Discrete Mathematical Modelling Math 381 Summer 2021

Time: MWF 10:50 - 11:50 AM **Place** Zoom link

Instructor: Junaid Hasan **Email**: junaid01@uw.edu **Office Hours**: Wednesdays 4 PM-5 PM Pacific Time link.

(Please email beforehand if you will be late say 5:30pm, then I will stay till 6pm)

Teaching Assistant Abeer Al Ahmadieh **Email**: aka2222@uw.edu **Office Hours**: Tuesdays 10:50-11:50 AM Pacific Time link.

Textbook and Notes: There is no strict textbook for the course. However, the references that we will use often are

- "Math 381 Course Notes".
- "Operations Research" by Wayne Winston, 4th Edition, 2004.

I will suggest you topics to read before the class. We will also be taking a look at several published papers as part of the reading assignment. I will be uploading my own notes as well on Canvas.

Assignments: There will be weekly assignments due every week on Thursday. The assignments will be fairly detailed and will involve reading papers, programming and writing reports(preferably in LaTeX or Markdown). More details on Assignments will be posted on Canvas.

You are welcome to work with other students. However, the report you turn in must be your own original work and you must acknowledge the students you have worked with. Students found to have engaged in academic misconduct may receive a zero on the assignment. The University takes academic integrity very seriously. Behaving with integrity is part of our responsibility to our shared learning community. If you're uncertain about if something is academic misconduct, ask me. I am willing to discuss questions you might have.

Project: This is a modelling course where we will learn to apply math to real world problems. Therefore there will be a course project to be presented at the end of the quarter. The project can be done individually or in groups of size $<= 2$. I will post a list of projects or you are free to come with your own ideas. Your project proposals are due sometime in mid July and then you will have a month to prepare and present. More details will be posted on Canvas.

Structure: I will be lecturing via Zoom MWF 10:50 - 11:50 AM Pacific Time.

It will *not* be traditional lecturing. The classroom will be mostly flipped, where the discussion is both ways. I expect you to be interactive and ask questions.

I will be using Python during the class, and I expect you to have a computer with Python installed. We will be doing examples on Python during the lecture. More details on software/tools will be posted on Canvas.

Schedule

- Week 1: Introduction to Linear Programming, Python setup and the Diet Problem.
- Week 2: Further examples of Linear Programs and Integer Linear Programs: Scheduling, Knapsack and Bin Packing.
- Week 3: Introduction to Graphs.
- Week 4: Travelling Salesman Problem and other routing problems.
- Weeks 5 and beyond: Introduction to Probability, Stochastic Processes etc.

Grading:

- Assignments: 60%.
- Projects: 30%.
- Participation: 10%.

The grading will be mostly on the mathematical content and partly on the writing style. For the project it depends on the presentation as well.

Late penalty: Late assignments will be deducted 10% for every day it is late. Contact me as early as possible in case of extraordinary circumstances.

Class Participation It is essential to attend classes regularly. It will be an interactive and lively discussion. I expect you to be going along (writing code, doing examples) as we discuss them during the class. Participating in these discussions is worth 10% of your grade. Furthermore, the assignments will be natural extensions of what I do during the lectures.

Programming Extensive programming is not required. However, this is a modelling course, so we will be running simulations/ little pieces of code during the lectures. I will be using the following tools:

- Python: To run simulations/code.
- SCIP (via PySCIPOpt): to solve Linear Programs.
- JupyterLab: To write our ideals as we go along.

Details on setting these up will be posted on Canvas.

I will have extensive office hours during the first week to get you setup with the tools.

Accommodation 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. Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form.