Fourier Analysis is a powerful tool for many problems, and especially for solving various differential equations of interest in science and engineering. The techniques presented in this course are well suited to study problems such as the vibrations of a stretched string (e.g. guitar string), the vibrations of a stretched membrane (e.g. drumhead), the waves in an incompressible fluid, electromagnetic waves (e.g. light or radio waves); the diffusion of heat or the minimization of certain energies. This is a course in applicable mathematics.

The study of Fourier analysis can serve as a capstone course in undergraduate mathematics, because it builds on such a variety of mathematical topics. Solving ordinary differential equations is the most crucial prerequisite, but ideas from many other courses are useful. Some aspects of Fourier series are best understood by regarding the coefficients in the series as components of an infinite dimensional vector. Then linear algebra becomes useful, in particular ideas about eigenvalues and eigenvectors. Convergence properties for sequences and series enter the course as described above, and vector calculus occasionally makes an appearance.

Text: Fourier Analysis and Its Applications, G. B. Folland

Syllabus: Chapters 1, 2, 3, selected topics from 4, 5, 6, 7, 8 and the Appendices. Topics include

- Fourier series
- Orthogonal sets of functions
- Boundary value problems in differential equations.
- Fourier Transform
- Laplace Transform

Instructor Information:

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Course website here
Office hours: by appointment.
TA Information:

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FREQUENTLY USED TERMS:

- **Synchronous learning:** Students have a common, real-time learning experience, e.g., a live class discussion.

- **Asynchronous learning:** Students learn the same material at different times, e.g., a demonstration video recorded and shared by a teacher, teacher notes or assigned movies.

- **Screencast:** An online video of a presenter’s screen overlaid with their voice to demonstrate a process or idea.

- **Video conference:** A conference in which participants in different locations are able to communicate with each other in sound and/or vision (via Zoom)

Course description: This term we will use a mixture of learning/teaching modalities. Student will have access to the lectures (notes and partial recordings of screencasts). On occasion movies (from the web) will also be made available. Students are expected to go over the lectures and movies (asynchronous learning). Class time Monday and Wednesday 2:30-3:50 (synchronous learning) will include class discussion. We will go over the concepts presented in the notes as well as problems labeled R in the homework (see below). A Q &A session will be included in the Monday and Wednesday meetings as well. If possible we will use a video conference format for these meetings. My intention is to record the discussion of the problems labeled R and the Q & A session, and make it available after class. The detailed format of the lecture will be presented in detail during the first week of class.

Grading policy:

- Course participation (20%)

- Weekly homework (20%): due on Wednesdays at 8pm.

- Midterm (30%): Monday May 11, 2020, 2:30 -3:50.

- Final Exam (30%): Tuesday June 9, 2:30-4:20.

Class participation: The class (video conferences on Monday and Wednesday 2:30-3:50) will include class discussion and Q & A, student involvement in this activity will be counted toward class participation. If zoom is not working properly, engagement with the course via canvas will also count as participation.
**Homework policy:** Homework problems each will be labelled:

- **R** = Required,
- **TI** = Turn In,
- **E** = Enrichment.

You are **R**esponsible for knowing the material in the **R** problems, but do not have to write them up to hand in. Some of them may provide **R**esults you will use in later **TI** Problems. **TI** problems should be written up neatly and clearly to turn in. A selection of the **TI** problems will be graded for correctness. The rest will be graded for 2 points each for “completion.” The **E** problems are recommended if you are looking for additional practice problems, some of them appeal to people with particular interests.

**Technology:**

- Classes will take place on line via zoom. Your invitations to class will be sent to your @uw.edu account. Open the first one ahead of time so that you can download zoom. If you prefer you can download zoom here https://washington.zoom.us/download#client_4meeting

- To turn in the homework, the midterm and the final, you will need to be able to scan your work: free apps are available for smart phones: Genius Scan and CamScanner are some options. If you do not have a smart phone please let me know.

**Prerequisites:** A minimum grade of 3.0 in Math 307 and 308; or a minimum grade of 3.0 in Math 324; or a minimum grade of 2.5 in Math 336; or instructor’s permission.

**Religious Accommodations:** Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/).

**The UW Food Pantry:** A student should never have to make the choice between buying food or textbooks. The UW Food Pantry helps mitigate the social and academic effects of campus food insecurity. They aim to lessen the financial burden of purchasing food by providing students with access to food and hygiene products at no-cost. Students can expect to receive 4 to 5 days’ worth of supplemental food support when they visit the Pantry. For information including operating hours, location, and additional food support resources visit uw.edu/anyhungryhusky. They can be found on the North side of West Campus’ Poplar Hall at the corner of Brooklyn Ave NE and 41st.