FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School: Physics and Engineering  Date: August 11, 2018

Course No. or Level: ENGR 250  Title: Mechanics of Materials

Semester hours: 3  Clock hours: Lecture: 3  Laboratory: 

Prerequisites: ENGR 301 Pre/Co: MATH 301

Enrollment expectation: 10 per year

Indicate any course for which this course is a (an)

modification
(proposed change in course title, course description, course content or method of instruction)

substitute
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description: Rahul Renu

Department Chairperson’s/Dean's Signature:

Provost's Signature:

Date of Implementation: Spring 2020

Date of School/Department approval: 8/20/18

Catalog description:

250 Mechanics of Materials (3) (Prerequisite: 301; Prerequisite/corequisite: Math 301) S.
The course covers determination of stresses, deflections, and stability of deformable bodies
with an introduction to finite element analysis. By successfully completing this course, students will be able to identify, formulate and solve problems related to the effect of forces on deformable bodies. An emphasis will be placed on the behavior of beams and columns.

Purpose: 1. For Whom (generally?)

For mechanical engineering majors.

2. What should the course do for the student?
By successfully completing the course, students will be able to identify, formulate and solve problems related to the effect of forces on deformable bodies. An emphasis will be placed on the behavior of beams and columns.

Teaching method planned:

Lecture

Textbook and/or materials planned (including electronic/multimedia):


Course Content: This course teaches students methods to analyze the effects of forces on deformable bodies. The analysis of beams and columns is emphasized as these are elementary structures that are components of many designs.

Syllabus for Proposed Course:
Mechanics of Materials Syllabus

1. Course Name and Number - Mechanics of Materials: ENGR 250
2. 3 credits, 45 contact hours
4. Specific Course Information
   a. Determination of stresses, deflections, and stability of deformable bodies with an introduction to finite element analysis.
   b. Prerequisites: ENGR301 (Engineering Mechanics); Corequisite: MATH301
   c. Required
5. Specific Goals for the Course
   a. By successfully completing this course, students will be able to identify, formulate and solve problems related to the effect of forces on deformable bodies. An emphasis will be placed on the behavior of beams and columns.
6. Brief List of Topics to be covered
   • Definition of stress and strain
   • Deformation of axially loaded members
   • Torsion of circular bars
   • Shear force and bending moment diagrams
   • Normal and shear stress in beams
   • Properties of sections
   • Beam deflection
   • Stress and strain transformation at a point
   • Principal stresses and maximum shear stress
   • Mohr’s circle
   • Combined loading
   • Column buckling
   • Introduction to Finite Element Analysis

Grading Scale
100 - 90 = A
89 - 88 = B+
87 - 80 = B
79 - 78 = C+
77 - 70 = C
69 - 68 = D+
67 - 60 = D
< 60 = F
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School    Physics and Engineering    Date    August 11, 2018

Course No. or Level    ENGR 370    Title    Fluid Mechanics

Semester hours    3    Clock hours:    Lecture    3    Laboratory    

Prerequisites    ENGR 250, MATH 301, 306, PHYS 200

Enrollment expectation    10 per year

Indicate any course for which this course is a (an)

modification    ____________________
(proposed change in course title, course description, course content or method of instruction)

substitute    ____________________
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate    ____________________
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description    Rahul Renu

Department Chairperson’s/Dean's Signature    ____________________

Provost’s Signature    ____________________

Date of Implementation    Spring 2021

Date of School/Department approval    8/20/18

Catalog description:

370 Fluid Mechanics (3) (Prerequisite: 250, Mathematics 301, Mathematics 306, Physics 200) S. The course introduces the concepts and applications of fluid mechanics and dimensional analysis with an emphasis on fluid behavior, internal and external flows, analysis of engineering applications of incompressible pipe systems, and external aerodynamics.
Purpose: 1. For Whom (generally?)

For mechanical engineering majors.

2. What should the course do for the student?

By successfully completing this course, students will be able to determine types of flow, apply dimensional analysis to fluid systems, and design fluid systems.

Teaching method planned:

Lecture

Textbook and/or materials planned (including electronic/multimedia):


Course Content: In this course, students are taught the fundamentals of fluid mechanics, fluid behavior and design of fluid systems.

Syllabus for Proposed Course:
Fluid Mechanics Syllabus

1. Course Name and Number - Fluid Mechanics: ENGR 370
2. 3 credits, 45 contact hours
4. Specific Course Information
   a. Introduction to the concepts and applications of fluid mechanics and dimensional analysis with an emphasis on fluid behavior, internal and external flows, analysis of engineering applications of incompressible pipe systems, and external aerodynamics.
   b. Prerequisites: Mechanics of Materials, MATH301, MATH306, PHYS200
   c. Required
5. Specific Goals for the Course
   a. By successfully completing this course, students will be able to determine types of flow, apply dimensional analysis to fluid systems, and design fluid systems.
6. Brief List of Topics to be covered
   • Introduction and overview of fluid mechanics
   • Hydrostatic forces
   • Types of fluid flow
   • Bernoulli’s Theorem
   • Flow losses
   • Flow over bodies
   • Dimensional analysis
   • Compressible fluid flow

Grading Scale
100 - 90 = A
89 - 88 = B+
87 - 80 = B
79 - 78 = C+
77 - 70 = C
69 - 68 = D+
67 - 60 = D
< 60 = F
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School  Physics and Engineering  Date  August 11, 2018

Course No. or Level  ENGR 400  Title  Thermodynamics and Heat and Mass Transfer

Semester hours  4  Clock hours:  Lecture  3  Laboratory  3

Prerequisites  ENGR 250, 370, PHYS 200, MATH 301

Enrollment expectation  10 per year

Indicate any course for which this course is a (an)

modification  
(proposed change in course title, course description, course content or method of instruction)

substitute  
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate  
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description  Rahul Renu

Department Chairperson’s/Dean's Signature

Provost's Signature

Date of Implementation  Spring 2022

Date of School/Department approval  8/20/18

Catalog description:

400 Thermodynamics and Heat and Mass Transfer (4:3-3) (Prerequisites: 250, 370, Physics 200, Mathematics 301) S. The course covers applications of the laws of thermodynamics to closed and open systems. Topics include steady one-dimensional conduction, lumped parameter analysis, convection, radiation, and diffusion.
Purpose: 1. For Whom (generally?)

For mechanical engineering majors.

2. What should the course do for the student?
By successfully completing this course, students will be able to: Apply the laws of thermodynamics to analyze mechanical systems; and analyze the modes of heat transfer in mechanical systems.

Teaching method planned:

Lecture and laboratory

Textbook and/or materials planned (including electronic/multimedia):

Course Content: (Please explain the content of the course in enough detail so that the Academic Affairs Committee can make an informed judgment. Include a syllabus for the course.)
The course covers applications of the laws of thermodynamics to closed and open systems. Topics include steady one-dimensional conduction, lumped parameter analysis, convection, and radiation.

Syllabus for Proposed Course:
On next page
Thermodynamics and Heat Transfer Syllabus

1. Course Name and Number - Thermodynamics and Heat Transfer: ENGR 400

2. 3 credits, 45 contact hours


4. Specific Course Information
   a. Applications of the laws of thermodynamics to closed and open systems. Steady one-dimensional conduction, lumped parameter analysis, convection, radiation.
   b. Prerequisites: Mechanics of Materials, PHYS200, MATH301, Fluid Mechanics
   c. Required

5. Specific Goals for the Course
   a. By successfully completing this course, students will be able to: Apply the laws of thermodynamics to analyze mechanical systems; and analyze the modes of heat transfer in mechanical systems.

6. Brief List of Topics to be covered
   • Introduction and basic concepts
   • Energy transfer and analysis
   • Energy analysis of pure substances
   • Mass and energy analysis of control volumes
   • Second Law of Thermodynamics
   • Entropy
   • Mechanisms of heat transfer
   • Steady and transient heat conduction
   • Forced convection
   • Natural convection
   • Radiation heat transfer
   • Heat exchangers

Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100 - 90</td>
</tr>
<tr>
<td>B+</td>
<td>89 - 88</td>
</tr>
<tr>
<td>B</td>
<td>87 - 80</td>
</tr>
<tr>
<td>C+</td>
<td>79 - 78</td>
</tr>
<tr>
<td>C</td>
<td>77 - 70</td>
</tr>
<tr>
<td>D+</td>
<td>69 - 68</td>
</tr>
<tr>
<td>D</td>
<td>67 - 60</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 60</td>
</tr>
</tbody>
</table>
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School  Physics and Engineering  Date  August 12, 2018

Course No. or Level  ENGR 401  Title  Design of Mechanisms

Semester hours  3  Clock hours:  Lecture  3  Laboratory

Prerequisites  ENGR 201, 250, MATH 301

Enrollment expectation  10 per year

Indicate any course for which this course is a (an)

modification  
(proposed change in course title, course description, course content or method of instruction)

substitute  
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate  
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description  Lorna Cintron-Gonzalez

Department Chairperson’s/Dean's Signature

Provost's Signature

Date of Implementation  Fall 2021

Date of School/Department approval  8/20/18

Catalog description:

401 Design of Mechanisms  (3) (Prerequisites: 201, 250, Mathematics 301) F. The course focuses on the function, classification, position, velocity, and acceleration of multi-element mechanical linkages. Furthermore, the course discusses design methods and practical information about common mechanisms and mechanism components. By successfully
Purpose: 1. For Whom (generally?)

For mechanical engineering majors.

2. What should the course do for the student?
By successfully completing this course, students will be able to identify and analyze various mechanical linkage mechanisms including four-bar mechanisms, gears, gear trains, and cams.

Teaching method planned:

Lecture

Textbook and/or materials planned (including electronic/multimedia):

Course Content: (Please explain the content of the course in enough detail so that the Academic Affairs Committee can make an informed judgment.
Include a syllabus for the course.)
The course focuses on the function, classification, position, velocity, and acceleration of multi-element mechanical linkages. Furthermore, the course discusses design methods and practical information about common mechanisms and mechanism components. By successfully completing this course, students will be able to identify and analyze various mechanical linkage mechanisms including four-bar mechanisms, gears, gear trains, and cams.

Syllabus for Proposed Course:
Design of Mechanisms Syllabus

1. Course Name and Number - Design of Mechanisms: ENGR 401

2. 3 credits, 45 contact hours


4. Specific Course Information
   a. The course focuses on the function, classification, position, velocity, and acceleration of multi-element mechanical linkages. Furthermore, the course discusses design methods and practical information about common mechanisms and mechanism components.
   b. Prerequisites: MATH301, ENGR201, Mechanics of Materials
   c. Required

5. Specific Goals for the Course
   a. By successfully completing this course, students will be able to identify and analyze various mechanical linkage mechanisms including four bar mechanisms, gears, gear trains, and cams.

6. Brief List of Topics to be covered
   • Introduction and overview of application of mechanisms
   • Kinematics chains and inversions
   • Description of various mechanisms
   • Velocity and acceleration analysis of mechanisms
   • Spur gears
   • Gear trains
   • Cams

Grading Scale

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 90</td>
<td>A</td>
</tr>
<tr>
<td>89 - 88</td>
<td>B+</td>
</tr>
<tr>
<td>87 - 80</td>
<td>B</td>
</tr>
<tr>
<td>79 - 78</td>
<td>C+</td>
</tr>
<tr>
<td>77 - 70</td>
<td>C</td>
</tr>
<tr>
<td>69 - 68</td>
<td>D+</td>
</tr>
<tr>
<td>67 - 60</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>F</td>
</tr>
</tbody>
</table>
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School  Physics and Engineering  Date  August 12, 2018

Course No. or Level  ENGR 402  Title  Systems Dynamics and Controls

Semester hours  3  Clock hours:  Lecture  3  Laboratory  

Prerequisites  ENGR 250, 310, MATH 301

Enrollment expectation  10 per year

Indicate any course for which this course is a (an)

modification  
(proposed change in course title, course description, course content or method of instruction)

substitute  
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate  
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description  Rahul Renu

Department Chairperson’s/Dean's Signature

Provost’s Signature

Date of Implementation  Spring 2022

Date of School/Department approval  8/20/18

Catalog description:

402 System Dynamics and Controls (3) (Prerequisites: 250, 310, Mathematics 301) S. The course covers dynamic modeling and simulation of systems with mechanical, hydraulic, thermal, and/or electrical elements. Topics include frequency response analysis, stability, and feedback control design of dynamic systems.
Purpose:  1. For Whom (generally?)

For mechanical engineering majors.

2. What should the course do for the student?
By successfully completing this course, students will demonstrate the ability to formulate mathematical models for mechanical, electrical, fluid, and thermal systems; students will demonstrate the ability to model mixed systems such as electro-mechanical and hydromechanical systems; and students will demonstrate the ability to apply feedback control to real-world engineering systems.

Teaching method planned:

Lecture

Textbook and/or materials planned (including electronic/multimedia):

Course Content: This course teaches the application of mathematical principles to modeling mechanical and electro-mechanical systems. The design and development of feedback loops for controlling systems is also covered.

Syllabus for Proposed Course:
On next page
System Dynamics and Controls Syllabus

1. Course Name and Number - Systems Dynamics and Controls: ENGR 402

2. 3 credits, 45 contact hours


4. Specific Course Information
   a. Dynamic modeling and simulation of systems with mechanical, hydraulic, thermal, and/or electrical elements. Frequency response analysis, stability, and feedback control design of dynamic systems.
   b. Prerequisites: Mechanics of Materials, MATH301, ENGR310
   c. Required

5. Specific Goals for the Course
   a. By successfully completing this course, students will demonstrate the ability to formulate mathematical models for mechanical, electrical, fluid, and thermal systems; students will demonstrate the ability to model mixed systems such as electro-mechanical and hydromechanical systems; and students will demonstrate the ability to apply feedback control to real-world engineering systems.

6. Brief List of Topics to be covered
   • Overview of rigid body dynamics
   • Euler equations for 3D rotational motion of rigid bodies
   • Laplace transforms
   • Modeling of mechanical systems
   • Transfer function modeling
   • Modeling of electrical and electromechanical systems
   • Modeling of fluid and thermal systems
   • Time response analysis of linear dynamic systems
   • Frequency response analysis of linear dynamic systems
   • Transient response analysis
   • Introduction to feedback control systems

Grading Scale
100 - 90 = A
89 - 88 = B+
87 - 80 = B
79 - 78 = C+
77 - 70 = C
69 - 68 = D+
67 - 60 = D
< 60 = F
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School  Physics and Engineering  Date  August 12, 2018

Course No. or Level  ENGR 411  Title  Design for Manufacturing and Assembly

Semester hours  3  Clock hours:  Lecture  3  Laboratory  

Prerequisites  ENGR 350  Pre/Co:  ENGR 401

Enrollment expectation  10 per year

Indicate any course for which this course is a (an)

modification
(proposed change in course title, course description, course content or method of instruction)

substitute
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description Rahul Renu

Department Chairperson’s/Dean's Signature  

Provost's Signature  

Date of Implementation  Fall 2021

Date of School/Department approval  8/20/18

Catalog description:

411 Design for Manufacturing and Assembly  (3) (Prerequisites: 350  Prerequisite/corequisite: 401) F. The course is based on concurrent engineering techniques to link product design to modern manufacturing and assembly process design. The course will also introduce students to modern manufacturing and assembly process design techniques
used to reduce costs. By successfully completing this course, students will be able to: design new products while considering manufacturing and/or assembly processes; redesign existing products to reduce product realization costs; analyze manufacturing and assembly systems to determine inefficiencies; and apply several other Design for X principles.

Purpose: 1. For Whom (generally?)

For mechanical engineering majors.

2. What should the course do for the student?

By successfully completing this course, students will be able to: design new products while considering manufacturing and/or assembly processes; redesign existing products to reduce product realization costs; analyze manufacturing and assembly systems to determine inefficiencies; and apply several other Design for X principles.

Teaching method planned:

Lecture

Textbook and/or materials planned (including electronic/multimedia):


Course Content: In this course, students are taught methods to incorporate manufacturing considerations during the design of new product, or during redesign of existing products. These range from traditional rule-based design decision-making methods to more contemporary artificial intelligence methods.

Syllabus for Proposed Course:
Design for Manufacturing and Assembly Syllabus

1. Course Name and Number - Design for Manufacturing and Assembly: ENGR 411
2. 3 credits, 45 contact hours
4. Specific Course Information
   a. The course is based on concurrent engineering techniques to link product design to manufacturing and assembly process design. The course will also introduce students to modern manufacturing and assembly process design techniques used to reduce costs.
   b. Prerequisites: ENGR350; Pre/Corequisite: Design of Mechanisms
   c. Required
5. Specific Goals for the Course
   a. By successfully completing this course, students will be able to: design new products while taking in to consideration manufacturing and/or assembly processes; redesign existing products to reduce product realization costs; analyze manufacturing and assembly systems to determine inefficiencies; and apply several other Design for X principles.
6. Brief List of Topics to be covered
   • Engineering design process
   • Overview of Design for X, where X includes manufacturing, assembly, and sustainability
   • Design for injection molding
   • Design for casting
   • Design for machining
   • Design for sheet metal working
   • Design for manual assembly
   • Design for automated assembly
   • Other Design for X techniques
   • Overview and application of lean manufacturing
   • Process variability and control
   • Overview of AI techniques to optimize product realization

Grading Scale
100 - 90 = A
89 - 88 = B+
87 - 80 = B
79 - 78 = C+
77 - 70 = C
69 - 68 = D+
67 - 60 = D
< 60 = F
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School  Physics and Engineering  Date  August 12, 2018

Course No. or Level  ENGR 482  Title  Mechanical Engineering Senior Design

Semester hours  4  Clock hours:  Lecture  Laboratory  Project-based

Prerequisites  ENGR 370, 411

Enrollment expectation  10 per year

Indicate any course for which this course is a (an)

modification
(proposed change in course title, course description, course content or method of instruction)

substitute
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description  Rahul Renu

Department Chairperson’s/Dean's Signature  

Provost's Signature  

Date of Implementation  Spring 2022

Date of School/Department approval  8/20/18

Catalog description:

482 Mechanical Engineering Senior Design  (4) (Prerequisites: 370, 411) S. This course serves as the capstone design experience for mechanical engineering students. The course involves the design and development of solutions to real-world mechanical engineering problems. Students will demonstrate the ability to work in teams and solve problems which
include multiple realistic constraints and require the application of engineering standards and codes.

Purpose: 1. For Whom (generally?)

For mechanical engineering majors.

2. What should the course do for the student?
Students will demonstrate the ability to work in teams and solve problems which include multiple realistic constraints and require the application of engineering standards and codes.

Teaching method planned:

Instruction and supervised group design projects with industry partners.

Textbook and/or materials planned (including electronic/multimedia):

No text. Resources determined by project.

Course Content: This is a capstone course for mechanical engineers, where students will work on a semester-long project and apply various mechanical engineering principles.

Syllabus for Proposed Course:
1. Course Name and Number – Mechanical Engineering Senior Design: ENGR 482
2. 3 credits, 45 contact hours
3. Text Book: None.
4. Specific Course Information
   a. This course serves as the capstone design experience for mechanical engineering students. The course involves the design and development of solutions to real-world mechanical engineering problems.
   b. Prerequisites: Design for Manufacturing and Assembly, Fluid Mechanics, Mechanics of Materials; This course is intended to be a culminating design experience for Mechanical Engineering students.
   c. Required
5. Specific Goals for the Course
   a. By successfully completing this course, students will demonstrate the ability to apply the engineering design process to solve mechanical engineering problems; students will demonstrate the ability to work in teams; and the students will demonstrate the ability to solve problems which include multiple realistic constraints and require the application of engineering standards and codes.
6. Brief List of Topics to be Covered
   • Engineering design process
   • Engineering codes and standards
   • Working in teams
   • Professional communication

Grading Scale
100 - 90  =  A
89 - 88  =  B+
87 - 80  =  B
79 - 78  =  C+
77 - 70  =  C
69 - 68  =  D+
67 - 60  =  D
< 60   =  F
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School  Physics and Engineering  Date  August 11, 2018

Course No. or Level  ENGR 101  Title  Introduction to Engineering

Semester hours  3  Clock hours:  Lecture  3  Laboratory

Prerequisites  Pre/Co: MATH 132 or 137 or permission of department

Enrollment expectation  30 per year

Indicate any course for which this course is a (an)

modification  ENGR 101  (proposed change in course title, course description, course content or method of instruction)

substitute

alternate

(The proposed new course replaces a deleted course as a General Education or program requirement.)

(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description  Lorna Cintron-Gonzalez

Department Chairperson’s/Dean's Signature

Provost's Signature

Date of Implementation  Spring 2020

Date of School/Department approval  8/20/18

Catalog description:

101 Introduction to Engineering (3) (Prerequisite/Corequisite: Mathematics 132 or 137 or permission of department) S. Introduction to the engineering profession; applications of engineering principles and approaches, integrated systems approach to problem solving, overall goals and components of the engineering programs, career opportunities, development
of engineering work skills, and communication skills. In addition, the course covers the importance of professionalism, ethics, contemporary challenges, and lifelong learning.

Purpose: 1. For Whom (generally?)

   For industrial and mechanical engineering majors.

2. What should the course do for the student?

   This course is designed to introduce students to engineering topics.

Teaching method planned:

   Interactive lecture, demonstration, and tutoring of student work.

Textbook and/or materials planned (including electronic/multimedia):


Course Content: (Please explain the content of the course in enough detail so that the Academic Affairs Committee can make an informed judgment. Include a syllabus for the course.)

This course will introduce our students to engineering so that students have an understanding of professional and ethical responsibility, and start to develop the ability to communicate effectively and work in teams. Students will learn fundamental skills, such as workplace assessment, simple data analysis, basic research skills, lean manufacturing, time studies, linear programming, among others.

Syllabus for Proposed Course:
# General Information

<table>
<thead>
<tr>
<th>Course Number</th>
<th>ENGR 101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Title</td>
<td>Introduction to Engineering</td>
</tr>
<tr>
<td>Credit-Hours</td>
<td>3</td>
</tr>
<tr>
<td>Class Meetings/Time</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>Co/Prerequisites</td>
<td>MATH 132 or 137, or permission of Department</td>
</tr>
</tbody>
</table>

# Instructor Information

| Instructor | |
| Office | |
| Office Hours | |
| Email | |

# Course Details

| Course Description | Introduction to the engineering profession, applications of engineering principles and approaches, integrated systems approach to problem solving, overall goals and components of the engineering programs, career opportunities, development of engineering work skills, oral and written communication skills, and the importance of professionalism, ethics, contemporary challenges, and lifelong learning. |
| Course Objectives/Outcomes | Upon completion of this course, students are expected to:  
  - Have an understanding of professional and ethical responsibility.  
  - Have a stronger ability to communicate effectively and work in teams.  
  - Apply fundamental skills, such as workplace assessment, simple data analysis, basic research skills, lean manufacturing, time studies, linear programming, among others.  
  - Recognize a need for, and develop an ability to engage in life-long learning, especially in –and for- the Industrial Engineering profession. |
| Textbook(s)/References | *Thinking Like an Engineer: An Active Learning Approach*, by Stephan, et.al. (3rd Edition or newer)  
*The Goal* by Eliyahu Goldratt (2014 Edition or newer) |
<table>
<thead>
<tr>
<th>Attendance</th>
<th>Attendance to lecture is required and follows FMU policy. Based on that policy, the maximum of un-excused absences for this course will be six. After six unexcused absences, you will receive a warning from your professor and your attendance will be mandatory from there on. Failure to comply will result in getting dropped from the course. In addition, tardiness will also affect this policy.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework/Classwork</td>
<td>Homework will be posted on Blackboard or distributed by the instructor. Late homework will result in penalty, which will be to the discretion of the instructor.</td>
</tr>
<tr>
<td>Quizzes/Tests</td>
<td>Quizzes and tests will be announced and will consist mainly of exercises, short answer questions and/or multiple-choice questions relevant to the current topics of the class. Students are expected to take all quizzes and tests when they are scheduled. Make-up quizzes and tests will be allowed only in case of medical conditions that will impede your assistance to the quiz or test. Proof from a health professional may be required and you should try to contact your instructor prior to missing the quiz or test. Student athletes must present official excuses from coach or staff.</td>
</tr>
<tr>
<td>Electronic Devices</td>
<td>Use of mobile phones, tablets and/or mp3 players will not be tolerated during class, quizzes or tests (unless otherwise specified by your instructor). Please put these devices at least on ‘silent’ mode and keep away from your table. Failure to comply will affect your participation/attendance grade. Instructor may also ask you to leave the classroom.</td>
</tr>
<tr>
<td>Withdrawals</td>
<td>If you decide to withdraw from the course, you should do so following FMU policies and procedures. Please refer to the FMU Academic Calendar to find important deadlines.</td>
</tr>
<tr>
<td>Academic Dishonesty</td>
<td>Plagiarism and collusion are common ways of violating FMU’s honor code (please refer to FMU’s Academic Integrity Policy in your student handbook). Copying assignments from any other source is strictly prohibited and is a form of Plagiarism. However, you are encouraged to work with classmates in topics needed for homework assignments and in-class problems. The interaction of teaching and learning within a group setting is a great way to learn the principles taught in class. The first time a student is found responsible for academic dishonesty on an assignment or quiz, he/she will receive a zero on their assignment, will be reported to the Office of the Provost and must attend a workshop on Plagiarism. Further incidents will result on dropping the course with a failing grade (F). If academic dishonesty occurs during a test, student will be dropped from course with a failing grade (F). Further incidents may result in suspension and/or expulsion.</td>
</tr>
<tr>
<td>Students with Disabilities</td>
<td>Students with disabilities are encouraged to contact the Office of Counseling and Testing to request alternate accommodations for testing. This service is available to qualified students with documented disabilities who are attending FMU.</td>
</tr>
</tbody>
</table>
Homework assignments, tests, quizzes, papers, tests, and attendance and participation in class will determine final grades. The weight of those on your final grade will be distributed as follows:

- Homework – 10%
- Quizzes – 20%
- Midterm Exam – 15%
- Project/Papers/Presentations – 30%
- Final Exam – 20%
- Participation/Attendance – 5%

TOTAL – 100%

Grading Scale:

- 100-90 = A
- 89-88 = B+
- 87-80 = B
- 79-78 = C+
- 77-70 = C
- 69-68 = D+
- 67-60 = D
- 59-0 = F

Grades will be posted/managed on Blackboard.

Projected Class Topics*

- About Engineering
  - History, Careers, Research, Organizations, Future
- Engineering Ethics
- Teamwork and Decision Making
- Effective Communication in Engineering
- Engineering Design Process
- Introduction Engineering in Manufacturing
  - Role Industrial Engineering in Manufacturing
  - Role of Mechanical Engineering in Manufacturing
  - Process Diagrams, Lean Manufacturing, Time Studies
- Introduction to Excel Spreadsheets and Data Analysis
  - Probability, Descriptive Statistics
- Introduction to Operations Research
  - Simple Forecasting, Linear Programming Fundamentals
- Additional:
  - Invited Speaker(s)
  - Site Visit/Plant Tour

*Topics are subject to change or may not be covered. Additional topics will be covered as needed. Changes will be notified in class.
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School  Physics and Engineering  Date  August 11, 2018

Course No. or Level  ENGR 320  Title  Statistics for Engineers

Semester hours  3  Clock hours:  Lecture  3  Laboratory  

Prerequisites  250 or 355

Enrollment expectation  15 per year

Indicate any course for which this course is a (an)

modification  ENGR 320
(proposed change in course title, course description, course content or method of instruction)

substitute  
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate  
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description  Brett Shields

Department Chairperson’s/Dean's Signature  

Provost's Signature  

Date of Implementation  Fall 2019

Date of School/Department approval  8/20/18

Catalog description:

320 Statistics for Engineers  (3) (Prerequisite: 250 or 355; Prerequisite/corequisite: Physics 220)
F. This course will introduce students to the theories and engineering applications of statistical methods, data analysis, experimental design, and data visualization. A major objective of this course is to develop students’ capabilities to analyze datasets, including the visualization and
communication of observations in addition to the application of statistical, mathematical, and probabilistic analytical methods, to engineering challenges.

Purpose: 1. For Whom (generally?)

For industrial and mechanical engineering majors.

2. What should the course do for the student?

This course will introduce students to the theories and engineering applications of statistical methods, data analysis, experiment design, and data visualization.

Teaching method planned:

   Lecture

Textbook and/or materials planned (including electronic/multimedia):


Course Content: (Please explain the content of the course in enough detail so that the Academic Affairs Committee can make an informed judgment. Include a syllabus for the course.)

This course will introduce students to the theories and engineering applications of statistical methods, data analysis, experiment design, and data visualization. A major objective of this course is to develop students’ analytical capabilities on datasets, including the visualization and communication of observations in addition to the application of statistical, mathematical, and probabilistic analytical methods, to engineering challenges.

Syllabus for Proposed Course:
ENGR 320                                         Statistics for Engineers

Course Description:
This course will introduce students to the theories and engineering applications of statistical methods, data analysis, experimental design, and data visualization. A major objective of this course is to develop students’ analytical capabilities on datasets, including the visualization and communication of observations in addition to the application of statistical, mathematical, and probabilistic analytical methods, to engineering challenges.

Educational Objectives:
- Develop students’ ability to apply statistical methods.
- Develop students’ ability to visualize and interpret datasets.
- Develop students’ ability to design and analyze experiments related to engineering.

Instructor:  Brett Shields
Office: 101B
Office hours: MWF: 10:00am-11:00am, WF: 1:30pm-3:30pm. TTH: 10:00 am - 11:00noon, or by appointment.
Phone: (843) 661-1626
Email: bshields@fmarion.edu

Class Meeting Time and Room:
MWF 11:30-12:20; MSB 106

Suggested Text:

Grading Policy:
Any late assignment will be decreased one letter grade for every 24 hours the assignment is late. Exceptions to this policy must be cleared with the professor prior to the assignment's due date. The grading scale is as follows. Note: I reserve the right to increase your grade based on class participation.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100</td>
<td>A</td>
</tr>
<tr>
<td>88 - 89</td>
<td>B+</td>
</tr>
<tr>
<td>80 - 87</td>
<td>B</td>
</tr>
<tr>
<td>78 - 79</td>
<td>C+</td>
</tr>
<tr>
<td>70 - 77</td>
<td>C</td>
</tr>
</tbody>
</table>
The grading will be based on the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>Midterm</td>
<td>25%</td>
</tr>
<tr>
<td>Final</td>
<td>25%</td>
</tr>
<tr>
<td>Project</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Class Policies**

- Cell phone/tablet use will not be tolerated during class. Please keep these items on silent for the duration of the class.
- Attendance for the course follows that outlined in the FMU policy.

**Academic Misconduct**

Plagiarism is a violation of FMU’s honor code (please refer to the Academic Integrity Policy in your student handbook). Copying assignments/tests from other sources, including online and past/present students, is a form of Plagiarism, and will result in a formal report to the Office of the Provost. Any instance of cheating will be reported and appropriate action taken (which includes possible failure of the course).

**Civility in the Classroom**

Students will conduct themselves with civility and respect towards all individuals in the classroom.

**Students with Special Accommodations Statement**

Special accommodations will be made for students with certified disabilities at the request of the student.

*This syllabus is subject to change at any point during the semester.*
FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School: Physics and Engineering  Date: August 11, 2018

Course No. or Level: ENGR 480  Title: Industrial Engineering Senior Design

Semester hours: 4  Clock hours: Lecture 3  Laboratory __

Prerequisites: ENGR 420 and 467  Corequisites: 330, 356, 470

Enrollment expectation: 6 to 10 per year

Indicate any course for which this course is a (an)

modification: ENGR 480
(proposed change in course title, course description, course content or method of instruction)

substitute: ____________________________
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate: ____________________________
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description: Rahul Renu

Department Chairperson’s/Dean’s Signature: ____________________________

Provost’s Signature: ____________________________

Date of Implementation: Spring 2020

Date of School/Department approval: 8/20/18

Catalog description:

480 Industrial Engineering Senior Design (4) (Prerequisite: 420 and 467; Prerequisites/corequisites: 330, 356 and 470) S. The capstone design course for industrial engineering majors. Survey of methods, tools, and techniques used to plan, communicate, manage and control projects, and work on teams. Students work in teams to develop a
Purpose: 1. For Whom (generally?)

For industrial engineering majors.

2. What should the course do for the student?

Students work in teams to develop a proposal for, and implement, an industrial engineering design project for an actual manufacturing or service industry client.

Teaching method planned:

Student/team projects

Textbook and/or materials planned (including electronic/multimedia):

None.

Course Content: (Please explain the content of the course in enough detail so that the Academic Affairs Committee can make an informed judgment. Include a syllabus for the course.)

The capstone design course for industrial engineering majors. Survey of methods, tools, and techniques used to plan, communicate, manage and control projects, and work on teams. Students work in teams to develop a proposal for, and implement, an industrial engineering design project for an actual manufacturing or service industry client.

Syllabus for Proposed Course:
INSTRUCTOR:  Dr. Rahul S. Renu  
OFFICE:  MSB 101-B  
OFFICE HOURS:  Monday 930AM to 1130AM; Tuesday 1PM to 3PM; Or by appointment  
EMAIL:  rrenu@fmarion.edu  

COURSE DESCRIPTION  
The capstone design course for industrial engineering majors. Survey of methods, tool and techniques used to plan, communicate, manage and control projects and work on teams. Students work in teams to develop a proposal for, and implement, an industrial engineering design project for an actual manufacturing or service industry client.  

CO/PREREQUISITES  
Prerequisites: ENGR420, EGNR467;  
Pre/Corequisite: ENGR330, ENGR356, ENGR470;  

REQUIRED TEXT BOOK  
None.  

COURSE MEETING TIME AND LOCATION  
 T Th  830AM – 945AM  MSB106  

COURSE OBJECTIVES  
By successfully completing this course, the students will:  
• Display an ability to apply industrial engineering principles to solve real-world problems.  
• Be able to apply the engineering design process to solve problems with multiple realistic constraints.  
• Demonstrate the knowledge of, and ability to apply engineering standards and codes.  
• Be able to communicate effectively and work in an engineering team.  

EXPECTATIONS  
Work ethically. Work hard. This your opportunity to grow as an engineer.  
100% effort on all work performed.  
Present your work professionally.  
Be punctual.  
You are expected to check your student (fmarion.edu) email and Blackboard regularly. Course updates and notifications will be communicated to you through either your student email, or Blackboard, or both.  

COURSE POLICIES
• If you decide to withdraw from the course, you should do so following FMU policies, dates, and procedures.
• Students may leave the classroom if the instructor is more than 15 minutes late.
• Students must be on time for class.
• There will be unannounced “pop” quizzes. There are no make-up pop-quizzes.
• NO CELLPHONES ALLOWED.
• In-class Decorum: You are encouraged to discuss course-related topics during in-class work times, but you are expected to pay quiet attention when your instructor is speaking. No tobacco products of any kind are acceptable for use in the class room.

The schedule, policies, procedures, and assignments in this course are subject to change to improve learning outcomes or by class-instructor consensus.

**GRADING**

Your final grade will be determined by your performance on the following criterion.

<table>
<thead>
<tr>
<th>Project</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Participation and Attendance</td>
<td>10%</td>
</tr>
</tbody>
</table>

**GRADING SCALE**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 90</td>
<td>A</td>
</tr>
<tr>
<td>89 - 88</td>
<td>B+</td>
</tr>
<tr>
<td>87 - 80</td>
<td>B</td>
</tr>
<tr>
<td>79 - 78</td>
<td>C+</td>
</tr>
<tr>
<td>77 - 70</td>
<td>C</td>
</tr>
<tr>
<td>69 - 68</td>
<td>D+</td>
</tr>
<tr>
<td>67 - 60</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>F</td>
</tr>
</tbody>
</table>

**ACADEMIC INTEGRITY**

Plagiarism and collusion are common ways of violating FMU’s honor code (please refer to FMU’s Academic Integrity Policy in your student handbook). Copying assignments from any other source is strictly prohibited and is a form of Plagiarism. However, I encourage you to discuss class-related topics with your classmates. The interaction of teaching and learning within a group setting is a great way to learn the principles taught in class.

_The first time a student is found responsible for academic dishonesty on an assignment or quiz, he/she will receive a zero on their assignment and must attend a workshop on Plagiarism. Further incidents will result on dropping the course with an F. If academic dishonesty occurs during a test, student will be dropped from course with an F. Further incidents may result in suspension and/or expulsion._
PROJECTED CLASS TOPICS

1. Engineering Design Process
2. Engineering Standards and Codes
3. Technical Communication
4. Teamwork
5. Review of Industrial Engineering principles

*Topics are subject to change or may not be covered. Changes will be notified in class

RELATIONSHIP TO ABET COURSE OUTCOMES

Outcome C: an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
Outcome E: an ability to identify, formulate, and solve engineering problems
Outcome G: an ability to communicate effectively
Outcome I: a recognition of the need for, and an ability to engage in life-long learning
Outcome K: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Course No. or Level  ENGR 397  Title  Undergraduate Research in Engineering

Semester hours  3  Clock hours:  Lecture  3  Laboratory

Prerequisites  ENGR 320

Enrollment expectation  a few per year

Indicate any course for which this course is a (an)

modification  ENGR 397
(proposed change in course title, course description, course content or method of instruction)

substitute
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description  Rahul Renu

Department Chairperson’s/Dean's Signature

Provost’s Signature

Date of Implementation  Spring 2021

Date of School/Department approval  8/20/18

Catalog description:

397 Undergraduate Research in Engineering (3), (2), or (1) (Prerequisite: 320) F, S. This course will be open to students in their junior or senior year. Working with an engineering faculty member, each student enrolled will be assigned to one or more engineering research projects. The project(s) assigned will be determined based on the interest of the student. The
number of hours will be based on the complexity of the project and the time required to complete the project(s). The culmination of this course will require a written report and a formal oral presentation.

Purpose: 1. For Whom (generally?)

For industrial and mechanical engineering majors.

2. What should the course do for the student?

This course is designed to allow students to complete supervised undergraduate research.

Teaching method planned:

Supervised research.

Textbook and/or materials planned (including electronic/multimedia):

None

Course Content: (Please explain the content of the course in enough detail so that the Academic Affairs Committee can make an informed judgment. Include a syllabus for the course.)

The student will meet with the advising faculty member to discuss research progress. The frequency of these meetings will be predetermined by the faculty member and communicated to the student. The faculty member will advise the student on how to explore literature, identify research gaps and perform research to address these gaps. The faculty member will also advise the student during the preparation of a written report and formal oral presentation.

Syllabus for Proposed Course:
ENGR397 – Undergraduate Research in Engineering

Course Syllabus

INSTRUCTOR:  Dr. Rahul Sharan Renu
OFFICE:  MSB 101
OFFICE HOURS:  Weekdays: 9:30AM to 10:30AM
Or by appointment

EMAIL:  rrenu@fmarion.edu

COURSE DESCRIPTION
This course will be open to students in their junior or senior year. Working with engineering faculty member, each student enrolled will be assigned to one or more engineering research projects. The project(s) assigned will be determined based on the interest of the student. The number of hours will be based on the complexity of the project and the time required to complete the project(s). The culmination of this course will require a written report and a formal oral presentation.

PREREQUISITES
ENGR 320

REQUIRED TEXT BOOK
None.

COURSE MEETING TIME AND LOCATION
Decided based on student and faculty availability.

STUDENT LEARNING OBJECTIVES
By successfully completing this course, the students will learn how to:
- Perform a literature review.
- Perform ethical research.
- Write a research report/paper.

COURSE FORMAT
The student will meet with the advising faculty member to discuss research progress. The frequency of these meetings will be predetermined by the faculty member and communicated to the student. The faculty member will advise the student on how to explore literature, identify research gaps and perform research to address these gaps. The faculty member will also advise the student during the preparation of a written report and formal oral presentation.

COMMUNICATION
You are expected to check your student (fmarion.edu) email and Blackboard regularly. Course updates and notifications will be communicated to you through either your student email, or Blackboard, or both.
COURSE POLICIES

- A student enrolled in ENGR 397 must have successfully passed ENGR 320.
- If you decide to withdraw from the course, you should do so following FMU policies, dates, and procedures.

The schedule, policies, procedures, and assignments in this course are subject to change to improve learning outcomes or by class-instructor consensus.

GRADING

Your final grade will be determined by the following factors.

<table>
<thead>
<tr>
<th>Research Performed</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting Attendance</td>
<td>10%</td>
</tr>
<tr>
<td>Written Report</td>
<td>25%</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>25%</td>
</tr>
</tbody>
</table>

GRADING SCALE

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 90</td>
<td>A</td>
</tr>
<tr>
<td>89 - 88</td>
<td>B+</td>
</tr>
<tr>
<td>87 - 80</td>
<td>B</td>
</tr>
<tr>
<td>79 - 78</td>
<td>C+</td>
</tr>
<tr>
<td>77 - 70</td>
<td>C</td>
</tr>
<tr>
<td>69 - 68</td>
<td>D+</td>
</tr>
<tr>
<td>67 - 60</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>F</td>
</tr>
</tbody>
</table>

ACADEMIC INTEGRITY

Plagiarism and collusion are common ways of violating FMU’s honor code (please refer to FMU’s Academic Integrity Policy in your student handbook). Copying assignments from any other source is strictly for homework assignments and in-class problems. The interaction of teaching and learning within a group setting is a great way to learn the principles taught in class.

*The first time a student is found responsible for academic dishonesty on an assignment or quiz, he/she will receive a zero on their assignment and must attend a workshop on Plagiarism. Further incidents will result on dropping the course with an F. If academic dishonesty occurs during a test, student will be dropped from course with an F. Further incidents may result in suspension and/or expulsion.*