Syllabus: Mathematical Modeling
MATH 421-01 and 421-02

Course Information

SIS Class Number: Class 15978 (MATH 421-01) and 15979 (MATH 421-02), Fall 2023

Prerequisites: MATH-221, -231 -241, and -251

Schedule: 421-01 Tuesdays & Thursdays, 2:00-3:15 in Wallace Library (WAL) 3560
421-02 Tuesdays & Thursdays, 3:30-4:45 in Gosnell Hall (GOS) 2365

Instructor Information

Name: Dr. Basca Jadamba **Office**: GOS 2312

Email: bxjsma@rit.edu **Phone**: (585) 475-3994

Office Hours: 2 pm-4 pm on Wednesdays in GOS 2312
or by appointments (you can request in-person or Zoom meeting)

Course Description

This course (3 credit hours) explores problem solving, formulation of the mathematical model from physical considerations, solution of the mathematical problem, testing the model, and interpretation of results. Problems are selected from the physical sciences, engineering, and economics.

Main Components of the Course

- Modeling process: Discussions
- Model types: Review with brief examples
- Detailed study: three or four modeling examples
- Final project: discussion of expectations

Course Expectations

Attending the classes regularly and engaging during the class time is vital for your learning, therefore you should make every effort to attend classes and take good notes. If you are unable to attend a class for any reason (personal obligations, illness, job interview etc.) contact me by email as soon as you are able. With a notice of an absence, you will be provided an opportunity to fulfill class assignments and expectations without penalty.

In-class Assignments

There will be in-class discussions and short individual or group assignments happening each week during the classes. The in-class assignments will typically be due at the end of the lecture day and they should be submitted via myCourses Assignments. Your grades will be based on participation and the assignment submission. For group assignments, please read the section "Group Work".

Homework

There will be biweekly homework assignments via myCourses. You will be required to submit the completed assignments to the myCourses Assignments dropbox in PDF format, created using LaTeX. The homework assignments will cover extensions and further analysis of the mathematical models introduced in class. Homework due dates will be listed in the assignment as well as in your course calendar in myCourses. For group assignments, please read the section "Group Work". Late homework will be accepted only with a prior authorization from the instructor.

Group Work

Mathematical modeling is often a team effort. An important part of this class will be to build skills for working effectively in groups including the ability to distribute work, communicate and listen to team members and cooperate. To help you build these skills many of the in-class work and homework assignments will involve group work and the groups may frequently change. For some of these assignments only a single submission will be collected and graded for each group with each group member assigned the same grade. This does not however mean that individual group members can rely on others to "carry their weight." It is at the instructor's discretion to assign a different grade to one or more students from the grade assigned to the rest of the group.

Final Project

In the Final Project you will be required to perform independent research into an application of interest to you, in which mathematical modeling can be used to help address/analyze/solve a problem in that application area. The Final Project will result in a technical report typed using LaTeX which you will submit via myCourses. Note that there are no extensions on the Final Project due date. Steps toward completion of the Final Project are:

- Discussion of stylistic elements in a technical report
- Selection of a topic in consultation with the instructor
- Final project proposal approved by the instructor
- Final written report submission
- Oral presentation

The due dates of the Final Project proposal, draft and final reports and the Final Project Guidelines (posted in myCourses). In addition getting a grade from the instructor on the Final Project Technical Report using the Technical Report Grading Rubric (posted in myCourses), your report will be forwarded to the School of Mathematics and Statistics (SMS) Writing Committee for evaluation of your writing ability, as required. This is a requirement that most students satisfy, however students whose reports are deemed to be poorly written may be referred to the University Writing Center for getting help in improving their writing skills. SMS Writing Committee will use the above mentioned rubric in evaluating your report.

Grading

Your final grade will be based on **in-class work** (20%), **homework** (40%) and a **final project** (40%). The grading scale shown in the table below will be used in determining your final grade for the course.

grade	A	A-	B+	B	B-	C+	C	C-	D	F
%	≥ 93	92-90	89-87	86-83	80-82	79-77	76-73	72-70	69-60	≤ 59

Writing Standards

Strong written communication skills are a primary requirement in most employment announcements, and this requirement is repeatedly cited by employers. As such, written communication is an important component of your RIT education. Written materials must adhere to standard American English. Failure to meet these requirements will negatively impact the evaluation of your written assignments, and could impact your future job prospects. Please proofread your papers before submitting them. The instructor will grade for content, completeness, organization, spelling, grammar, and punctuation, as well as demonstration of knowledge gained in the course and your ability to apply it. If you feel that you need an assistance with written assignments, please take advantage of the support offered by RIT's University Writing Program. You can find the RIT Library Guide for citation standards and sources under https://infoguides.rit.edu/citation).

Suggested Textbooks (not required)

We won't follow a single textbook for this course, I will use multiple sources to create materials for the class. The best textbook on this subject I know is F. R. Giordano, M. D. Weir, and W. P. Fox, *A First Course in Mathematical Modeling*, Brooks/Cole, 5th Edition, 2013. A SIAM Guidebook on Mathematical modeling is posted in myCourses. You will have to write technical reports for this course. Recommended book on writing skills: W. Strunk Jr., E. B. White *The Elements of Style*, Longman, 1999.

Class Materials and Help

myCourses: Class notes will be posted, however, these may not contain everything that we discuss during the lectures. Assignments and some sample codes will be also posted. Please check assignment due dates, important announcements, and your

grades regularly.

Office hours/help: Make good use of the office hours and get your doubts clarified as soon as you can. You can make in-person or Zoom appointments with me to ask questions or get help. The academic demands in this course and your other classes can be understandably difficult. It is normal to feel anxious about your academic ability, especially when unexpected life events emerge. Please connect with me about any difficulties you have in this course as soon as possible. I want you to get the additional help needed before the challenges become too much.

Technology

Computing Software: Often, reliance on a computing environment or programming language, such as Wolfram Alpha, MATLAB, R, SAS, or Python, will help us formulate or analyze models. I will frequently use MATLAB to illustrate examples. For in-class work, homework assignments, and the final project, you are welcome to use whatever computing environment/language you may be comfortable with. RIT has MATLAB licenses for students and you can download it on your personal computer. Many labs on campus already have MATLAB installed. Here is the link for information regarding MATLAB use at RIT (also contains instructions on how to download). The ITS Service Desk is your point of contact for your RIT Computer Account, network, or technology-related issues. The Service Desk can troubleshoot your technology issues and create a work request ticket and connect you with ITS specialists. Web form: help.rit.edu, phone: (585) 475-4357, in-person: Gannett Hall 1113. If you have never used MATLAB before or would like to learn more about its features, the MathWorks website contains a variety of "Getting Started" videos and interactive tutorials. It is highly recommended that you view these videos/tutorials within the first few weeks of class.

Typesetting using LaTeX: For homework and the final project assignment you will be required to use LaTeX. LaTeX is a free high-quality typesetting system that includes features designed for the production of technical and scientific documentation. Please plan to use Overleaf, an online collaborative LaTeX editor, which will allow the members of a group to work simultaneously on the same LaTeX file. Overleaf website provides a lot of information on "Getting Started" with both LaTeX and Overleaf. Additional resources on "Getting Started with LaTeX" can be found here. It is highly recommended that you review these resources within the first few weeks of the semester.

Academic Integrity

The RIT Student Academic Integrity policy is found at
https://www.rit.edu/academicaffairs/policiesmanual/d080. A breach of student academic integrity falls into three basic areas: cheating, duplicate submission and plagiarism (see the definitions of these terms using the above link) and any violations of these will be dealt according to the procedure listed in the policy above.

Plagiarism

Plagiarism is a serious offense and is in violation of the RIT Student Academic Integrity Policy. If you are unsure of what constitutes plagiarism in written documents, a good

description can be found here. Plagiarism does not just occur in written documents; it also occurs in homework solutions and in code. Many of the models we will formulate and analyze will rely on algorithms that may have been coded by others who have posted solutions/code online. While it is perfectly natural to search out such solutions/code online, it is unacceptable (and it is considered plagiarism) to copy solutions/code written by others and submit it as your own (this includes homework solutions and code that is written by your fellow students!). Even making minor changes to code, such as changing variable names, function names, or formatting, etc., is not enough to allow you to claim your solution/code as your own because the underlying structure of the solution/code remains unchanged. If you do consult any online sources of code, and you use them in whole or in part in what you submit, you must properly attribute the corresponding sections to their original source, as you would add quotations, footnotes, or references in a written document. The consequences of plagiarism, whether in homework assignments, code, or the final project, are at the discretion of the instructor, and can be as severe as automatic failure of the course.

Use of Class Copyrighted Material

All course materials students receive or to which students have online access are protected by copyright laws. Students may use course materials and make copies for their own use as needed, but unauthorized distribution and/or uploading of materials without the instructor's permission is strictly prohibited. RIT Policy C03.2 (Copyright Policy) addresses this issue. For example, uploading completed homework, or other assignments to any study site constitutes a violation of this policy. Students who engage in the unauthorized distribution of copyrighted materials may be held in violation of the University's Code of Conduct, and/or liable under Federal and State laws.

A Note on Disability

RIT is committed to providing academic adjustments to students with disabilities. If you would like to request academic adjustments such as testing modifications due to a disability, please contact the Disability Services Office (DSO). Contact information for the DSO and information about how to request adjustments can be found at https://www.rit.edu/disabilityservices/. After you receive an academic adjustment approval, it is imperative that you see me during office hours so that we can work out whatever arrangement is necessary.

Statement on Title IX

Title IX violations are taken very seriously at RIT. RIT is committed to investigate complaints of sexual discrimination, sexual harassment, sexual assault and other sexual misconduct to ensure that appropriate action is taken to stop the behavior, prevent its recurrence, and remedy its effects. Please view the Title IX Rights and Resources at RIT.