
<td>A.6, 2.1-2.3</td>
<td>2 1</td>
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<tr>
<td>4</td>
<td>R 9/6</td>
<td>Plotting sinusoids, complex exponentials and phasors</td>
<td>2.4-2.5</td>
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<tr>
<td>5</td>
<td>T 9/11</td>
<td>Phasor addition</td>
<td>2.6, 2.8</td>
<td>3 2</td>
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<tr>
<td>6</td>
<td>R 9/13</td>
<td>Sums of sinusoids, spectral representations</td>
<td>3.1-3.2</td>
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<tr>
<td>7</td>
<td>T 9/18</td>
<td>Amplitude modulation, spectral operations</td>
<td>3.2-3.4</td>
<td>4 3</td>
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<tr>
<td>8</td>
<td>R 9/20</td>
<td>Fourier series</td>
<td>3.4-3.6</td>
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<tr>
<td>9</td>
<td>T 9/25</td>
<td>Spectrogram and chirp signals</td>
<td>3.6-3.7</td>
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<tr>
<td>10</td>
<td>R 9/27</td>
<td>Intro to sampling</td>
<td>4.1-4.2</td>
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<tr>
<td>11</td>
<td>T 10/2</td>
<td><strong>Exam 1:</strong> covers material through PS4</td>
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<tr>
<td>12</td>
<td>R 10/4</td>
<td>Spectral interpretation of sampling</td>
<td>4.2-4.3</td>
<td>5</td>
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<tr>
<td></td>
<td>T 10/9</td>
<td><em>No class due to holiday; Monday classes meet Tuesday</em></td>
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<td>6 5</td>
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<tr>
<td>13</td>
<td>R 10/11</td>
<td>Sampling demos</td>
<td>4.3-4.4</td>
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<tr>
<td>14</td>
<td>T 10/16</td>
<td>Difference equations and FIR filters</td>
<td>5.1-5.3</td>
<td>7 6</td>
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<tr>
<td>15</td>
<td>R 10/18</td>
<td>Linearity, time invariance, and convolution</td>
<td>5.4, 5.6</td>
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<tr>
<td>16</td>
<td>T 10/23</td>
<td>Convolution and LTI systems</td>
<td>5.7-5.8</td>
<td>8 7</td>
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<tr>
<td>17</td>
<td>R 10/25</td>
<td>Convolution examples</td>
<td>5.5, 5.9</td>
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<tr>
<td>18</td>
<td>T 10/30</td>
<td>Frequency response</td>
<td>6.1-6.2</td>
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<tr>
<td>19</td>
<td>R 11/1</td>
<td>Properties of frequency response</td>
<td>6.4-6.5</td>
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<tr>
<td>20</td>
<td>T 11/6</td>
<td><strong>Exam 2:</strong> covers material through PS8</td>
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<tr>
<td>21</td>
<td>R 11/8</td>
<td>Frequency response examples, filtering continuous signals</td>
<td>6.6-6.8</td>
<td>9</td>
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<tr>
<td>22</td>
<td>T 11/13</td>
<td>Discrete time Fourier transform</td>
<td>7.1-7.2</td>
<td>10 9</td>
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<tr>
<td>23</td>
<td>R 11/15</td>
<td>DTFT examples</td>
<td>7.3-7.5</td>
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<tr>
<td>24</td>
<td>T 11/20</td>
<td>Discrete Fourier transform</td>
<td>8.1</td>
<td>11 10</td>
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<td></td>
<td>R 11/22</td>
<td><em>Thanksgiving recess; no class</em></td>
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<td>25</td>
<td>T 11/27</td>
<td>DFT properties</td>
<td>8.2-8.4</td>
<td>12 11</td>
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<tr>
<td>26</td>
<td>R 11/29</td>
<td>Spectrum analysis and windows</td>
<td>8.5-8.6</td>
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<tr>
<td>27</td>
<td>T 12/4</td>
<td>Spectrogram</td>
<td>8.7</td>
<td>13 12</td>
</tr>
<tr>
<td>28</td>
<td>R 12/6</td>
<td>Fast Fourier transform</td>
<td>8.8</td>
<td>13</td>
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<tr>
<td></td>
<td>T 12/18</td>
<td><strong>Comprehensive Final Exam: 10:30am-1:15pm</strong></td>
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### Other Important Dates
- **Sept 3:** Labor Day; university closed
- **Sept 4:** Last date to add courses
- **Sept 10:** Final drop deadline
- **Oct 8:** Fall break; Monday classes meet on Tuesday; Tuesday classes do not meet
- **Nov 21-25:** Thanksgiving recess
- **Dec 8:** Last day of classes
- **Dec 10-11:** Reading days
- **Dec 12-19:** Exam period