

Course Syllabus

Course Description:

3 hours. Fourier Series, Fourier and Laplace transforms with emphasis on their physical interpretation. System representation by transfer functions and impulse response functions. Convolution integral. Transient response, discrete time signals and systems, sampling techniques, Z and discrete Fourier transforms. Use of software tools for analysis is integral to this course.

Instructor:

Dr. Robert Akl, Discovery Park F229, (940) 565-2804, Robert.Akl@unt.edu
(<mailto:Robert.Akl@unt.edu>)

Teaching Assistant:

Lakshmi Sukrutha T.V., LakshmiSukruthaTirumalaVangipuram@my.unt.edu
(<mailto:LakshmiSukruthaTirumalaVangipuram@my.unt.edu>) OR lt0264@unt.edu (<mailto:lt0264@unt.edu>)

Office hours: Mondays and Wednesdays, 5:00 pm - 7:00 pm, Zoom:
<https://unt.zoom.us/j/93656734404> ➞ (<https://unt.zoom.us/j/93656734404>)

Class Hours:

Mondays and Wednesdays, 7:00 pm – 8:20 pm, NTDP E265 and Zoom meeting

Office Hours:

Before class from 5:30 pm - 7:00 pm, or by appointment for zoom meeting or email.

Textbook:

Signals and Systems: Analysis Using Transform Methods and MATLAB, 2nd edition, M. J. Roberts, McGraw Hill, 2012.

ISBN 978-0-07-338068-1. [Signals and Systems - M.J. Roberts - 2nd Edition.pdf](https://unt.instructure.com/courses/90998/files/22952653?wrap=1)
(<https://unt.instructure.com/courses/90998/files/22952653?wrap=1>) ↓
(https://unt.instructure.com/courses/90998/files/22952653/download?download_frd=1)

Supplemental text: MATLAB Student Edition

Grading

Attendance	10%
Homework	15%

Project	15%
Midterm	25%
Final	35%

Course Outcomes:

1. Understand the mathematical descriptions of continuous-time (CT) and discrete-time (DT) signals.
2. Understand the characteristics and properties of real systems.
3. Analyze signals and systems in both the time and frequency domain.
4. Gain experience with CT and DT Fourier series.
5. Apply the properties of the Fourier transform, Laplace transform and z-transform to real systems.

Homework:



Homework will be turned in through Canvas on the due date.

Syllabus:

Introduction (Chapter 1 – 1 [Lecture](http://www.cse.unt.edu/~rakl/class3010/Chapter1.ppt)  (<http://www.cse.unt.edu/~rakl/class3010/Chapter1.ppt>), [Chapter1.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter1.pdf)  (<http://www.cse.unt.edu/~rakl/class3010/Chapter1.pdf>)

Types of Signals

HW1: due first week of class.

Mathematical Description of Continuous-Time Signals (Chapter 2 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter2.ppt)  (<http://www.cse.unt.edu/~rakl/class3010/Chapter2.ppt>), [Chapter2.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter2.pdf)  (<http://www.cse.unt.edu/~rakl/class3010/Chapter2.pdf>)

Continuous-Time Signal Functions

Shifting and Scaling



Even and Odd Functions

Signal Energy and Power

HW ch2: P31 (a), (c), (e), and (g). P32 (a) and (b). P42 (a). P43 (a).

P48 (a) and (b). P52 (a). P55 (a) and (b). P57 (a). P58 (a).

Project 1: P35 (a).

Discrete-Time Signal Description (Chapter 3 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter3.ppt)  (<http://www.cse.unt.edu/~rakl/class3010/Chapter3.ppt>), [Chapter3.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter3.pdf)  (<http://www.cse.unt.edu/~rakl/class3010/Chapter3.pdf>)

Sinusoids and Singularity Functions

Shifting and Scaling

Even and Odd Functions

Signal Energy and Power

HW Ch3: P23 (a) and (c). P24 (a) and (b). P27 (a). P28 (a) and (b).

P32 (a) and (b). P37 (a). P38 (a).



Project 2: P26 (a).

Description of Systems (Chapter 4 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter4.ppt) , <http://www.cse.unt.edu/~rakl/class3010/Chapter4.ppt>), [Chapter4.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter4.pdf) , <http://www.cse.unt.edu/~rakl/class3010/Chapter4.pdf>)

System Modeling - Continuous and Discrete

System Properties - Continuous and Discrete

HW Ch4: P26. P33.

Time-Domain System Analysis (Chapter 5 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter5.ppt) , <http://www.cse.unt.edu/~rakl/class3010/Chapter5.ppt>), [Chapter5.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter5.pdf) , <http://www.cse.unt.edu/~rakl/class3010/Chapter5.pdf>)

Impulse Response

The Convolution Integral



The Convolution Sum

HW5: P26. P28 (a). P35. P36.

Project 3: Solve P40 using Matlab

Midterm Exam

TBD.



Continuous-Time Fourier Methods (Chapter 6 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter6.ppt) , <http://www.cse.unt.edu/~rakl/class3010/Chapter6.ppt>), [Chapter6.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter6.pdf) , <http://www.cse.unt.edu/~rakl/class3010/Chapter6.pdf>)

Continuous-Time Fourier Series

Continuous-Time Fourier Transform

HW Ch6: P39. P46 (a), (f) (mag only). P54 (d). P55 (a)

Project 4: Solve P4 using Matlab.

Discrete-Time Fourier Methods (Chapter 7 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter7.ppt) , [\(<http://www.cse.unt.edu/~rakl/class3010/Chapter7.ppt>\)](http://www.cse.unt.edu/~rakl/class3010/Chapter7.ppt)), [Chapter7.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter7.pdf) , [\(<http://www.cse.unt.edu/~rakl/class3010/Chapter7.pdf>\)](http://www.cse.unt.edu/~rakl/class3010/Chapter7.pdf)

Discrete-Time Fourier Series

Discrete-Time Fourier Transform

No homework will be assigned.

The Laplace Transform (Chapter 8 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter8.ppt) , [\(<http://www.cse.unt.edu/~rakl/class3010/Chapter8.ppt>\)](http://www.cse.unt.edu/~rakl/class3010/Chapter8.ppt)), [Chapter8.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter8.pdf) , [\(<http://www.cse.unt.edu/~rakl/class3010/Chapter8.pdf>\)](http://www.cse.unt.edu/~rakl/class3010/Chapter8.pdf)

Development and Properties of the Laplace Transform

Inverse Laplace Transform

Unilateral Laplace Transform

HW Ch7: P18 (a). P19 (a) and (d). P21 (a). P23.

The z-Transform (Chapter 9 – [Lectures](http://www.cse.unt.edu/~rakl/class3010/Chapter9.ppt) , [\(<http://www.cse.unt.edu/~rakl/class3010/Chapter9.ppt>\)](http://www.cse.unt.edu/~rakl/class3010/Chapter9.ppt)), [Chapter9.pdf](http://www.cse.unt.edu/~rakl/class3010/Chapter9.pdf) , [\(<http://www.cse.unt.edu/~rakl/class3010/Chapter9.pdf>\)](http://www.cse.unt.edu/~rakl/class3010/Chapter9.pdf)

Development and Properties of the z-Transform

Inverse z-Transform

Unilateral z-Transform

HW8: P20 (a). P21 (a) and (b). P22 (a) and (b).

Final Exam

As assigned by the University.

Academic Dishonesty:

Students caught cheating or plagiarizing will receive a "0" for that particular assignment or exam or an "F" in the course. Additionally, the incident may be reported to the Office of Student Rights and Responsibilities, which may impose for further penalty. According to the UNT catalog, the term "cheating" includes, but is not limited to: a. use of any unauthorized assistance in taking quizzes, tests, or examinations; b. dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; c.


the acquisition, without permission, of tests or other academic material belonging to a faculty or staff member of the university; d. dual submission of a paper or project, or resubmission of a paper or project to a different class without express permission from the instructor(s); or e. any other act designed to give a student an unfair advantage. The term "plagiarism" includes, but is not limited to: a. the knowing or negligent use by paraphrase or direct quotation of the published or unpublished work of another person without full and clear acknowledgment; and b. the knowing or negligent unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

ADA Statement:


The University of North Texas is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 – The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act of 1990 (ADA) as amended, pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can be found at www.unt.edu/oda. Also, you may visit the Office of Disability Accommodation in the University Union (room 321) or call (940) 565-4323.

Acceptable Student Behavior:

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Center for Student Rights and Responsibilities to consider whether the student's conduct violated the Code of Student Conduct. The university's expectations for student conduct apply to all instructional forums, including university and electronic classroom, labs, discussion groups, field trips, etc. The Code of Student Conduct can be found at www.unt.edu/csrr  [_.\(http://www.unt.edu/csrr\)](http://www.unt.edu/csrr).

Emergency Notification & Procedures:


UNT uses a system called Eagle Alert to quickly notify you with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). The system sends voice messages (and text messages upon permission) to the phones of all active faculty staff, and students. Please make certain to update your phone numbers at www.my.unt.edu  [_.\(http://www.my.unt.edu/\)](http://www.my.unt.edu/). Some helpful emergency preparedness actions include: 1) ensuring you know the evacuation routes and severe weather

shelter areas, determining how you will contact family and friends if phones are temporarily unavailable, and identifying where you will go if you need to evacuate the Denton area suddenly. In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.

Student Evaluation of Teaching:

The Student Evaluation of Teaching is a requirement for all organized classes at UNT. This short survey will be made available at the end of the semester to provide students a chance to comment on how this class is taught. Student feedback is important and an essential part of participation in this course.

Access to Information:

As you know, your access point for business and academic services at UNT occurs within the my.unt.edu site www.my.unt.edu  [\(http://www.my.unt.edu/\)](http://www.my.unt.edu/). If you do not regularly check Eagle Connect, you can forward incoming mail to your favorite e-mail account. For more information, please visit the website that explains Eagle Connect and how to forward your email:

<http://eagleconnect.unt.edu/>  [\(http://eagleconnect.unt.edu/\)](http://eagleconnect.unt.edu/)

COVID Notice:

Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

If you are experiencing any [symptoms of COVID-19](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c) 

[\(https://nam04.safelinks.protection.outlook.com/?](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c)

[url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c)

[testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c)

[\(https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html](https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html) 

[\(https://nam04.safelinks.protection.outlook.com/?](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c)

[url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c)

[testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsymptoms-testing%2Fsymptoms.html&data=04%7C01%7CRobert.Akl%40unt.edu%7C11993007b3c7404326af08d964c2c)

) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu (<mailto:askSHWC@unt.edu>)) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Team at COVID@unt.edu

(<mailto:COVID@unt.edu>) for guidance on actions to take due to symptoms, pending or positive test

results, or potential exposure.

