I. Course Information

<table>
<thead>
<tr>
<th>Course Title/Number</th>
<th>Sections (CRN)</th>
<th>Semester/Year</th>
<th>Days - Time</th>
<th>Location</th>
<th>Instructor</th>
<th>Office</th>
<th>Phone</th>
<th>E-Mail</th>
<th>Office/Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Computations - ENGR 111</td>
<td>201 (3759), 202 (3758), and 203 (3757)</td>
<td>Spring 2014</td>
<td>S201: TR 8:00 – 9:15; S202: TR 11:00 – 12:15; S203 TR 2:00 – 3:15</td>
<td>GH 211 (all sections)</td>
<td>William Pierson (S201 and S203)</td>
<td>GH-3F</td>
<td>304-696-2695</td>
<td><a href="mailto:pierson@marshall.edu">pierson@marshall.edu</a></td>
<td>10-11 MTWRF; 1-3 MW; or by appointment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Iyad Hijazi (S202)</td>
<td>EL 109a</td>
<td>304-696-3845</td>
<td><a href="mailto:hijazii@marshall.edu">hijazii@marshall.edu</a></td>
<td>MW 12:00-3:00</td>
</tr>
</tbody>
</table>

University Policies

By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802

- Academic Dishonesty/ Excused Absence Policy for Undergraduates/
- Computing Services Acceptable Use/ Inclement Weather/ Dead Week/
- Students with Disabilities/ Academic Forgiveness/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Catalog Description: Engineering Computations. 3 hrs. II.

Introduction to effective problem-solving techniques used in various engineering applications with an emphasis on accuracy. Computational tools including calculators, spreadsheets, and a computational environment such as MATLAB will be covered. (CR: MTH 132 or higher)

Textbook and Supplies:

1. **Text:** *Esource Marshall University: Engineering Computations*; notes will also be provided.
2. **Calculator:** Casio fx115ES Plus or fx115 ES (not the MS or MS Plus) calculator. These are available, generally for under $20 at discount stores such as WalMart.
3. **Flash Drive:** A flash (jump) drive will be useful for saving files created during lab exercises.

II. Course Objectives

There are two main objectives for this course. First of all, the course will emphasize the skills, attitudes and good habits that are necessary to be a successful engineering student, such as good attendance, active class participation, promptness, and good organization and neatness on submitted work.

The second objective of the course is to introduce engineering students to problem solving techniques using manual methods, spreadsheets, and a high-level programming and computational tool such as MATLAB. An emphasis will be placed on accuracy. More specifically,
Manual techniques will involve using the Casio fx115ES, which is an acceptable calculator for the Fundamentals of Engineering (FE) exam.

Spreadsheet programs will be used to implement several commonly encountered engineering calculations, especially those problems that require analyzing tabular data.

Students will be introduced to a commonly used computational and programming environment used in engineering analysis, especially for applications involving matrices. Basic programming aspects such as logical operations, relational operations, conditional execution, and loop structures will also be introduced.

The course will use typical engineering applications as examples and emphasize a methodology used in solving engineering problems. Furthermore, an emphasis will be placed on accuracy and a good presentation of solutions.

III. Course Outcomes:
At the completion of this course the student will be able to:

a) Effectively use a calculator to solve typical engineering problems that will be encountered in higher-level engineering courses.

b) Use a logical, well-organized solution methodology, including appropriate documentation and solution verification.

c) Use a spreadsheet program to solve typical engineering problems.

d) Use relative and absolute cell references when copying cells within a spreadsheet.

e) Use spreadsheets to perform engineering calculations and operations using built-in functions, plotting facilities, and Solver.

f) Use MATLAB, an interactive computational environment to solve commonly encountered engineering problems, especially those involving matrices.

g) Interpret and generate pseudocode and/or flowcharts to describe an algorithm that involves conditional execution statements and loops.

h) Create, edit, save, debug, and execute MATLAB scripts.

i) Create, access, and manipulate vectors and arrays in mathematical, logical, and relational expressions.

j) Create modular programs using user-defined functions.

k) Create various types of plots to enhance the presentation of an engineering analysis.

IV. Course Activities and Policies:

Quizzes - Quizzes will be given regularly. The objective of the quizzes is to actively engage students and to provide feedback about the level of understanding. Quizzes will be based upon lecture material, lab exercises, homework, and reading assignments. Quizzes may be given in class or online using the course web site.

Homework and Labs - A significant number of homework problems and in-class lab exercises will be assigned and graded. Typically, one homework assignment and one lab exercise will be made each week. Some important notes about HW assignments and lab exercises:

- Unless stated otherwise, assignments are due at the beginning of class on the due date.
- Without a valid excuse (see institutional absence policy), late HW or missed lab exercises will not be accepted.
- Typically, a week will be given to complete homework assignments. Students should start the assignments immediately so that they will have an opportunity to ask questions during the intervening class period or by contacting the instructor.
- Lab exercises can generally be completed during regular class time and will be due at the end of the class period in which they are assigned or at the beginning of the following class period.
- Handwritten assignments should be submitted on engineering paper using the format described in class. Computer generated results should be formatted for 8.5 x 11” output and
ENGR 111 – Engineering Computations  

- Problems should be presented in a neat manner that is easy to read. You should show all steps and (when appropriate) calculations to each problem. Answers should be clearly marked and easy to find. The name(s) of the student(s) and the number of the problem should be shown at the top of each sheet. Computer solutions (Excel spreadsheets and MATLAB scripts) should be well documented (commented) and thoroughly tested before submission.

- Students are encouraged to work together on programming and homework assignments; however, cheating will not be tolerated on exams or quizzes. Any student caught cheating on an exam or quiz will receive a zero. Students should familiarize themselves with the MU Policy on Academic Dishonesty.

Exams - The will be two exams, a mid-term exam and a final. Each exam will count for 25% of the overall course grade.

Class Attendance and Participation - Students are expected to attend all class sessions and participate in class activities. Attendance will be taken and influence the overall grade in the course (see below). The MU policy on absences will be followed; students should read and understand this policy.

Lab Assignments - Learning to use a calculator, spreadsheets, and MATLAB requires hands-on, active participation, not just listening to a series of lectures. Hence, a series of in-class lab exercises have been designed that will give you a chance to implement concepts and techniques covered in lectures. The instructor will be available to answer questions, clarify the requirements, or to help get you started. If you do not complete a lab during class hours, then you are expected to complete the assignment outside of class.

Communication: Class communications will be handled via the MU email system, and students are expected to check their MU email account regularly. Assignments and lecture notes will be available at the online course repository. More details regarding access to this site will be distributed at a later date. Course notes, handouts, assignments, announcements, and other information will also be posted on the course MU-Online web site.

V. Evaluation/Grade Computation:

Course grades are based on weighted percentage averages. Your final grade will be determined by multiplying each individual activity score by summing the weighted averages as shown in the following table.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Average</th>
<th>Weight</th>
<th>= Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework &amp; Labs</td>
<td>0 to 100%</td>
<td>25</td>
<td>0 to 25</td>
</tr>
<tr>
<td>Quizzes</td>
<td>0 to 100%</td>
<td>20</td>
<td>0 to 20</td>
</tr>
<tr>
<td>Exams (Two exams: @ 100 points per exam.)</td>
<td>0 to 100%</td>
<td>50</td>
<td>0 to 50</td>
</tr>
<tr>
<td>Class Attendance</td>
<td>0 to 100%</td>
<td>5</td>
<td>0 to 5</td>
</tr>
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</table>

Grand Total = 0 to 100

Evaluation Scale

90 & Above =A  80 - 89 = B  70 - 79 = C  60 - 69 = D  59 & Below = F
VI. Schedule of Topics (Tentative, subject to updates and changes):

<table>
<thead>
<tr>
<th>Class #</th>
<th>Day</th>
<th>Topics Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan. 14: Introductions, Course Expectations Quiz #1</td>
<td>- Problem solving methodology</td>
</tr>
</tbody>
</table>
| 2       | Jan. 16: Calculator Basics Quiz #2a & #2b | - fxl15 Basics : Setup Menu, Modes, Constants.  
  - Example: Engineering Economics  
  - HW#1 Assigned |
| 3       | Jan. 21: Spreadsheet Basics Read: Ch. 1 (Pgs. 1-41) Quiz #4 | - A brief history  
  - The Excel environment, definitions, concepts, basic operations, relative vs. absolute cell addressing |
| 4       | Jan. 23: Excel Basics, Part 2 HW#1 Due, Quiz #3 | - Lab 2-2a&b: Microsoft Excel Walkthrough: Excel Functions, Documentation, Autofill, Keyboard Shortcuts |
| 5       | Jan 28: Excel Basics, Part 3 Read: Ch. 2 (Pgs. 51-109) Quiz #4 | - Formulas, Operator Precedence  
  - Formatting & Printing  
  - Lab 03-1: Interest Rate Tables  
  - HW #2 Assigned |
| 6       | Jan. 30: Polynomial Basics | - Definitions and Concepts  
  - Using the fxl15 to find roots of quadratics and cubics  
  - Complex numbers  
  - The fxl15 TABLE facility  
  - Lab 03-2 |
| 7       | Feb. 4: In class activity: Lab 03-2 Due | - Interest Rate Tables (HW #2) |
| 8       | Feb. 6: Plotting in Excel Read: Ch. 3 (Pgs. 117-158) Quiz #5, | - Plot types  
  - Labeling plots  
  - Editing and controlling plot attributes  
  - Trend lines, Thermocouple calibration (Lab 04-2) |
| 9       | Feb. 11: Basic Trigonometry Projectile Motion (Dynamics) Intro. To Solver HW#2 Due, Quiz #6 | - Assumptions and Equations  
  - Analytical solution, Manual sketches  
  - HW #3 Assigned  
  - Lab05-1: Projectile motion using Excel |
| 10      | Feb. 13: What-If Analysis Using Solver | - What-if analysis using SOLVER to find credit card payoff  
  - Using SOLVER to analyze polynomials  
  - Continue work on HW#3 |
| 11      | Feb. 18: More Excel Functions Read Ch. 4 (Pgs. 167-205) Lab 06-1, HW #3 Due | - CONVERT() examples  
  - Dates and Times formatting and functions  
  - Using VLOOKUP() |
| 12      | Feb. 20: Intro. To Statistics Read Ch. 5 (Pgs. 211-235) | - Basic Statistics; Excel Statistical Functions  
  - Histograms |
| 13      | Feb. 25: Importing Data Data Analysis Add-in | - HW #4 Assigned (Baseball” Problem)  
  - Work on HW #4 |
| 14      | Feb. 27: TBD Lab 07-2 HW #4 Due (end of class) | TBD |
| 15      | Mar. 4: | - Review for Mid-term Exam  
  - Catch-up Day |
<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topics</th>
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<tbody>
<tr>
<td>16</td>
<td>Mar 6</td>
<td>Mid-term Exam</td>
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<tr>
<td>17</td>
<td>Mar 11</td>
<td>Engineering Example – Transportation HW#5 Due</td>
</tr>
<tr>
<td></td>
<td>Mar 13</td>
<td>Interfacing with Word</td>
</tr>
<tr>
<td>18</td>
<td>Mar 13</td>
<td>Copying Excel spreadsheets and plots into MS Word for reports</td>
</tr>
<tr>
<td></td>
<td>Mar 17</td>
<td>(wk. 9) Importing data from delimited text files</td>
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<tr>
<td></td>
<td>Mar. 11</td>
<td>Engineering Example – Transportation</td>
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<tr>
<td></td>
<td>Mar. 17</td>
<td>(wk. 9) GVW Weight Analysis</td>
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<tr>
<td>19</td>
<td>Mar. 13</td>
<td>Interfacing with Word</td>
</tr>
<tr>
<td>20</td>
<td>Mar. 17</td>
<td>Importing data from delimited text files</td>
</tr>
<tr>
<td>21</td>
<td>Mar. 25</td>
<td>Simultaneous Equations</td>
</tr>
<tr>
<td></td>
<td>Apr. 1</td>
<td>MATLAB Operators</td>
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<tr>
<td></td>
<td>Apr. 3</td>
<td>Application Example</td>
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<tr>
<td></td>
<td>Apr. 8</td>
<td>More MATLAB Scripts</td>
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<tr>
<td>22</td>
<td>Apr. 10</td>
<td>MATLAB Plotting Facilities</td>
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<tr>
<td>23</td>
<td>Apr. 15</td>
<td>Programming Constructs</td>
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<td>24</td>
<td>Apr. 17</td>
<td>MATLAB Matrices</td>
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<td></td>
<td>Apr. 22</td>
<td>Solving Simultaneous Equations</td>
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<tr>
<td>25</td>
<td>Apr. 24</td>
<td>Vectors</td>
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<td></td>
<td>Apr. 29</td>
<td>MATLAB Engineering Example #4</td>
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<tr>
<td>26</td>
<td>Apr. 29</td>
<td>MATLAB Engineering Example #4</td>
</tr>
<tr>
<td>27</td>
<td>Apr. 29</td>
<td>MATLAB Engineering Example #4</td>
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<tr>
<td></td>
<td>May 1</td>
<td>Wrap-up and review</td>
</tr>
<tr>
<td>28</td>
<td>May 8, Exam #2</td>
<td>During Final Exam Period</td>
</tr>
<tr>
<td>29</td>
<td>May 8, Exam #2</td>
<td>During Final Exam Period</td>
</tr>
</tbody>
</table>

**March 17–21 Spring Break**

- Enjoy and Be Safe
### Course Outcomes

Students will effectively use a calculator to solve typical engineering problems that will be encountered in higher-level engineering courses.

- **Lectures;**
- **in-class labs using active learning;**
- **homework**

**How Practiced in this Course**

- Week 1 HW – Engineering Economics
- Lab03_1 – Polynomials
- Week 5 HW – Projectile Motion
- Week 13 HW – Flowerpot problem
- Exam #1 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Quantitative Fluency

---

Students will use a logical, well-organized solution methodology, including appropriate documentation and solution verification.

- **Lectures;**
- **homework**

**How Practiced in this Course**

- Week 1 HW - Economics
- Week 3 HW- Loan Payment Analysis
- Week 4 HW – Plotting w/ Excel
- Week 5 HW – Projectile Motion
- Week 6 HW Baseball problem
- Week 9 HW – GVW Analysis
- Week 13 HW – Flowerpot problem
- Exam #1 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (g) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Analytic Inquiry
- IS: Use of Information Resources
- IS: Quantitative Fluency
- IS: Communication Fluency

---

Students will create, edit, loops.

- **Lectures;**
- **in-class labs using active learning;**
- **homework**

**How Practiced in this Course**

- Lab 02_2 – Intro to Excel
- Lab 03_1 – Generating interest rate tables w/Excel
- Exam #1 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Quantitative Fluency

---

Students will use a spreadsheet program to solve typical engineering problems.

- **Lectures;**
- **in-class labs using active learning;**
- **homework**

**How Practiced in this Course**

- Lab02_1 – Polynomial plots using MATLAB
- Lab 12_1 – Simultaneous Equations
- Exam #2 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Quantitative Fluency

---

Students will use relative and absolute cell references when copying cells within a spreadsheet.

- **Lectures;**
- **in-class labs using active learning;**
- **homework**

**How Practiced in this Course**

- Lab04_1 – Plotting w/Excel
- Week 4 HW – Plotting w/Excel
- Week 6 HW – Using Excel’s SOLVER
- Lab07_1 – Excel functions
- Lab08_1 – Importing data into Excel
- Exam #1 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Quantitative Fluency

---

Students will use Matlab, an interactive computational environment to solve commonly encountered engineering problems, especially those involving matrices.

- **Lectures;**
- **in-class labs using active learning;**
- **homework**

**How Practiced in this Course**

- Lab11_1 – Intro to MATLAB
- Lab 12_1 – Polynomial plots using MATLAB
- Lab 12_2 – Importing data into MATLAB; curve fitting
- Week 13 HW – Flowerpot Problem
- Lab 14_2 – Simultaneous Equations
- Exam #2 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Analytic Inquiry
- IS: Quantitative Fluency

---

Students will interpret and generate pseudocode and/or flowcharts to describe an algorithm that involves conditional execution statements and loops.

- **Lectures;**
- **in-class labs using active learning;**
- **homework**

**How Practiced in this Course**

- Lab12_1 – Polynomial plots using MATLAB
- Lab 12_2 – Importing data into MATLAB; curve fitting
- Week 13 HW – Flowerpot Problem
- Exam #2 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Analytic Inquiry
- IS: Quantitative Fluency

---

Students will create, edit, save, debug, and execute Matlab scripts.

- **Lectures;**
- **in-class labs using active learning;**
- **homework**

**How Practiced in this Course**

- Week 13 HW – Flowerpot Problem
- Exam #2 problems (TBD)

**How Evaluated in this Course**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Program Outcomes - Levels**

- (a) – 1 & 2
- (e) - 2
- (k) – 1 & 2

**Degree Profile Outcomes**

- Specialized knowledge
- IS: Analytic Inquiry
- IS: Quantitative Fluency
### ENGR 111 – Engineering Computations

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>How Practiced in this Course</th>
<th>How Evaluated in this Course</th>
<th>Program Outcomes</th>
<th>Degree Profile Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will create modular programs using user-defined functions.</strong></td>
<td>Lectures;</td>
<td>Lab12_1 – Polynomial plots using MATLAB</td>
<td>(a) – 1 &amp; 2</td>
<td>• Specialized knowledge</td>
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<tr>
<td></td>
<td>in-class labs using active learning;</td>
<td>Week 13 HW – Flowerpot Problem</td>
<td>(e) - 2</td>
<td>• IS: Quantitative Fluency</td>
</tr>
<tr>
<td></td>
<td>homework</td>
<td>Exam #2 problems (TBD)</td>
<td>(k) – 1 &amp; 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(a) – 1 &amp; 2</td>
<td>(e) - 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(k) – 1 &amp; 2</td>
<td>(g) - 2</td>
<td></td>
</tr>
<tr>
<td><strong>Students will create various types of plots to enhance the presentation of an engineering analysis.</strong></td>
<td>Lectures;</td>
<td>Lab04_1 – Plotting w/Excel</td>
<td>(a) – 1&amp;2</td>
<td>• Specialized knowledge</td>
</tr>
<tr>
<td></td>
<td>in-class labs using active learning;</td>
<td>Week 4 HW – Plotting w/Excel</td>
<td>(e) - 2</td>
<td>• IS: Quantitative Fluency</td>
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<tr>
<td></td>
<td>homework</td>
<td>Lab12_1 – Polynomial plots using MATLAB</td>
<td>(g) - 2</td>
<td>• IS: Communication Fluency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lab 12_2 - Importing data into MATLAB; curve fitting</td>
<td>(k) – 1 &amp; 2</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Exam #2 problems (TBD)</td>
<td>(k) – 1 &amp; 2</td>
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