New Course Proposal

Prepare course proposal in accordance with the guidelines below and the format shown on the following pages.

COURSE PROPOSAL NUMBER: 25-26-12 (a)

REVISION (label Revision #1, #2, etc.): 0

SECTION 1: PROPOSAL INFORMATION

Name:	James A. Long Jr.	
Title:	Assistant Professor of Computer Science	
E-mail Address:	James.Long@fairmontstate.edu	
Phone Number:	x4626	

College:	College of Science and Technology
Department:	Computer Science and Mathematics
Program Level:	Undergraduate
Date Originally Submitted:	Click or tap to enter a date.
Implementation Date Requested:	August 2026

APPROVAL

The Deans of the affected colleges must sign below to indicate their notification and departmental support of this new course proposal. Should this new course affect any other department or program in another college, a memo must be sent to the Dean of each college impacted and a copy of the letters(s) or email(s) of support must be included with this proposal.

By signing below, you are indicating your college and department(s)'s approval of this proposal.

College	Dean's Signature
Science and Technology	

ADDITIONAL COMMENTS:

New Course Proposal

SECTION 2: COURSE CATALOG INFORMATION

1. **Course Subject Prefix and number (e.g., ENGL 1101):** Course number/prefix combinations may be used only once, and may not be recycled; please check with the Registrar's Office to get a list of available, valid course numbers.	MATH 2545
2. Course Title: The title of the course as it will appear in the course catalog.	Mathematical Modeling
3. **Number of Credit Hours:** Indicate the total number of credit hours for the course. If you are proposing a course with variable credit options, explain that here.	3
4. **Repeatability (number of repeat credit hours):** Students can repeat the course for credit.	No
5. **Course Prerequisites:** Include subject prefix and course number. List only immediate prerequisites (not prerequisites for other prerequisite courses).	MATH 2501
6. **Course Co-requisites:** Include subject prefix and course number.	None
7. **Course Cross-listings** (e.g., PSYC 2230 and SOCY 2230)	None
8. **Course Restrictions** (e.g., Seniors only)	None
9. **Grade Type:** Indicate whether students will be assigned a standard A-F final grade, a Pass/Fail (P/F) grade, or No Grade (NG).	A-F Final Grade
10. **Requirements:** Will the course be a required or elective course? What course requirements will this course satisfy? Indicate specific major, minor, or College/Department requirement(s).	Elective for B.S. in Math, B.A.E. in Math Education (5-adult); B.S. in Computer Science
11. **Course Terms:** In what semester(s) will the course be offered? (e.g., Fall only, Summer)	To be determined
12. **Writing Intensive:** Does this course fulfill the Writing Intensive major requirement?	NO
13. **Core Curriculum:** Will the course be reviewed and considered as a University Core Curriculum course offering? If yes, you will need to submit a separate Core Curriculum application to the General Studies Committee.	NO

SECTION 3: CURRICULUM-BASED RATIONALE

What is the reason for developing the proposed course? Explain how the course fits into the curriculum. For example, is it a required or elective course for any specific program (if so, which one)? Which students will be taking this course? If there are already similar courses offered, explain why the needs of the program cannot be satisfied by an existing course. The curriculum-based rationale should be brief and to the point.
The department has been running mathematical modeling as a special topics course. That course has been well-received and so we are looking to turn it into a full course. Moreover, we hope the course would be popular with a variety of other degree programs on campus.

SECTION 4: COURSE SYLLABUS

Attach the course syllabus or at minimum the following course components:

Catalog Course Description: Include a course catalog description written in complete sentences that will be published in the university catalog. The word length for a catalog description should be less than 80 words. Do not include any prerequisites, corequisites or any other restrictions in the description.

Course Learning Outcomes: These should be stated in terms of what new knowledge and/or skills students should be able to demonstrate upon successful completion of the course. Present course learning outcomes as a bulleted list predicated with "Upon successful completion of this course, students should be able to…"

Assessment: Describe generally how students' achievement of the course learning outcomes will be assessed.

Course Outline: Attach a course content outline consisting of at least two levels.

Catalogue Description:

This course introduces the principles and applications of mathematical modeling as a means of exploring, analyzing, and predicting natural and observed phenomena.

Students will develop and evaluate models using mathematical formulas and computer software to interpret, explain, and forecast complex systems and behaviors.

Course Learning Outcomes:

1. Analyze data and identify a model to represent the data.
    - Metric: Quiz/Exam Question
    - Mastery: Average of 3 or more on Arizona Rubric
2. Use software tools for modeling (e.g. simulations, visualizations, etc.)
    - Metric: Quiz/Exam Question
    - Mastery: Average of 3 or more on Arizona Rubric
3. Communicate modeling ideas effectively
    - Metric: Quiz/Exam Question
    - Mastery: Average of 3 or more on Arizona Rubric

Assessment:

This course utilizes a variety of assessment types including but not limited to exams, homeworks, projects, and presentations

Course Outline:

1. Introduction to modeling
    a. What is mathematical modeling?
    b. Types of modeling (e.g. deterministic vs. stochastic, discrete vs. continuous)
    c. The modeling process
2. Basic functions and graphical models
    a. Linear, polynomial, exponential, and logarithmic functions
    b. Graphical interpretation of relationships
    c. Curve fitting (regression, error, etc.)
    d. Model validation
    e. Physics applications
3. Discrete models
    a. Simple population growth
    b. Financial modeling
    c. Recurrence relations
    d. Other models (e.g. difference equations)
4. Continuous Models
    a. Exponential growth and decay
    b. Population dynamics
    c. Predator-Prey Model
    d. Other models (e.g. epidemics, harvesting)
5. Advanced Topics (examples below)
    a. Monte Carlo
    b. Markov Chains
    c. Random Walks

d. Graph-Theoretic Models (e.g. networks, transportation/logistics, job scheduling/assignment)
e. Optimization models (e.g. Linear programing, objective functions, simplex method)