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## Term Information

Effective Term Autumn 2017

## General Information

Course Bulletin Listing/Subject Area Mathematics  
Fiscal Unit/Academic Org Mathematics - D0671  
College/Academic Group Arts and Sciences  
Level/Career Undergraduate  
Course Number/Catalog 1138  
Course Title Fundamentals of Mathematics for Engineers  
Transcript Abbreviation Math for Eng  
Course Description This application-oriented, hands-on, introduction to engineering, mathematics course will provide an overview of the salient math topics most heavily used in beginning engineering courses. All math topics will be presented within the context of an engineering application, and reinforced through extensive examples of their use in the core engineering courses.  
Semester Credit Hours/Units Fixed: 4

## Offering Information

Length Of Course 14 Week  
Flexibly Scheduled Course Never  
Does any section of this course have a distance education component? No  
Grading Basis Letter Grade  
Repeatable Yes  
Allow Multiple Enrollments in Term No  
Max Credit Hours/Units Allowed 4  
Max Completions Allowed 2  
Course Components Recitation, Laboratory, Lecture  
Grade Roster Component Lecture  
Credit Available by Exam No  
Admission Condition Course No  
Off Campus Never  
Campus of Offering Columbus

## Prerequisites and Exclusions

Prerequisites/Corequisites Course Code N on the Mathematics Placement Test  
Exclusions Math 1151

## Cross-Listings

Cross-Listings ENGR 1138

## Subject/CIP Code

Subject/CIP Code 14.9999  
Subsidy Level Baccalaureate Course

Intended Rank

Freshman

## Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

## Course Details

### **Course goals or learning objectives/outcomes**

- Students will be able to solve problems involving applications of algebra and trigonometry in engineering
- Students will be able to solve problems involving applications of vectors and complex numbers in eng
- Students will be able to solve problems involving applications of systems of equations and matrices in engineering.
- Students will be able to solve problems involving applications of derivatives in engineering
- Students will be able to solve problems involving applications of integrals in engineering
- Students will be able to solve problems involving applications of differential equations in engineering
- Students will be able to use MATLAB to solve a variety of introductory engineering mathematics problems
- Students will be able to conduct a variety of physical experiments using engineering laboratory equipment
- Students will be able to write proper technical executive summaries for engineering laboratory assignments

### **Content Topic List**

- Introductions
  - Application of Algebra in Engineering Linear and Quadratic Equations
- 2D Vectors in Engineering
- How Learning Works - The Importance of Reflection and Planning
- MATLAB Instruction
- Trigonometry - One Link Planar Robot, One and Two Link Planar Robots
- Goal Setting, Time Management; Stress Management
- Complex Numbers in Engineering
- Test Taking Strategies
- Sinusoids and Harmonic Signals in Engineering
- Measurement and Analysis of Harmonic Signals
- Systems of Equations and Matrices in Engineering
- Self-Awareness / Personal Responsibility
- Systems of Equations in Engineering: The Two-Loop Circuit
- Introduction to Derivatives in Engineering
- Application of Derivatives in Electrical and Mechanical Eng
- Introduction to Integrals in Engineering
- Derivatives in Engineering: Velocity and Acceleration in Free-Fall
- Excel Instruction
- Integrals in Statics and Other Applications
- Integrals in Engineering: Work and Stored Energy in a Spring
- Introduction to Differential Equations
- Differential Equations in Engineering Applications

**Attachments**

- deadline appeal.pdf: Deadline Appeal  
*(Appeal. Owner: Husen, William J)*
- ENGR 1138 syllabus au 2017.docx: Syllabus  
*(Syllabus. Owner: Husen, William J)*
- ENGR-1138 COE input.pdf: Engineering Submission and Rationale  
*(Other Supporting Documentation. Owner: Husen, William J)*

**Comments**

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Husen, William J	04/18/2017 10:07 AM	Submitted for Approval
Approved	Husen, William J	04/18/2017 10:07 AM	Unit Approval
Approved	Haddad, Deborah Moore	04/18/2017 10:59 AM	College Approval
Pending Approval	Nolen, Dawn Vankeerbergen, Bernadette Chantal Hanlin, Deborah Kay Jenkins, Mary Ellen Bigler	04/18/2017 10:59 AM	ASCCAO Approval



100 Math Tower  
231 W 18<sup>th</sup> Avenue  
Columbus, OH 43210-1174

614-292-4975 Phone  
614-292-1479 Fax

Math.osu.edu

April 18, 2017

Re: Deadline Appeal

To Whom It May Concern,

I am writing to request an exception to the standard deadlines for new course acceptance. In this instance, the course that is being submitted for approval, Math 1138, is to be cross-listed with a course in the College of Engineering (ENGR 1138). This course was developed primarily by the Engineering faculty, but, due to its concentration on mathematics, the Department of Mathematics would like to be involved in this course. As Engineering is the primary submitter, the Department of Mathematics was not able to submit its course until all submission materials were prepared, which occurred today, April 18, 2017. As such, I would request that the Department of Mathematics' cross-listed submission be allowed to proceed in the curriculum process so that it may be ready as a course for Autumn 2017.

Sincerely,

William J. Husen, Ph.D.  
Director of Undergraduate Instruction

**Engineering 1138/Math 1138 – Autumn Semester 2017**  
**Fundamentals of Mathematics for Engineers (4 credit hours)**  
**The Ohio State University**

**Course Meeting Times and Locations:**

Lecture: MWF 9:10-10:05am HI 208; Lab: T 8:00-10:05am HI 208  
Recitation: R 8:45-10:05am HI 208

**Instructional Team:**

Dr. Lisa Abrams	x
Associate Chair	Graduate Teaching Assistant
abrams.34@osu.edu	<u>x</u>
Office hours: M 10:00-11:00am HI 179	Office hours: W, R 10:00-11:00am HI 208
T 11:00-noon HI 179	

**Objectives:** The objective of this course is to increase student retention, motivation and success in engineering through an application-oriented, hands-on introduction to engineering mathematics. This course will provide an overview of the salient math topics most heavily used in beginning engineering courses. All math topics will be presented within the context of an engineering application, and reinforced through extensive examples of their use in the core engineering courses.

**Prerequisites:** Course Code N on the Mathematics Placement Test

**Learning Outcomes:** Upon completing this course, students will be able to:

- Solve problems involving applications of algebra and trigonometry in engineering.
- Solve problems involving applications of vectors and complex numbers in eng.
- Solve problems involving applications of systems of equations and matrices in engineering.
- Solve problems involving applications of derivatives in engineering.
- Solve problems involving applications of integrals in engineering.
- Solve problems involving applications of differential equations in engineering.
- Use MATLAB to solve a variety of introductory engineering mathematics problems.
- Conduct a variety of physical experiments using engineering laboratory equipment.
- Write proper technical executive summaries for engineering laboratory assignments.

**Texts:**

- Rattan and Klingbeil, *Introductory Mathematics for Engineering Applications*, John Wiley & Sons, 2014.
- Gilat, A., *MATLAB: An Introduction with Applications*, 5<sup>th</sup> ed., John Wiley & Sons, 2014.

**Grade Distribution:**

Homework/In class problems/Quizzes	10%
Lab	20%
Reflections	5%
Exams (3 Exams; 20% each)	60%
Lab Final	5%

**Grading Scheme:** Dr. Abrams uses the OSU Standard Grading Scheme. Note: If you attend and participate in class regularly and attend office hours regularly, your grade may be rounded up to the next letter grade. For example, if you have a 92.9% (A-) and attend and participate in class regularly, you may receive an A in the class. This is up to the discretion of Dr. Abrams. No extra credit assignments will be given to boost a student's grade in the class (so you don't need to ask).

Letter Grade	Numerical Grade
A	93-100
A-	90-92.9
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9
D+	67-69.9
D	60-66.9
E	<60

**Homework:** Homework is assigned each day in lecture (M, W, F). Unless otherwise noted, all homework for the week is due within the first ten minutes of class on the following Monday. All problems will be collected but only one problem will be graded for full credit. The rest will be graded for completion. Late homework may be turned in by the next lecture (Wednesday) for a 30% penalty. In-class problems are due at the end of the class during which they are assigned. No in-class problems will be accepted late. Since homework is a mandatory component of this course, a passing grade in homework/in class problems/quizzes is required for a passing course grade.

**Labs:** Unless otherwise noted, lab assignments are due within the first ten minutes of lab the following week (Tuesday). Late labs may be turned in by the next lecture for a 30% penalty. Since the laboratory is a mandatory component of this course, the completion of all lab assignments is required for a passing course grade. Each weekly lab will form the basis for the lab final which will be administered during the last lab session and is worth 5% of the total course grade.

**Reflections:** You are responsible for responding to reflection prompts each week through Carmen. See the Dropbox section each week for the reflection prompt. Online responses are due by the beginning of class every Thursday. All responses are kept

confidential among the instructional team. Unless otherwise specified, reflections should be double-spaced, typed, not less than ½ page, but not more than 1 page.

**Exams:** Exams are closed books, closed notes, closed outside resources. The only materials permitted for each exam is a calculator and a formula sheet which will be provided with the exam. The formula sheet must be returned with the exam.

**Regrading of Assignments and Exams:** If you think an assignment or exam has been graded incorrectly, please return the assignment or exam to Dr. Abrams within a week of it being returned to you. It should have a stapled cover sheet outlining the error. Beyond a week, there will be no regarding of assignments or exams.

**MATLAB and Excel:** This course will also provide an introduction to MATLAB and Excel, which is used in the engineering curriculum. Application of the software will be integrated with each lab assignment. In addition, required reading and problems may be assigned during lecture and/or lab.

**Make-Up Exam Policy and Guidelines:** You are expected to take each exam at the regularly scheduled time. Accommodations may be made for the following reasons:

1. **ILLNESS OR EMERGENCY ON EXAM DAY:** Students who are ill or have a family emergency (death or serious illness of a close family member) on the day of an exam will be allowed to take a make-up. Written documentation is required. You must contact the instructor as soon as possible and certainly **WITHIN 24 HOURS** after the exam. (The make-up exam must be completed as soon as possible)
2. **UNAVOIDABLE CONFLICTS WITH EXAM TIME:** Such conflicts include military duty or an out-of-town interview. Documentation of the conflict with the regularly scheduled exam time must be provided in writing one week prior to the day of the regularly scheduled exam.
3. **UNEXCUSED ABSENCES:** If you miss an exam without a legitimate, documented excuse, you may receive a score of zero for that lab/exam. Exceptions will be made only under unusual circumstances approved by the instructor.

#### 4. LATENESS

A student who is late for his/her scheduled exam should take a seat quietly and begin the exam regardless of how much time remains; no additional time will be granted; no penalty will be applied to the exam score. If a student may be late due to a job interview, he/she should notify the instructor one week prior to the exam.

**Make-Up Lab Policy and Guidelines:** You are expected to participate in every lab at the regularly scheduled time. Accommodations may be made for the following reasons:

1. **ILLNESS OR EMERGENCY ON LAB DAY:** Students who are ill or have a family emergency (death or serious illness of a close family member) on the day of a lab will

be allowed to participate in a make-up. Written documentation is required. You must contact the instructor as soon as possible and certainly WITHIN 24 HOURS after the lab. (The make-up lab must be completed as soon as possible)

2. **UNAVOIDABLE CONFLICTS WITH LAB TIME:** Such conflicts include military duty or an out-of-town interview. Documentation of the conflict with the regularly scheduled lab time must be provided in writing one week prior to the day of the regularly scheduled lab. You must make up the lab as soon as possible.

3. **UNEXCUSED ABSENCES:** If you miss or are more than 20 minutes late to a lab without a legitimate, documented excuse, you may must make up the lab with a member of the teaching team within a week of the original date of the lab. Your lab write up is due on the original due date and will receive a penalty of 30%.

**Professional Conduct:** Students are expected to conduct themselves in a professional manner and to abide by the provisions in the Code of Student Conduct. Students should appreciate diversity, and they should conduct themselves professionally with members of the opposite gender and/or from different cultures. Any forms of sexual harassment or intimidation will not be tolerated. The University's Code of Student Conduct and Sexual Harassment Policy are available on the OSU web page. Harassment can occur between two or more students and between students and faculty, and the actions can take place in physical, verbal, or written forms. When a complaint is received, the situation will be investigated by the department and possibly by the police even if the harassment was done anonymously or possibly as a jest. Being found guilty of harassment, even if it was nominally done in jest, can be professionally damaging.

Students are also reminded to represent themselves in a professional manner in any information that they wish to share with the public. This includes information on personal forums available inexpensively on the web. Examples are Twitter, Instagram, and Facebook. Information on these pages is often screened by potential employers, and unprofessional material can have a negative impact on job prospects.

**Academic Misconduct,** such as cheating or plagiarism, will be reported using official University procedures. Policies and procedures can be found in the Code of Student Conduct available online in several places including [http://studentaffairs.osu.edu/resource\\_csc.asp](http://studentaffairs.osu.edu/resource_csc.asp).

**For Students with Disabilities:** Please note that course materials and exercises can be made available in alternative formats. Please contact the instructor or the Office for Disability Services (292-3307) for further information.

**First-Year Engineering Computer Lab (HI 324):** In addition to your classrooms and labs, you will have access to the First-Year Engineering Computer Lab located in Hitchcock Hall Room 324. This lab can be used for assignments and lab reports, as it contains MATLAB, Excel, and Word. You may not install any software onto, or copy



any software from the lab computers. Food and drink are not permitted in the lab. Violation of these policies will result in expulsion from the lab. The door is unlocked the following hours: Monday - Thursday 7:30 am – 5:30pm and is accessible using your BuckID during other hours.

<b>Day</b>	<b>Format</b>	<b>Topics</b>
Tuesday Aug 22	Lab	Introductions Application of Algebra in Engineering – Linear and Quadratic Equations
Weds Aug 23	Lecture	Application of Algebra in Engineering – Linear and Quadratic Equations
Thurs Aug 24	Recitation	How Learning Works - The Importance of Reflection and Planning
Fri Aug 25	Lecture	Application of Algebra in Engineering – Linear and Quadratic Equations
Mon Aug 28	Lecture	MATLAB Instruction
Tues Aug 29	Lab	Application of Algebra in Engineering: The One-Loop Circuit
Weds Aug 30	Lecture	Trigonometry - One Link Planar Robot, One and Two Link Planar Robots
Thurs Aug 31	Recitation	Goal Setting
Fri Sept 1	Lecture	Trigonometry - One Link Planar Robot, One and Two Link Planar Robots
Mon Sept 4	No class	N/A
Tues Sept 5	Lab	Trigonometric Relationships in One and Two-Link Robots
Weds Sept 6	Lecture	2D Vectors in Engineering
Thurs Sept 7	Recitation	Time Management
Fri Sept 8	Lecture	2D Vectors in Engineering

Mon Sept 11	Lecture	Complex Numbers in Engineering
Tues Sept 12	Lab	MATLAB Instruction
Weds Sept 13	Lecture	Complex Numbers in Engineering
Thurs Sept 14	Recitation	Test Taking Strategies I
Fri Sept 15	Lecture	Review
Mon Sept 18	Lecture	Sinusoids and Harmonic Signals in Engineering
Tues Sept 19	Lab	MATLAB Instruction
Weds Sept 20	Lecture	Sinusoids and Harmonic Signals in Engineering
Thurs Sept 21	Recitation	Midterm Exam
Fri Sept 22	Lecture	Sinusoids and Harmonic Signals in Engineering
Mon Sept 25	Lecture	Sinusoids and Harmonic Signals in Engineering
Tues Sept 26	Lab	Measurement and Analysis of Harmonic Signals
Weds Sept 27	Lecture	Systems of Equations and Matrices in Engineering
Thurs Sept 28	Recitation	Self-Awareness / Personal Responsibility
Fri Sept 29	Lecture	Systems of Equations and Matrices in Engineering
Mon Oct 2	Lecture	Systems of Equations and Matrices in Engineering

Tues Oct 3	Lab	Systems of Equations in Engineering: The Two-Loop Circuit
Weds Oct 4	Lecture	Introduction to Derivatives in Engineering
Thurs Oct 5	Recitation	Scheduling 101
Fri Oct 6	Lecture	Introduction to Derivatives in Engineering
Mon Oct 9	Lecture	Introduction to Derivatives in Engineering
Tues Oct 10	Lab	MATLAB Instruction
Weds Oct 11	Lecture	Application of Derivatives in Electric Circuits
Thurs Oct 12	No Class	N/A
Fri Oct 13	No Class	N/A
Mon Oct 16	Lecture	Application of Derivatives in Electric Circuits
Tues Oct 17	Lab	MATLAB Instruction
Weds Oct 18	Lecture	Application of Derivatives in Mechanics of Materials
Thurs Oct 19	Recitation	Stress Management
Fri Oct 20	Lecture	Application of Derivatives in Mechanics of Materials
Mon Oct 23	Lecture	Introduction to Integrals in Engineering
Tues Oct 24	Lab	Derivatives in Engineering: Velocity and Acceleration in Free-Fall
Weds Oct 25	Lecture	Introduction to Integrals in Engineering
Thurs Oct 26	Recitation	Test Taking Strategies II

Fri Oct 27	Lecture	Review
Mon Oct 30	Lecture	Introduction to Integrals in Engineering
Tues Oct 31	Lab	Excel Instruction
Weds Nov 1	Lecture	Integrals in Statics
Thurs Nov 2	Recitation	Exam
Fri Nov 3	Lecture	Integrals in Statics
Mon Nov 6	Lecture	Integrals - U-Substitution
Tues Nov 7	Lab	Excel Instruction
Weds Nov 8	Lecture	Integrals - U-Substitution
Thurs Nov 9	Recitation	13 Best Ideas
Fri Nov 10	No Class	N/A
Mon Nov 13	Lecture	Introduction to Differential Equations - The Leaking Bucket - Part A
Tues Nov 14	Lab	Integrals in Engineering: Work and Stored Energy in a Spring
Weds Nov 15	Lecture	Introduction to Differential Equations - The Leaking Bucket - Part B
Thurs Nov 16	Recitation	Time Management Check In
Fri Nov 17	Lecture	Introduction to Differential Equations - The Leaking Bucket - Part C
Mon Nov 20	Lecture	2nd-Order Differential Equations in Engineering

Tues Nov 21	Lab	Differential Equations in Engineering: The Leaking Bucket
Weds Nov 22	No class	N/A
Thurs Nov 23	No class	N/A
Fri Nov 24	No class	N/A
Mon Nov 27	Lecture	2nd-Order Differential Equations in Engineering
Tues Nov 28	Lab	Differential Equations in Engineering: Spring-Mass Vibration
Weds Nov 29	Lecture	2nd-Order Differential Equations in Engineering
Thurs Nov 30	Recitation	Presentations 101
Fri Dec 1	Lecture	Review
Mon Dec 4	Lecture	Lab Presentations
Tues Dec 5	Lab	Lab Presentations
Weds Dec 6	Lecture	Review
xxx	Final	Cumulative

# ENGR 1138 (Proposed): Fundamentals of Mathematics for Engineers

## Course Description

This application-oriented, hands-on, introduction to engineering, mathematics course will provide an overview of the salient math topics most heavily used in beginning engineering courses. All math topics will be presented within the context of an engineering application, and reinforced through extensive examples of their use in the core engineering courses.

**Prior Course Number:** 2194

**Transcript Abbreviation:** Math for Eng

**Grading Plan:** Letter Grade

**Course Deliveries:** Classroom

**Course Levels:** Undergrad

**Student Ranks:** Freshman

**Course Offerings:** Autumn

**Flex Scheduled Course:** Never

**Course Frequency:** Every Year

**Course Length:** 14 Week

**Credits:** 4.0

**Repeatable:** Yes

**Maximum Repeatable Credits:** 4.0

**Total Completions Allowed:** 2

**Allow Multiple Enrollments in Term:** No

**Time Distribution:** 3.0 hr Lec, 2.0 hr Rec, 1.5 hr Lab

**Expected out-of-class hours per week:** 5.5

**Graded Component:** Lecture

**Credit by Examination:** No

**Admission Condition:** No

**Off Campus:** Never

**Campus Locations:** Columbus

**Prerequisites and Co-requisites:** Course Code N on the Mathematics Placement Test

**Exclusions:** Math 1151

**Cross-Listings:** Math 1138

**Course Rationale:** The objective of this course is to increase student retention, motivation and success in engineering.

**The course is required for this unit's degrees, majors, and/or minors:** No

**The course is a GEC:** No

**The course is an elective (for this or other units) or is a service course for other units:** Yes

**Subject/CIP Code:** 14.9999

**Subsidy Level:** Baccalaureate Course

## General Information

Students in UENG who completed ENGR 2194 in Autumn 2014 and 2015 were retained to Engineering one year later at a rate of 80.6%, while only 53.9% of peers in the Autumn 2012-2015 comparison group were retained to Engineering. Students who entered in UENG and completed ENGR 2194 in Autumn 2015 were retained to Engineering two years later at a rate of 41.2%, while only 31.6% of peers in the Autumn 2012-2015 comparison group were retained. In addition, 50.0% of students who entered in UEXP and completed ENGR 2194 in Autumn 2015 had successfully moved to UENG two years later.

Students who completed ENGR 2194 earned higher average grades in Math 1148, Math 1149, Chemistry 1210, and Chemistry 1220 than students who did not take ENGR 2194.

## Course Goals

Students will be able to solve problems involving applications of algebra and trigonometry in engineering
Students will be able to solve problems involving applications of vectors and complex numbers in eng
Students will be able to solve problems involving applications of systems of equations and matrices in engineering.
Students will be able to solve problems involving applications of derivatives in engineering
Students will be able to solve problems involving applications of integrals in engineering
Students will be able to solve problems involving applications of differential equations in engineering
Students will be able to use MATLAB to solve a variety of introductory engineering mathematics problems
Students will be able to conduct a variety of physical experiments using engineering laboratory equipment
Students will be able to write proper technical executive summaries for engineering laboratory assignments

## Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introductions Application of Algebra in Engineering Linear and Quadratic Equations	2.0		3.0					
2D Vectors in Engineering	2.0							
How Learning Works - The Importance of Reflection and Planning		2.0						
MATLAB Instruction	1.0		10.0					
Trigonometry - One Link Planar Robot, One and Two Link Planar Robots	2.0		2.0					
Goal Setting, Time Management; Stress Management		6.0						
Complex Numbers in Engineering	2.0							
Test Taking Strategies		3.0						
Sinusoids and Harmonic Signals in Engineering	3.0							
Measurement and Analysis of Harmonic Signals			2.0					
Systems of Equations and Matrices in Engineering	3.0							
Self-Awareness / Personal Responsibility		1.5						
Systems of Equations in Engineering: The Two-Loop Circuit			2.0					
Introduction to Derivatives in Engineering	3.0							
Scheduling 101		1.5						
Application of Derivatives in Electrical and Mechanical Eng	4.0							
Introduction to Integrals in Engineering	4.0							
Derivatives in Engineering: Velocity and Acceleration in Free-Fall			2.0					
Excel Instruction			4.0					
Integrals in Statics and Other Applications	4.0							
Integrals in Engineering: Work and Stored Energy in a Spring			2.0					
Introduction to Differential Equations	6.0							
Differential Equations in Engineering Applications			4.0					
Presentations	1.0	1.5	2.0					

## Representative Assignments

Weekly homework assignments reflecting each of the topics above
Reflections following recitation classes
Lab reports

## Grades

Aspect	Percent
Homework	10%
Lab	20%
Reflections	5%
Exams	60%
Lab Final	5%

## Representative Textbooks and Other Course Materials

Title	Author
<i>Introductory Mathematics for Engineering Applications</i>	Rattan and Klingbeil
<i>MATLAB: An Introduction with Applications</i>	Gilat

## ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
	c	An ability to design a system, component, or process to meet desired needs.
***	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
**	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Prepared by: Lisa Abrams