

Department of Civil and Environmental Engineering
CEE 696 Uncertainty Quantification

Instructor: Dr. Jonghyun Harry Lee

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Class information: TBA

Office location: Holmes 336

Office hours: Two hours in a week; additional in person meetings upon request but I recommend direct messages/usings Q&A channel in the class Slack for real-time feedback.

I. Course Description

This course aims to offer the theory of uncertainty quantification to PhD-level graduate students in Civil and Environmental Engineering. During the course, students will learn the fundamentals of uncertainty quantification in various applications using probability, statistics, numerical linear algebra, differential equation, and optimization theory. The class will primarily discuss 1) how they can quantify the uncertainty given sparse information, and 2) how they can propagate the uncertainty through physical models.

II. Course Information, Policies and Resources

1. **Attendance policy:** Students who are enrolled in this course, but never attend will be flagged by the course instructor for non-participation before the last day to add/drop (for 100% tuition refund) deadline. Flagged students will be administratively dropped by the Office of the Registrar. Any changes to a student's enrollment status may affect financial aid eligibility and can result in the return of some of all of federal student financial aid.
2. **Statement on Disability: KOKUA Program** If you have a disability and related access needs, please contact the KOKUA Program (Office for Students with Disabilities) at 956-7511, KOKUA@hawaii.edu, or go to Room 013 in the Queen Lili'uokalani Center for Student Services. Please know that I will work with you and KOKUA to meet your access needs based on disability documentation. Kokuia's services are confidential and offered free of charge.
3. **Academic Integrity and Ethical Behavior: Office of Student Conduct** Cheating, plagiarism, or other forms of academic dishonesty are not permitted within this course and are prohibited within the System-wide Student Conduct Code (EP 7.208). Examples include: fabrication, facilitation, cheating, plagiarism, and use of improper materials. Any incident of suspected academic dishonesty will be reported to the Office of Student Conduct for review and possible adjudication. Additionally, the instructor may take action in regards to the grade for the deliverable or course as they see fit.
4. **Office of Title IX:** (808) 956-2299 / t9uhm@hawaii.edu / <https://manoa.hawaii.edu/titleix/>
5. **Department of Public Safety:** (808)956-6911 (Emergency) / (808)956-8211 (Non-Emergency) <http://manoa.hawaii.edu/dps/>
6. **UH System Basic Needs** include food and housing, childcare, mental health, financial resources and transportation, among others. Student basic needs security is critical for ensuring strong

academic performance, persistence and graduation and overall student well being. If you or someone you know are experiencing basic needs insecurity, please see the following resources: [UH System Basic Needs](#)

III. Course Content and Learning Objectives

1. **Course Content:** Probability Theory, Representation of Uncertainty, Sensity Analysis, Uncertainty Propagation (Forward UQ), Inverse Problem (Inverse UQ), Optimization under uncertainty
2. **Institutional Learning Objectives**
 - To combine linear algebra, computer programming, statistics and optimization techniques covered from previous engineering/science courses to better understand UQ as a research methodology for graduate students.
 - To apply UQ techniques to support students' graduate research and dissertation chapter writing.
3. **Program/Course Learning Objectives**
 - To understand better the machine learning concepts covered in the lectures with traditional linear algebra, statistics and optimization theory.
 - To obtain experience in the techniques employed by engineers and scientists in analyzing data and performing tasks such as uncertainty propagation and data assimilation.
 - To explain better the numerical results with engineering and scientific interpretation.

IV. Required Texts and Readings

Class notes, slides, and reference materials posted in the class website <https://www2.hawaii.edu/~jonghyun/classes/F23/CEE696002/>

V. Course Assignments, Evaluation and Grading

Assignments: homework may be assigned every 2-3 weeks using Google Colab. Students are also encouraged to use UH HPC MANA's Open OnDemand interactive apps such as Jupyter Notebook for GPU-intensive tasks (and their final projects).

Attendance/Participation expectation: Students are expected to be on time and stay until the end of the class.

Assessment of work: The assignments and design project will be graded by the instructor. The students' assignments will be graded based on grammar, writing style, content, technical correctness, and completeness. Written comments, feedback and corrections will be provided on each report. After the graded assignments are returned to the class, the instructor will explain orally in class the common errors and problems observed in the students' assignments, and discuss ways to correct and improve their understanding.

Grading: 40% assignments, 60% final project presentation. Letter grades will follow the scale A+: 100-97, A: 96-93, A-: 92-90, B+: 89-87, B: 86-83, B-: 82-80, C+: 79-77, C: 76-73, C-: 72-70, D+: 69-67, D: 66-63, D-: 62-60, and F: below 60.

University of Hawai'i at Mānoa (UHM) TITLE IX SYLLABUS INFORMATION

UHM is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know experiences any of these, UHM has staff and resources on campus to support and assist you. Staff also can direct you to resources in the community. Here are some:

If you wish to remain **ANONYMOUS**, speak with someone **CONFIDENTIALLY**, or would like to receive information and support in a **CONFIDENTIAL** setting, contact: (* **Confidential Resource**)

Counseling & Student Development Center* (808) 956-7927 • manoa.hawaii.edu/counseling/

Office of Gender Equity* (808) 956-9499 • manoaadv@hawaii.edu

Lesbian, Gay, Bisexual, Transgender, Queer (LGBTQ+) Center (808) 956-9250 • manoa.hawaii.edu/lgbt

Respondent Support (808) 956-4392 • PAUrs@hawaii.edu

Student Parents at Mānoa (SP@M)* (808) 956-8059 • manoa.hawaii.edu/studentparents/

UH Confidential Advocacy* • advocate@hawaii.edu

University Health Services Mānoa* (808) 956-8965 • hawaii.edu/shs/

<http://www.manoa.hawaii.edu/titleix/resources.html#confidential>

If you wish to **REPORT** an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact:

Dee Uwono

Director and Title IX Coordinator

Hawai'i Hall 124

2500 Campus Road

Honolulu, HI 96822

(808) 956-2299

t9uhm@hawaii.edu

As a member of the University faculty, I am **required to immediately report** any incident of sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and I cannot guarantee confidentiality, you will still have options about how your case will be handled. My goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need. For more information regarding sex discrimination and gender-based violence, the University's Title IX resources and the University's Policy, EP 1.204, go to: <http://www.manoa.hawaii.edu/titleix/>