
Term Information

Effective Term Spring 2022

General Information

Course Bulletin Listing/Subject Area Mathematics
Fiscal Unit/Academic Org Mathematics - D0671
College/Academic Group Arts and Sciences
Level/Career Undergraduate
Course Number/Catalog 3307
Course Title Mathematical Modeling of Real World Problems
Transcript Abbreviation Math Modeling
Course Description In this course in mathematical modeling, students will learn a variety of mathematical techniques and their applications to real world problems. The students will develop their written and oral communication skills through group reports and a final presentation.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week, 12 Week, 8 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites A grade of C- or above in Math 1141, 1151, 1156, 1161, or 1181H
Exclusions
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 27.0101
Subsidy Level Baccalaureate Course
Intended Rank Freshman, Sophomore, Junior, Senior

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Construct mathematical models based on real world problems.
- Identify mathematical techniques appropriate for their models or analysis.
- Work in teams to solve interdisciplinary problems and write a scientific report describing their mathematical model and results.
- Effectively communicate their modeling process and major results in both written and oral formats.

Content Topic List

- Introduction to Matlab
- Introduction to Mathematical Modeling
- Sensitivity analysis
- Kinematics
- Optimization
- Network modeling
- Stochastic modeling
- Data analysis

Sought Concurrence

No

Attachments

- 3307-Mathematical Modeling of Real World Problems.docx: Syllabus
(Syllabus. Owner: Husen, William J)
- Curriculum_map_math_04302021.docx: Curriculum map
(Other Supporting Documentation. Owner: Husen, William J)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Husen, William J	04/30/2021 02:39 PM	Submitted for Approval
Approved	Husen, William J	04/30/2021 04:24 PM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	05/03/2021 01:35 PM	College Approval
Pending Approval	Jenkins, Mary Ellen Bigler Hanlin, Deborah Kay Oldroyd, Shelby Quinn Hilty, Michael Vankeerbergen, Bernadette Chantal	05/03/2021 01:35 PM	ASCCAO Approval

Mathematical Modeling of Real World Problems

Math 3307

Rationale: *Applied mathematics is a rapidly expanding and in-demand field, and the ability to effectively communicate complex scientific concepts is a critical skill regardless of a student's ultimate educational and workforce path. This course fills a departmental need by focusing on scientific communication as well as preparing student teams to compete in COMAP MCM/ICM, an international contest in mathematical modeling.*

Format: Lecture

Credit Hours: 3

Prerequisites: A grade of C- or above in Math 1141, 1151, 1156, 1161, or 1181H

Course description: In this course in mathematical modeling, students will learn a variety of mathematical techniques and their applications to real world problems. The students will develop their written and oral communication skills through group reports and a final presentation. The weekly class meetings will begin with a brief introduction to a mathematical concept, with the remainder of the class devoted to working in a team on a given problem. Practice problems will be drawn from those offered in the COMAP Mathematical or Interdisciplinary Contest for Modeling (MCM/ICM). Students will also have the opportunity to compete in teams of their choice in the annual MCM/ICM contest offered during the spring semester.

Course learning outcomes: By the end of this course, students should successfully be able to:

- Construct mathematical models based on real world problems.
- Identify mathematical techniques appropriate for their models or analysis.
- Work in teams to solve interdisciplinary problems and write a scientific report describing their mathematical model and results.
- Effectively communicate their modeling process and major results in both written and oral formats.

Course materials: No textbook will be required for this course. Course materials will include instructor notes based on the course topics as well as problems from the extensive database of the Mathematical Contest for Modeling, available online at:

<http://www.comap.com/undergraduate/contests/matrix/index.html>.

All course materials will be posted to the Carmen page

Course Requirements and Grade Weights:

Participation (4%): Students are expected to regularly participate in classroom discussion of the real world problems and mathematical techniques. Given that group work is essential to this course, students should also be actively engaged with their team in the weekly group work sessions.

Self-assessments (4%): Self-assessments are due each Tuesday. The self-assessments are maximum one page and require a reflection on project aspects that worked well and those that could be improved. A template is available on Carmen.

Peer Evaluation (4%): Every student will be assigned a Mini-Project report from another group to evaluate. A detailed rubric and evaluation feedback template is available on Carmen, along with the winning paper from the COMAP competition and the judge's commentary.

Mini-projects (48%): Each week students will get to work in a different team on a mini-project based on the week's problem. To mimic the competition's conditions, students will work in teams of three and will be required to write a 1-2 page team summary of their progress, due at the next class. After submitting their summaries, students will also provide peer review for another team's report. Each mini-project will be worth 6% of the grade (8 mini-projects total).

Final Project (30%): There will be a final project and report due at the end of course. Students will get to organize themselves in teams of three and work on a more extensive model and report for an MCM problem of their choice. Teams interested in participating in the MCM competition may use their contest report as their final project.

Final Presentation (10%): Students will present the results of their final project as a group in a formal 15 minute presentation to the class. The rubric used for evaluation is available on Carmen.

Course Grade: Student grades will be based on the performance on course required activities and weighted as noted and assigned according to the university standard grading scale.

Weekly Topics:

Week	Topic	Assessment
1	Introduction to COMAP MCM/ICM, Latex and report templates; Project 1: Maximizing points in Pokemon Go (Introduction to Matlab)	
2	Project 1 evaluation and discussion; Project 2: Controlling outbreaks of the Hanta virus (Introduction to mathematical modeling)	Group report due; Peer evaluation due; Self-assessment due
3	Project 2 evaluation and discussion; Project 3: Designing the ultimate brownie pan (Sensitivity analysis)	Group report due; Peer evaluation due; Self-assessment due
4	Project 3 evaluation and discussion; Project 4: Designing the gnarliest snowboard course (Kinematics)	Group report due; Peer evaluation due; Self-assessment due
5	Project 4 evaluation and discussion; Project 5: Maximizing campsite use along a river (Optimization)	Group report due; Peer evaluation due; Self-assessment due
6	Project 5 evaluation and discussion; Project 6: Determining optimal placement of charging stations for electric cars (Network modeling)	Group report due; Peer evaluation due; Self-assessment due
7	Project 6 evaluation and discussion; COMAP MCM/ICM start (Project 7 if offered in Fall)	Group report due; Peer evaluation due; Self-assessment due
8	COMAP MCM/ICM debrief; Decide on groups and topics for final report; Project management; task list for final report	Self-assessment due
9	Group work; Project 7: Game of Life (Stochastic modeling)	Self-assessment due
10	Project 7 evaluation and discussion; Figures and captions	Group report due; Peer evaluation due; Self-assessment due
11	Group work; Project 8: Optimizing educational grant funding (Data analysis)	Self-assessment due
12	Project 8 evaluation and discussion; Persuasive writing; Formatting references	Group report due; Peer evaluation due; Self-assessment due
13	Group work; Course feedback; Group work	Self-assessment due
14	Student presentations	Written reports due; Peer evaluation due

Ohio State’s academic integrity policy: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Copyright disclaimer: The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX: Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

Accessibility accommodations for students with disabilities: The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Your mental health!: As a student you may experience a range of issues that can cause barriers to learning such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org

Math - BS/BA Curriculum Map					
Goal 1	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning and an understanding of how to read and write proofs.				
Goal 2	Acquire basic mastery of core areas of mathematics including calculus, analysis and algebra.				
Goal 3	Develop powerful mathematical problem solving skills.				
Goal 4	Learn to communicate mathematical understanding effectively.				
Goal 5	Become proficient in chosen tracks within the major.				
Course	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
AcctMIS 2000			Beginning		Intermediate
Biochem 4511					Advanced
Biology 1113			Beginning		Intermediate
Biology 1114			Beginning		Intermediate
Biology 3401					Intermediate
BusFin 3120			Intermediate	Intermediate	Advanced
BusFin 3220			Intermediate	Intermediate	Advanced
Chem 1210			Beginning		Intermediate
Chem 1220			Beginning		Intermediate
Chem 2210					Advanced
Chem 2510					Advanced
Chem 4300					Advanced
Chem 4310					Advanced
CSE 1222			Beginning		Intermediate
CSE 1223			Beginning		Intermediate
CSE 2221			Beginning	Beginning	
CSE 2111			Beginning		Intermediate
Econ 2001.01			Beginning		Intermediate
Econ 2002.01			Beginning		Intermediate
EEOB 3310					Advanced
EEOB 3420					Advanced
EEOB 4520					Advanced
Math 1151	Beginning	Beginning	Beginning		
Math 1152	Beginning	Beginning	Beginning		
Math 1181H	Intermediate	Intermediate	Beginning		
Math 1295				Intermediate	Beginning
Math 2153	Intermediate	Intermediate	Beginning		
Math 2182H	Intermediate	Intermediate	Beginning		
Math 2255	Beginning	Intermediate	Intermediate	Beginning	

Math 2568	Beginning	Beginning	Beginning		Beginning
Math 2568H	Intermediate	Beginning	Intermediate	Beginning	Beginning
Math 3307			Intermediate	Intermediate	Advanced
Math 3345	Advanced	Advanced	Intermediate	Intermediate	Intermediate
Math 3345H	Advanced	Advanced	Intermediate	Intermediate	Intermediate
Math 3350				Intermediate	Beginning
Math 3589			Intermediate	Intermediate	Advanced
Math 3607			Intermediate	Intermediate	Advanced
Math 3618			Intermediate	Advanced	Advanced
Math 4181H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 4182H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 4350			Intermediate	Advanced	Advanced
Math 4504	Advanced	Intermediate	Intermediate	Advanced	Advanced
Math 4507	Advanced	Intermediate	Intermediate	Advanced	Advanced
Math 4512	Intermediate		Intermediate	Intermediate	Intermediate
Math 4530	Intermediate	Beginning	Intermediate	Intermediate	Intermediate
Math 4547	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 4548	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 4551	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Math 4552	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Math 4556			Intermediate	Advanced	Advanced
Math 4557	Intermediate		Intermediate	Intermediate	Intermediate
Math 4570	Intermediate	Intermediate	Advanced	Intermediate	Intermediate
Math 4573	Advanced	Intermediate	Intermediate	Intermediate	Intermediate
Math 4575	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Math 4578	Intermediate	Intermediate	Intermediate	Intermediate	Advanced
Math 4580	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 4581	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 5101	Beginning	Advanced	Intermediate		Intermediate
Math 5102	Beginning	Advanced	Intermediate		Intermediate
Math 5421	Beginning	Beginning	Intermediate	Beginning	Advanced
Math 5451	Beginning	Beginning	Intermediate	Beginning	Advanced
Math 5520H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5522H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5529H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5530H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5540H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 5540H	Advanced	Advanced	Advanced	Intermediate	Beginning
Math 5576H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 5590H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 5591H	Advanced	Advanced	Advanced	Advanced	Advanced

Math 5632			Intermediate	Advanced	Advanced
Math 5635			Intermediate	Advanced	Advanced
Math 5636			Intermediate	Advanced	Advanced
Math 5660					Intermediate
Math 5756			Beginning	Intermediate	Intermediate
Math 5757			Beginning	Intermediate	Intermediate
MolGen 4500					Advanced
MolGen 5601					Advanced
Physics 1250			Beginning		Intermediate
Physics 1251			Beginning		Intermediate
Physics 2300					Advanced
Physics 2301					Advanced
Stat 4201	Intermediate	Beginning	Intermediate	Intermediate	Intermediate
Stat 4202	Intermediate		Intermediate		Intermediate