

EE 311 Signals and Linear Systems

Fall, 2021

Location: SPEARE 16

MWF, 9:50 – 10:40

Instructor: Rene Arechiga
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Office Hours: MTW 2:00 – 4:30 or by appointment

Course Description:

Signals and Linear Systems, 3 cr, 3 cl hrs

Normally offered fall semester

Fundamentals of continuous and discrete signals and systems. Topics include: linear time-invariant systems, convolution, Fourier series, Fourier transforms, Laplace transforms, z-transforms, sampling theory, transfer functions, poles and zeros, feedback systems, filters, application of MATLAB, and related topics.

Mode of Instruction: face-to-face.

Pre-requisites: EE 212, EE 271, and MATH 335

Place in Curriculum: It's a required course for EE majors

Course Learning Outcomes: The objectives of the linear systems sequence are for the student to be able to analyze linear time-invariant continuous-time and discrete-time systems, and to design simple systems. EE 341 covers time-domain and frequency-domain representations of signals, and time-domain, frequency-domain representations, and transfer function representation of linear systems.

To accomplish this, the student will be able to:

- Describe the basics of linear time-invariant systems and systems.
- Determine whether a system is linear, time-invariant, and causal.
- Represent continuous-time linear systems by differential equations, and discrete-time linear systems by difference equations.
- Find the output of a simple linear system by solving its differential or difference equation.
- Find the output of a simple linear system through convolution techniques.
- Determine the frequency components of signals using the Fourier transform.
- Determine the responses of linear systems to simple inputs using Fourier transform techniques.
- Use the discrete Fourier transform (DFT) to approximate the discrete-time Fourier transform (DTFT) of discrete-time signals. Determine the responses of continuous time linear systems to

simple inputs using Laplace transform techniques.

- Determine the responses of discrete time linear systems to simple inputs using z-transform techniques.
- Use MATLAB to plot signals.
- Use MATLAB to generate computer implementations of the techniques for analysis and design of linear systems discussed in this course.

Program Learning Outcomes:

<https://www.nmt.edu/academics/eleceng/undergrad/index.php>

Course Requirements:

Text:

Title: SIGNALS & SYSTEMS
THEORY AND APPLICATIONS

PDF: free download: umich.edu/publications/ee/.

or at:

<https://services.publishing.umich.edu/wp-content/themes/mpub-services/library/pdf/SSTA-107.pdf>

Authors: Fawwaz T. Ulaby and Andrew E. Yagle

Publisher: Michigan Publishing, 2018



Tentative Course Schedule: Homework will be assigned once per week. There will be a short quiz every Friday unless agreed upon on the previous Wednesday. There will be two or three partial exams and a final.

Grading:

Grade distribution proposed is as follows:

Homework: 20%

Quizzes: 10%

Mid-term exams: 40%

Final exam: 30%

Academic Honesty: New Mexico Tech's Academic Honesty Policy for undergraduate and graduate students is found in the student handbook, which can be found at: <http://www.nmt.edu/student-handbook>. You are responsible for knowing, understanding, and following this policy.

Reasonable Accommodations:

New Mexico Tech is committed to protecting the rights of individuals with disabilities. Qualified individuals who require reasonable accommodations are invited to make their needs known to the Office for Disability Services (ODS) as soon as possible. They will describe the process by which you can request such accommodations for this course. To schedule an appointment, please call 835-6209, or email disability@nmt.edu.

Counseling Services:

New Mexico Tech offers individual and couples counseling, safety assessments, crisis intervention and consultations through The Counseling Center. These confidential services are provided free of charge by licensed professionals. For more information, please call 835-6619, email counseling@nmt.edu or complete an Intake Form on our website at <https://www.nmt.edu/cds/>. All services are provided via phone or Zoom during the Covid-19 pandemic.

Respect Statement: New Mexico Tech supports freedom of expression within the parameters of a respectful learning environment. As stated in the New Mexico Tech Guide to Conduct and Citizenship: "New Mexico Tech's primary purpose is education, which includes teaching, research, discussion, learning, and service. An atmosphere of free and open inquiry is essential to the pursuit of education. Tech seeks to protect academic freedom and build on individual responsibility to create and maintain an academic atmosphere that is a purposeful, just, open, disciplined, and caring community."

COVID-19 Safety Issues for Face-to-Face Instruction: As of the beginning of Fall semester, NMT classes are under the following constraints, which may change as COVID conditions and/or New Mexico Governor's orders change. Please check for daily updates of COVID constraints, posted on www.nmt.edu/covid19/.

- 1) All vaccinated and unvaccinated individuals are required to wear a face mask indoors anywhere on campus. It is anticipated based on prior Governor's orders that, when conditions improve individuals who have not been fully vaccinated will still be required

to wear a face mask and to social distance indoors. Vaccinated individuals, in contrast, would not be required to wear a mask indoors but are welcome to still wear a mask if they choose to, so please do not assume that individuals wearing masks are unvaccinated.

- 2) Instructors and TAs will not ask for proof of vaccination. This, too, may change in response to changing conditions.
- 3) Please note provisions on masks, vaccines or other possible requirements are subject to change as the situation evolves, based on guidance from the Centers for Disease Control, the State of New Mexico, and university officials (i.e., the President and the Board of Regents).
- 4) Students should not to come to class if they are feeling ill and to follow any quarantine guidelines that they are given in the event of exposure to COVID-19. If you do miss class, please contact the instructor for missed assignments, contact the Student Health Center, and consider getting tested for COVID-19.

For the most up-to-date guidelines, please consult NMT's COVID- 19 information page: <https://www.nmt.edu/covid19/>.

Title IX Reporting:

Sexual misconduct, sexual violence and other forms of sexual misconduct and gender-based discrimination are contrary to the University's mission and core values, violate university policies, and may also violate state and federal law (Title IX). Faculty members are considered "Responsible Employees" and are required to report incidents of these prohibited behaviors. Any such reports should be directed to Tech's Title IX Coordinator (Dr. Peter Phaiah, 20D Brown Hall, 575-835-5187, titleixcoordinator@nmt.edu). Please visit Tech's Title IX Website (www.nmt.edu/titleix) for additional information and resources.