

## Syllabus

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|----------------|---|---|
| Instructor     | <b><i>Sheng-Chiang (John) Lee</i></b>   | <b>Textbooks</b><br><br>Introduction to Computational Science<br>by Shiflet & Shiflet<br>2 <sup>nd</sup> edition<br>ISBN: 978-0-691-16071-9 |
| Location/Time  | Lecture: MWF 2-2:50pm (SEB140)  |   |
| Office/Contact | SEB 206; 478-301-2599<br><a href="mailto:Lee_SC@Mercer.Edu">Lee_SC@Mercer.Edu</a> |   |
| Office Hour    | BY APPOINTMENT  |   |
| Pre-Requisite  | MAT 191   |   |

### ***Course Description:***

This course will introduce Mathematica® as a tool for scientific modeling. The syntax of Mathematica® as a symbolic computing environment will be discussed, and students will acquire sufficient proficiency in using Mathematica® to perform computational tasks, such as algebra, solving equations, visual presentations of numerical results. Introductory concepts and practices of "programming" will be introduced through working with Mathematica®'s "functions". Students are not expected to learn new mathematical knowledge in this course, but should be able to apply existing knowledge to model and solve a problem.

### ***Objectives:***

After taking this course, you should

- Be able to use *Mathematica*® to perform common computational tasks
- Be able to analyze simple system dynamics problems with the modeling process and implement computational strategy
- Understand the issues of precision and accuracy involved in numerical computation

### ***Tentative Coverage:***

1. Introduction to Mathematica®
  - a. Symbolic computation
  - b. Working with data (numbers, lists, strings, etc...)
  - c. Functions
  - d. Graphical presentation
2. Introduction to Computational Modeling
  - a. Steps of computational modeling process
  - b. Modeling System Dynamics Problems (SDPs)
  - c. Issues with numbers: errors
  - d. Simple simulation techniques
3. Case Study & Project Discussions

### ***Grading Methods:***

Grading Scale:

|        |     |       |       |       |       |       |     |
|--------|-----|-------|-------|-------|-------|-------|-----|
| Score: | 90+ | 85~89 | 80~84 | 75~79 | 70~74 | 60~69 | 59- |
| Grade: | A   | B+    | B     | C+    | C     | D     | F   |

Grading Components:

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|        | Reading Quiz | Homework/Exercises | Presentation | Final Project |
|--------|--------------|--------------------|--------------|---------------|
| Weight | 10%          | 40%                | 10%          | 40%           |

### **Reading Quiz:**

Students should always be prepared for a class. Reading quizzes will be administered throughout the semester, and students will be notified in the previous class.

### **In-Class Exercises/Homework:**

In-Class Exercises are small practices students will perform during classes, and submit at the end of the class for grades. No make-up will be available for students missing the class.

Homework assignments are more comprehensive exercises related to the class coverage. Some of the class time may be used as help/discussion sessions for the assignments.

### **Project Presentation:**

When the topic of the final project is finalized after discussing with the instructor, the student should conduct research and present the project topic of his/her choice to the class. The presentation will be evaluated by the instructor and the peers on the “clarity of presentation”, “knowledge of the topic”, “computational approach/modeling”, and “Q&A”.

### **Final Project:**

Students should choose a "real" problem to solve/model/simulate in *Mathematica*<sup>®</sup> with the tools learned in this course. The topic of this project should be first submitted to the instructor before 2/12 (end of the first month) to allow ample time for discussion and revision. The topic should be finalized by the end of the week before Spring break.

### **Class Evaluation**

In an ongoing effort to improve the quality of instruction, each student enrolled in this course is required to complete the standard CLA course evaluation administered through the University's **CoursEval** system. There is another written evaluation, which will be administered through **BlackBoard**. Both evaluations should be completed before 4/29.

### ***Important Dates:***

**Last Day for Course Withdrawal: 3/24/2016**

**Final Project Due: 5/05/2016, 5pm**

### ***Class Policies:***

**Attendance Policy:** Attendance is mandatory. We will have hands-on exercise almost in each section, and many of them will be graded. There will be no make-up for such activities if you miss a class.

**Class Etiquette:** You are expected to conduct yourself in a respectful manner to your fellow classmates and the instructor. The instructor may ask you to leave the classroom/lab if your behavior is disturbing to the instructor or other students.

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**Honor Code:** You are bound by the Mercer honor code. The College's academic misconduct policy will be followed. All work, for which a grade is received, must be the **original** work of the **student** without aid or assistance of another party, or any printed and or electronic data/information. Academic misconduct cases will be referred to the honor council and the student will automatically receive a grade of incomplete (IC) pending a ruling by the honor council.

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**Cell Phone and Laptop Usage:** Out of courtesy for all those participating in the learning experience, all cell phones must be **kept in your pocket/backpack with power/ringer off** before entering any classroom, lab, or formal academic or performance event.

You are encouraged to bring your laptop computers with Mathematica installed on it to exercise along with the class. However, using laptops for activities unrelated to the class is prohibited.

Warning will be given for the first-time violation. One semester credit will be taken for each following violation up to three times. If a student keeps violating the policy, one may be asked to leave the room by the instructor.

**Documented Disability Statement:** *"Students requiring accommodations for a disability should inform the instructor at the close of the first class meeting or as soon as possible. The instructor will refer you to the ACCESS and Accommodation Office to document your disability, determine eligibility for accommodations under the ADA/Section 504 and to request a Faculty Accommodation Form. Disability accommodations or status will not be indicated on academic transcripts. In order to receive accommodations in a class, students with sensory, learning, psychological, physical or medical disabilities must provide their instructor with a Faculty Accommodation Form to sign. Students must return the signed form to the ACCESS Coordinator. A new form must be requested each semester. Students with a history of a disability, perceived as having a disability or with a current disability who do not wish to use academic accommodations are also strongly encouraged to register with the ACCESS and Accommodation Office and request a Faculty Accommodation Form each semester. For further information, please contact Carole Burrowbridge, Director and ADA/504 Coordinator, at 301-2778 or visit the ACCESS and Accommodation Office website at <http://www.mercer.edu/disabilityservices>.*

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*Tentative Schedule:* may vary according to actual progress

| Week            | Topic  | Required Reading              |
|-----------------|--|-------------------------------|
| 1/11 – 1/15 (3) | Intro to Mathematica <sup>®</sup> ; symbolic computation; working with different types of variables/data | Ch1 & required Mathematica nb |
| 1/19 – 1/22 (2) | <b>MLK Day</b> ; Functions and Visualization   | Required Mathematica nb       |
| 1/25 – 1/29 (3) | Introduction to Computational Modeling   | Ch1                           |
| 2/01 – 2/05 (3) | Modeling for One Variable System Dynamics Problems (SDPs)  | Ch2                           |
| 2/08 – 2/12 (3) | mini projects/exercises of SDPs (Ch2)<br><b>Project proposal due</b>                                     | Ch2                           |
| 2/15 – 2/19 (3) | Examples of such SDPs in Physics   | Ch3                           |
| 2/22 – 2/26 (3) | mini projects/exercises of Ch3   |                               |
| 2/29 – 3/04 (2) | Multi-Variable Inter-Dependent SDPs<br><b>Topics of Final Project finalized</b>                          | Ch4                           |
| 3/07 – 3/11 (0) | <b>Spring Break</b>  |                               |
| 3/14 – 3/18 (3) | Presentations: Topics of the Final Project and Plans of Implementation                                   |                               |
| 3/21 – 3/25 (2) | “Errors” in Computation; <b>Good Friday</b>  | Ch5                           |
| 3/28 – 4/01 (3) | Simulation Techniques  | Ch6                           |
| 4/04 – 4/08 (3) | Simulation Techniques; Project progress report   | Ch6                           |
| 4/11 – 4/15 (3) | Simulation Techniques; Project progress report   | Ch6                           |
| 4/18 – 4/22 (1) | Simulation Techniques; Project progress report   | Ch6                           |
| 4/25 – 4/29 (3) | Simulation Techniques; Project progress report   | Ch6                           |
| 5/05            | <b>Final Project Due</b>   |                               |