Manufacturing Simulation
MANE 4352

Classroom: Education Complex, Room 3.224
Three Hours of Undergraduate Credit
Call Number 16123 and 16124
Monday and Wednesday, 12:15 – 1:30 pm
Monday and Wednesday, 1:40 – 2:55 pm
Fall 2017

Instructor:
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EASFC Building, Room 1.316B (956) 665-665-3527 FAX
1201 University Avenue (956) 664-0468 home
Edinburg, TX 78539-2999 alley.butler@utrgv.edu

Catalog Course Description:
This course develops skills in applying discrete computer simulation and modeling techniques for facility layout design and production planning. Topics include data collection, input analysis, distribution fitting, model development, verification, and output analysis.

Manufacturing Engineering General Learning Outcomes
The educational outcomes were derived from the Accreditation Board for Engineering and Technology (ABET) program education objectives, and are the skills students acquired by the time of graduation. It will be demonstrated that the student:

1. is able to use knowledge of mathematics, basic sciences and engineering to analyze problems in manufacturing engineering,
2. is able to design and conduct experiments and interpret the results,
3. is able to design devices, systems or processes that meet given specifications,
4. is able to use computers and software for analysis, design and documentation,
5. is able to communicate ideas effectively in graphical, oral and in written media,
6. is able to function as a team member to solve engineering problems,
7. understands the professional responsibility of an engineer and how engineering solutions impact safety, economics, ethics, politics, society and cultural issues,
8. understands the need for life long learning to keep abreast of current practice.
Manufacturing Engineering Specific Learning Outcomes

Students graduating from the manufacturing engineering department will have proficiency in the areas of

- **A. materials and manufacturing processes**
  - A1. understands the effect of processes on the properties of materials,
  - A2. has the ability to design and conduct experiments to measure the performance of materials, components and systems, and to communicate results,
  - A3. has the ability to select and evaluate materials and specify manufacturing steps for manufacturing processes.

- **B. process and product engineering**
  - B1. has the ability to create and annotate two dimensional drawings, and generate three dimensional computer based solid models of components and assemblies,
  - B2. has the ability to design products, tooling or equipment,
  - B3. has the ability to design manufacturing process and specify the process plan.

- **C. manufacturing productivity and quality**
  - C1. has the ability to analyze and improve the methods used in the manufacture of products,
  - C2. has the ability to do designed experiments and apply statistical concepts of quality to all aspects of manufacturing.

- **D. manufacturing systems engineering**
  - D1. has the ability to build and analyze models of manufacturing systems,
  - D2. has the ability to design control systems for manufacturing,
  - D3. has the ability to establish systems to plan and control the manufacturing of products using modern methods.

Student Learning Outcomes for this Course

After successfully completing this course the students should be able to:

I. Statistically analyze random processes used in a simulation study
II. Have knowledge of the system modeling approach and use in simulation projects
III. Have specific knowledge of at least one commercial simulation modeling system, and
IV. Have the ability to infer and make decisions based on results obtained from a simulation model
**Course Outcomes and Assessment Relative to Manufacturing Engineering Outcomes:**
The student should be able to:

1. Develop a valid statistical model from input data (H, T)
2. Prove validity of a statistical model using Goodness of Fit methods (H, T)
3. Understand methods and techniques for random number generation (H, T)
4. Develop a model of manufacturing processes using the Arena (H, T)
5. Validate an Arena simulation (H, T)
6. Make decisions regarding manufacturing system design based on simulation (H, T)

Key: H = homework and T = test

**Relationship of Course Outcomes to General Student Learning Outcomes:**

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<th>Course Outcomes</th>
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**Relationship of Course Outcomes to Manufacturing Engr. Learning Outcomes:**

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<th>B3</th>
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**Prerequisites:**
There is one course that is considered prerequisite for the material in this course. The UTRGV course is:

MANE 2332 – Engineering Statistics (with Calculus)
Courses taken elsewhere with the same content can satisfy the prerequisite requirement.

**Textbook (Required):**


In addition to the textbook there are Instructor Notes in Microsoft PowerPoint, and the textbook includes ARENA Software – Student Edition

**Course Schedule:**

<table>
<thead>
<tr>
<th>Class</th>
<th>Date</th>
<th>Subject</th>
<th>Reading/Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/28</td>
<td>Course Introduction, Review of Statistics</td>
<td>Handouts</td>
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<td>Review of Statistics</td>
<td>Handouts</td>
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<td>9/6</td>
<td>Review of Statistics</td>
<td>Handouts</td>
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<tr>
<td>5</td>
<td>9/11</td>
<td>Goodness of Fit Tests</td>
<td>Handouts</td>
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<tr>
<td>6</td>
<td>9/13</td>
<td>Random Number Generation</td>
<td>Chapter 12</td>
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<td>7</td>
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<td>Introduction to Simulation</td>
<td>Chapter 1</td>
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<td>9/25</td>
<td>Simulation Concepts</td>
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<td>Arena Guided Tour</td>
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The course schedule in this syllabus is **approximate. Dates and material covered may change** based on class progress through the material. The chapters listed under reading are the relevant chapters in the textbook.
Last Day to Drop:
The last day to change your semester schedule without penalty is Wednesday, September 13, 2017. The last day to drop a course or withdraw from school is Wednesday, November 15, 2017. Please keep these deadlines in mind, if you are considering dropping the course.

Course Drops: According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Homework</td>
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<td>Exam 1</td>
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<td>Exam 2</td>
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<tr>
<td>Exam 3</td>
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Grades on homework and tests are based on a rigorous process in which the parts to the solution or answer to the problems are assigned a specific number of points to each component of the solution. So, if the solution is essentially the same as the posted solution, then full credit is given. If a part of the solution is incorrect or missing, then the partial credit points assigned to the part of the solution that is incorrect or missing is lost, and the score of the problem or question is reduced accordingly.

Exams:
Exams will be structured on a 0 to 100 percent basis. If scores are lower than “traditional grades” for this course, scores will be scaled by the instructor to produce a “normal curve” for the class. Therefore, test grades are relative in nature. Students with the highest grades on tests should receive an “A” and those with lower grades should receive lower grades, accordingly.

Exam Administration:
Examinations are administered in the assigned classroom or in the computer laboratory on campus in Edinburg, TX. The last and final exam is on TBD at TBD. All other exams are scheduled during normal class periods, as discussed in class.

Bathroom Breaks during an Exam Are NOT Allowed: It is recommended that you visit the bathroom BEFORE an exam starts, and that you refrain from visiting the bathroom until you have finished the exam. Once you begin an exam, you must refrain from visiting the bathroom until you have completed the exam.
Make Up Examinations: Every attempt should be made to complete examinations when they are scheduled. In the event that an emergency arises which prevents taking a scheduled exam, a written response should be provided with documentation, as soon as possible. If the nature of the emergency is considered a valid reason for the missed exam, a make-up exam can be administered.

Grading Basis: Grading of examinations, homework, and other assignments is based on technical considerations (method correctness, appropriateness of stated assumptions, modeling methods, etc.) and non-technical considerations (neatness, professional appearance/substance, grammar, spelling, etc.)

Cut and Paste Not Allowed
A significant quantity of material is provided as PowerPoint or in other formats that allow direct or indirect extraction of ideas. If an assignment includes material available through a cut and paste utility, then the student can simply use the cut and paste utility to extract the verbiage to answer a question directly. Of course, this completely defeats the purpose of the question on the assignment, because anyone can use the cut and paste utility with almost no effort to learn and respond in a way that reflects that learning.

Because cut and paste of textual material “short circuits” a normal learning process, it is not counted as an appropriate answer to a question or assignment. Instead, the student is expected to read the textual material and respond to the question or assignment in their own words. This act of reading and reproducing even a paraphrased response significantly improves the chance that the student learns the material. For this reason, answers that are clearly developed by cut and paste or other means of direct extraction and reproduction of material are not counted as valid answers. In other words, students that only provide an answer that is directly extracted from other material are to receive no credit for that response to a problem or assignment.

Use of Our Electronic Environment:

Blackboard:
The instructor provides information regarding the course through the UTRGV Blackboard software in current use. Every effort is be made to employ the Blackboard software on an aggressive basis to allow students to easily obtain course material and information. The course is principally PowerPoint based, and the lectures that are in PowerPoint are placed on the UTRGV Blackboard system.

Answers to homework and examinations are available on the Blackboard system. Grades are posted through the Blackboard, and handout material is also available. Additionally, homework assignments and other information for the course are placed on the Blackboard system. When the deadline for a homework assignment or exam is passed, the solution is posted on Blackboard. As a result, all homework and exam solutions are viewable over the internet, using Blackboard.
Grades on Blackboard:
Blackboard has the ability to record and maintain records of student grades. This grade information is available to the instructor, the Teaching Assistant, the student, and the Center for Learning, Teaching, and Technology who monitor the course only. So, the student’s privacy is maintained by the software. The grade utility is employed in this course for use by the students. The grade utility is used to keep students aware of their grades on assignments and tests as the course continues.

PowerPoint Files and Lectures
A set of PowerPoint files is provided on the blackboard to allow students to print PowerPoint handout material allowing a more effective note taking process. The PowerPoint Lectures are keyed to the chapters in the textbook, so the schedule provided as outlined in this syllabus is a good guide regarding which files are used in which classes. By consulting the course schedule in this syllabus, the student can ensure that the appropriate material is printed and available for the appropriate class.

Adobe Reader
Many of the files used in this course are Portable Document Format or PDF files that can be read using Adobe software. To obtain a free copy of the Adobe reader for PDF files, please visit http://www.adobe.com/products/reader/

Computer Systems Support:
The university help desk is available to help students with computer software and hardware problems for those who “walk in” to the Academic Services Building. For students who contact the helpdesk by telephone, can receive assistance over the telephone. The hours are 8:00 am to 5:00 pm, Monday through Friday. The help desk can be contacted as follows:

UTRGV Help Desk (Edinburg Campus)
956-665-2020
https://apps.utrgv.edu/it/it-help

The Center for Online Learning, Teaching, and Technology (COLTT) also assists students with software and its operation with a specific emphasis on distance learning. Their staff includes specialists with the expertise to help you with problems. Their office hours are 7:30 to 6:00 pm on Monday through Friday. They can be contacted as follows:

Center for Online Learning, Teaching & Technology (COLTT)
Education Complex-(EDCC) 2.202 (2nd Floor)
1201 W University Dr., Edinburg TX, 78401
coltt@utrgv.edu
(956) 665-2979
http://www.utrgv.edu/online or http://cdl.utpa.edu/Home/

Receiving Homework Assignments:
Homework assignments are posted on Blackboard in an assignments folder. Each assignment is provided in Microsoft Word, and each assignment contains: 1) the date
posted, 2) the date due, and 3) the date that the solution is expected to be posted. Assignments received before the solution is posted are accepted and graded.

**E-mail Use:** The computer network at UTRGV represents current technology that can save time and work for all involved. To this end, electronic mail (or e-mail) is used to communicate with the class on matters of class administration, assignment clarification, and for other purposes. Information sent by e-mail is assumed to be received by all. This means that each student should make sure that the instructor has a current and valid e-mail address for the student, and that e-mail is checked on a regular basis.

To avoid duplication of e-mail systems, the e-mail system within Blackboard is disabled. Students are expected to use the University of Texas – Rio Grande Valley e-mail system instead. E-mail sent through the Blackboard system are ignored.

**Software Available to the Student:** There are multiple software packages available to the student to help with learning. As the principle course platform, the Blackboard software package is available for multiple purposes (electronic bulletin board, discussion board, chat, computer managed assignments and assignment drop box, computer provided quizzes, management of other software interfaces like Blackboard Collaborate, etc.). So, Blackboard is the first of several packages that help student access and learning. Additionally, Blackboard Collaborate is used as a learning tool.

**Software Available to the Instructor:** The instructor has multiple software packages available for reading and printing student assignments. However, it is possible to send an assignment that the instructor cannot print and grade. With this in mind, students should consult the list of software available to the professor, and make sure that the assignment can be accessed and printed with the software available to the instructor. Otherwise, the assignment is returned for conversion to conform to a software package compatible with the instructor’s software.

The instructor’s operating system is Windows 7. The instructor’s software packages include:

- Adobe Professional Version 9.0 (includes Adobe reader)
- Microsoft Office 2013 (Word, Excel, PowerPoint, Access)
- Microsoft Windows Journal
- Microsoft Notepad and Wordpad
- Microsoft Windows Media Player

**ARENA License Agreement:** The software license agreement contains specific provisions regarding the academic use of the Arena Software. Essentially, the software provides for an academic license in which the student is allowed to use the software at no cost, with the understanding that the Arena Software is only used for the Manufacturing Simulation course. Use of the Arena Software for purposes other than teaching (learning) and university research are prohibited by the license agreement.
Note: A copy of the ARENA License Agreement is placed on Blackboard for your use. Please read this agreement, because you are bound by its terms and conditions.

**Class and University Policies for a Productive Semester:**

**Class Attendance:** Class attendance is the responsibility of each student. Information and materials are provided in class for use by each student, so class attendance is strongly recommended. If a class is missed for some reason, the material covered in class should be obtained from other students, unless special arrangements are made.

**Student Responsibilities:** The attendance policy is relatively liberal, and on occasion, students miss class and then need assistance from the professor. For example, one student did not attend class, and then could not work the homework. To help the student, the instructor had to repeat the lecture for the benefit of this single student. This represents an unfair burden on the instructor, and students that miss material because they are not present in class should not ask the instructor for assistance on the missed material.

**Collaboration on Assignments:** Homework is assigned as a learning experience. It is anticipated that each student does his or her own homework. Because homework is a major part of the grade, collaboration among students is discouraged. If it is apparent that more than one student submits a homework assignment that is substantially the work of a single student, adjustments to grading may be made. Additionally collaboration on homework and other assignments is a matter of Academic Honesty.

**Collaboration on Homework:** Due to past student abuse in copying homework, the instructor provides an opportunity for the students to show that they have completed the homework faithfully. In the class after each homework assignment is due, the instructor holds an in class verification on the homework. The in class verification represents an in class quiz in which the student is asked to reproduce one of the homework problems in the previous assignment.

The grade for the in class problem is multiplied by the score for the complete homework assignment to obtain the final homework assignment score. So, if a student is unable to complete the in class homework problem, the final assignment score is significantly reduced by the student’s failure to complete the homework problem in class.

**Scholastic Integrity:** As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of
Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

Sexual Harassment, Discrimination and Violence: In accordance with UT System regulations, your instructor is a “responsible employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student’s time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

Copyright: Material provided on Blackboard is made available for student use in this course, only. Copyright laws protect the authors and publishers with regard to this material, and these legal provisions require that the material made available to you for this course not be distributed, disseminated, or otherwise used outside of this course. This includes transmission to individuals that are not officially enrolled in this class, and it includes use after the course is completed. Violation of these provisions may constitute violation of copyright laws and may be punishable through legal recourse by the copyright owner. Additionally, copyright violations may be considered a violation of UTRGV policy, and therefore, subject to disciplinary procedures.

Students with Disabilities: If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. Brownsville Campus: Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at accessibility@utrgv.edu. Edinburg Campus: Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at accessibility@utrgv.edu.

Mandatory Course Evaluation Period: Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Online evaluations will be available Nov. 15 – Dec. 6, 2017. Students who complete their evaluations will have priority access to their grades.

Attendance: Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV’s attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students
should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

Office Hours: Traditional in office, office hours are Tuesday 1:00 pm to 2:45 pm, and Wednesday 3:15 pm to 6:30 pm. Additional office hour services are provided using the Blackboard Collaborate software, at student request. To obtain assistance from the instructor using the Blackboard Collaborate software, simply call the instructor’s office during office hours, and the Blackboard Collaborate software can be employed to provide instructor – student contact.

Additionally, office and home phone numbers are provided on this syllabus (along with e-mail), and students are encouraged to contact the instructor by any means between 8:00 am and midnight, seven days per week, as needed for assistance. Each phone line has voice mail, and messages are returned as soon as possible. E-mail can also help in reaching the instructor for assistance. Since the professor’s residence is close to campus, meeting the professor for assistance on campus in the evening or weekends at a mutually convenient time is a service available for students. Appointments are also scheduled upon request.

Phone Messages: Due to a high volume of calls that include solicitations, wrong numbers, and unwanted traffic, calls are often not answered when the phone rings. Therefore, it is imperative that you speak clearly and leave your name, phone number, date, and time when you called. This allows your instructor to return your call as promptly as possible.

Late Assignments: The instructor has typically allowed a grace period from the due date on an assignment until the answers are posted on the Blackboard system. However, after the answers are posted, late assignments can not be accepted, and assignments received after answers are posted receive a grade of zero.

Assignments can be submitted through several means that include:
  submission in person,
  submission through the US Mail,
  submission by e-mail,
  submission by FAX, or
  submission into the department secretary in the MANE department, or
  submission electronically through Blackboard.
For purposes of establishing the day and time of submission, the postmark date or day and time of e-mail/FAX transmission is considered the time of submission. Sometimes FAX transmissions are not readable or do not transmit properly. The risk for this type of problem may cause you to choose another means of submission, since a transmission that is not transmitted properly or completely can receive credit for only the work that is transmitted properly.

Submission Guarantee: Assignments submitted in person and using Blackboard can be verified as having been submitted. Other methods such as FAX, US Mail, e-mail, etc. are
less certain. For this reason, the student is advised that unless the assignment is submitted in person or with Blackboard, there is no guarantee that the instructor has received the assignment. Therefore, the student takes a risk that receipt of the assignment does not occur as planned, unless the assignment is submitted by Blackboard or in class.

The submission guarantee is only valid, if the Blackboard system shows that the assignment has been uploaded to the Blackboard server. Therefore, the student should check to be sure that a date and time are associated with the upload of the homework. If no date and time are shown for the homework submission the student should assume that attempts to submit the homework have failed, and efforts should continue until the software shows a valid date and time of submission.

**Assignment Format:** Since grading is done sometimes done from hard copy, any electronic submission should be placed in a format for immediate printing on 8.5 inch by 11 inch paper. Page numbers should be used to allow the printed copy to be placed in the correct order. Failure to format for printing may cause points to be deducted.

Additionally, all electronic submission should include the student’s name and the name of the assignment in the file name. Further, the student’s name and the name of the assignment should also be displayed on the assignment where it can be easily found, on the printed copy of the assignment. The header or footer of an MS document may work well for this purpose.

**Signatures on E-mail:** To avoid confusion, students are requested to provide their complete names as the signature on e-mail. Signing an e-mail message, “Juan” is not helpful when there is more than one “Juan” in the class. So, please use your first and last name on all e-mail transmissions to provide clarity and to avoid ambiguity.

**Grading Concerns:** Every effort is made by the instructor, Teaching Assistants or TA’s, and graders to correctly understand, interpret, and respond properly to each question on each exam or assignment. However, each class includes a number of students, and it is possible that mistakes might be made. Course policy for the response to concerns about grading begins with a WRITTEN response from the student to the instructor. This WRITTEN response can be an e-mail which is easily reduced to a writing. Further, the complete exam or assignment should also be returned by the student so that the entire examination or assignment can be re-graded by the instructor.

**Mistakes on Assignments**
The material in this course has been presented by this instructor in previous semesters. Some of this material is made available to the students through the Blackboard system for use in improving problem solving skills. Given the current situation, some level of mistakes and problems are inevitable. As a reward for spotting mistakes and helping to get them corrected, additional points are given to the first student that finds a mistake on a homework assignment or exam. Major mistakes receive several “extra bonus” points, and minor mistakes may receive one or more “extra bonus” points. This is only true for
the first person finding and correctly identifying a real mistake. The validity and value of finding a mistake is evaluated by the instructor.