

Course No: MET4400
Course Name: Simulation Methods
Credits: 3 semester credits, (0 – 3 – 0)
Semester: Spring 2008
Section: R01
Day / Time: Recitation MW 9:05 - 09:55 (07-421)
 Th 12:00 – 1:00 (07-421)

Instructor: Mark A. Johnson Ph.D.
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Office Hours: M-W 10:00 – 12:00
 F 10:00 – 11:00

Textbook: Kelton David W., Sadowski Randall P., Sadowski Deborah A. (2007). Simulation With Arena, Fourth edition, New York: McGraw-Hill Companies, ISBN#0-07-352341-0

Prerequisites: MA 2710

Additional Materials/References: There may be additional reading, homework, etc. distributed via email or on reference in the library. Even though it is not listed on the syllabus, it is your responsibility to make sure that you review the material. This material could be included on exams.

Course Description: This course will provide basic knowledge required to develop computer simulation designed to model processes found in the manufacturing or service environment. Arena computer software will be used to model real life problems and provide solutions. The student will apply knowledge learned using simulation results to modify and enhance the baseline model to improve output and desired deliverables.

Course Objectives: After completing this course, you should be able to:

- Understand how to develop a computer simulation using actual or proposed initial conditions.
- Use results of simulation to modify current or proposed system to deliver the correct outcomes.
- Apply the tools you have learned to real-life problems.
- Understand the importance of accurate modeling, data collection and analysis and how it impacts the organization.

Class Sessions:

Instructional Methods

A variety of methods will be used to transfer the knowledge and skills of manufacturing to you as a student. The following methods will be used:

- Lecture
- Class Discussion
- Group Presentations
- Reviewing Sample Problems
- Case Studies

Skills

You will be using many different skills in this course. There are several prerequisites prior to taking this course, which serve as the foundation for topics covered. It is important to have completed the prerequisites prior to taking this course. You will use the following skills:

- Problem solving skills
- Critical thinking skills
- Analytical skills
- Understanding of Statistics
- Computer application skills

Course Evaluation: Grades will be based on the following:

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|--|------|--------------|
| • Homework and Lab Assignments | 30% | 300 pts |
| • Class Participation and Perfect Attendance | 5% | 50 pts Bonus |
| • Exam #1 | 20% | 200 pts |
| • Exam #2 | 20% | 200 pts |
| • Team Project | 30% | 300 pts |
| • Total Points | 100% | 1000 pts |

Grading Scale:

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|-----------|--|
| A | 93% and above (Excellent, with 4.0 grade points per credit) |
| AB | 88-92 (Very good, with 3.5 grade points per credit) |
| B | 82-87% (Good, with 3.0 grade points per credit) |
| BC | 76-81% (Above average, with 2.5 points per credit) |
| C | 70-75% (Average, with 2.0 points per credit) |
| CD | 65-69% (Below average, with 1.5 points per credit) |
| D | 60-64% (Inferior, with 1.0 points per credit) |
| F | 59% and below (Failure, with 0.0 points per credit) |
| I | Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student's control. It must be made up by the close of the next four quarters in residence or the incomplete grade becomes a failure. A grade of incomplete maybe given only when approved in writing by the department chair. Incomplete grades at graduation are considered (F) grades in computing the final grade |

Homework:

ALL ASSIGNMENTS ARE DUE IN THE BEGINNING OF CLASS ON THE DUE DATE. NO LATE ASSIGNMENTS WILL BE ACCEPTED. **ALL homework assignments should be completed using appropriate word processing, spreadsheet, or presentation software. If problems require calculations, these can be done neatly using pencil and standard paper (8 1/2" X 11" white), no spiral notebook paper will be accepted. All assignments must be stapled.** Show detail when working on homework solutions. If you have any questions, please feel free to contact the instructor for further information or direction.

Additional Guidelines for Homework Assignments

- Please make a copy of your homework to have when problems are reviewed in class.
- Please identify at the top of each page which question, exercise, or problem you are answering.
- Please make sure your name is on the top of each page.
- Please make sure to staple your assignment together. Please do not fold the corner over because pages could be misplaced.
- Each assignment must be turned in on time. Late assignments will receive zero points.
- Please show all the calculations. Homework will be reviewed in class after it is returned, only if there are questions. Answers for problems will be posted on my website for your review.
- Sloppy, incomplete, or hard to understand homework will lose points.
- Discussion and review questions will be used for the basis of class discussions.

Hour Examinations:

There will be three exams. The exams will consist of a combination of multiple choice, short answer, and problems. There will be no makeup exams except in extreme, documented circumstances.

Cheating or Plagiarism:

Proper professional and ethical behavior is expected of all students in this class. If cheating is suspected the Dean of Students will be notified and standard MTU policies will be followed.

Student Expectations:

The most important expectation would be to learn about Design of Experiments that you could use in your working life. However, to be able to be successful in this course, the following are expectations I have to ensure your completion and a good grade:

- Attend every class (outlined in the university attendance policy) www.mtu.edu/studenthandbook/academic_info/attendance.html
- Read the required material prior to attending the course.
- Complete all assignments on time.
- Participate in class and group discussions.
- Be prepared for class.
- Present professional reports and presentations.
- Abide by the Academic Integrity policy.
- Use recommended software and word processing for required assignments.
- Interact with class members and be respectful of other's opinions.
- Apply continuous improvement and make recommendations to instructor.

This class is designed for you to participate in the learning experience. You are responsible for being a learner and a teacher of information. You can learn as much from the instructor as you can from exchanges and discussions with other students in the class. Many of the students bring valuable work experience that is relevant to the subjects being discussed.

If you are not in class, it is hard to participate. If you have an extreme situation, which prevents you from attending the course, please document the circumstance and provide the written notice to the instructor. Universities excused absences include documented plant trips and other university related business. Please provide **written notice of absence in advance** of missing class. Class participation includes full attendance, being prepared for in-class group work and discussions, and responding to discussion topics.

Since attendance is such an integral part of participating in class discussions, failure to attend will result in loss of points. **If you have three unexcused absences you will lose 50% of the 100 points from your total score. The fourth unexcused absence you will lose an additional 25 points. The fifth unexcused absence you will lose all 100 points. With a sixth unexcused absence you should drop the class and if after the drop date, you will receive an "X" grade.** Some examples of absences that will not be excused are my ride is leaving early for break and I am going away for the holiday weekend.

Notice:

If you have any special needs because of personal circumstances, please feel free to meet with me in the beginning of the semester or as soon as possible. MTU complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disability Act of 1990 (ADA). If you have a disability and need reasonable accommodation for equal access to education or services at MTU, Associate Dean of Students at 487-2212. For other concerns about discrimination, you may contact your advisor, department head, or the Affirmative Action Office at 487-3310.

Time Management

This course is one of several courses you are required to complete for your degree. It is always helpful to have an idea of the time requirements associated with a particular course. It is estimated that outside of class you will need to spend approximately, on average, 2-3 hours per credit hour or 6-9 hours a week to complete the recommended assignments. It is possible in some weeks that it will be more and other weeks it will be less.

Web

All current material is on WEBCt/Blackboard

Date Chapter/Homework Assignments**Week 1**

- 01/14 Course Introduction
Review of course syllabus
- 01/16 Chapter #1 **What is Simulation**
Required reading pages 1 – 14
- 01/17 Chapter #1 (Continued)

Week 2

- 01/21 No Class (Martin Luther King Recess)
- 01/23 Chapter #2 **Fundamental Simulation Concepts**
Required reading pages 15 - 48
Homework #1: Problem 2.7
- 01/24 Chapter #2 (Continued)

Week 3

- 01/28 Chapter #3 Guided Tour through Arena
Required reading: Text pages 53 – 110
Homework #1 Due (at start of class)
Homework #2: 3-1, 3-2, 3-3, 3-4, 3-5
- 01/30 Chapter #3 (Continued)
- 01/31 Lab – Exercise

Week 4

- 02/04 Chapter #3 (Continued)
- 02/06 **Homework #2 Due (at start of class)**
Homework #3: 3-6, 3-7, 3-8, 3-9
- 02/07 Lab - Exercise

Week 5

02/11 Chapter #4 Modeling Basic Operations and Inputs
Required Reading: Text pages 115 - 187
Homework #3 Due (at start of class)
Homework #4: 4-1, 4-2, 4-3, 4-4

02/13 Chapter #4 (Continued)
Homework #5: 4-5, 4-6, 4-7, 4-13

02/16 Lab – Exercise

Week 6

02/18 Chapter #4 Problem presentation
Homework #4 Due (at start of class)

02/20 Chapter #4 Problem Presentation

02/21 Lab – Exercise

Week 7

02/25 Work Select Problem from chapter 4
Homework #5 Due (at start of class)

02/27 **Review Chapters 1-4**

02/28 **Test #1**

Week 8

03/03 Chapter #5 Modeling Detailed Operations
Required Reading: Text Pages 195 – 258
Homework #6 5-1, 5-2, 5-3, 5-4, 5-5

03/05 Assign Homework problems to teams

03/06 Lab – Exercise

Week 9

03/17 Chapter #6 Statistical Analysis of Output From Terminating Simulations
Required Reading: Text Pages 265 – 288
Homework #6 Due
Homework #7 6-1, 6-2, 6-3, 6-4

03/19 Meet with instructor during class to discuss project selection

03/20 Lab - Exercise

Week 10

03/24 Chapter #7 Intermediate Modeling and Steady-State Statistical Analysis
Required Reading: Text Pages 293 – 321
Homework #8 7-4, 7-5, 7-6, 7-7

03/26 Chapter #7 (Continued)
Homework #7 Due

03/27 Lab - Exercise

Week 11

03/31 Chapter #8 Entity Transfer
Required reading: Text pages 327 - 356
Homework #9 8-1, 8-2, 8-3, 8-4

04/02 Initial Observations and interviews for project (teams review with instructor)
Homework #8 Due

04/03 Lab – Work on project

Week 12

04/07 Simulation review with Instructor

04/09 **Homework #9 Due**

04/10 Lab – Work on project

Week 13

04/14 **Exam #2**

04/16 Review Exam

04/17 Team Project Presentations

Week 14

04/21 Team Project Presentations

04/23 Team Project Presentations

04/24 Team Project Presentations

Final Exam Week – April 28 – May 2, 2008