Alias Course: M E 101 | Semester Course: ME 1010

General Info

Document Description: Alias Course: M E 101 | Semester Course: ME 1010
Document ID: 102304
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/30/2009 by Frank Kraft (kraftf)

Document Version: 1.0
Document Status: COMPLETED - UCC
Contact Oak ID: kraftf
Designee Oak ID: cibula
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 101
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, WF, FN, FS, AU, I
Course Short Name: M E GATEWAY COURSE
Course Long Name: Mechanical Engineering - Gateway Course
Credit Hours: 4.0
Course Description: Gateway course introduces students to the culture and problem solving methods of the mechanical engineering profession. Student teams will work cooperatively with teams of senior ME students on topics of interest to both. Introduction to use of numerical modeling and graphical representation in engineering problem solving. Introduction to professional ethics.

Course Prerequisites: MATH 263A OR CONCURRENT

Semester Course Info

Course ID: ME 1010
Course Prefix: ME
Course Number: 1010
Course Short Name: M E GATEWAY COURSE
Course Long Name: Mechanical Engineering - Gateway Course
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F, WP, WF, FN, FS, AU, I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall
Course Description: Gateway course introduces students to the culture and problem solving methods of the mechanical engineering profession. Student teams will work cooperatively with teams of senior ME students on topics of interest to both. Introduction to use of numerical modeling and graphical representation in engineering problem solving. Introduction to professional ethics.

Additional Resources:

Outcome Goals:

1. Awareness of the influence of science and technology on civilizations and an ability to explain how science and technology have been applied to the betterment of humankind.
2. Ability to evaluate ethical issues that may occur in professional practice.
3. Understanding of the role of engineering ethics in professional problem solving. Familiarity with the NSPE Code of Ethics and its use in professional decision making.
4. Familiarity with the engineering profession and the mechanical engineering discipline and an understanding of an engineer's role in society.
5. Fluency in both English and SI units and an ability to translate between them.
6. Familiarity with the faculty, staff, and student organizations of the mechanical engineering department at Ohio University.

Prerequisites

Prerequisite Text:

Prerequisites:

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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**Course Topics:**

**Course Topic Notes:**

**Relationships (Major Set Asides)**

Major Set Aside Percent: 75%

Explanation: This is the introductory course for mechanical engineering majors.

Available To:

1. BS7257 - MECHANICAL ENGINEERING (M E - ENT)
ME 1800

General Info

Document Description: ME 1800
Document ID: 102524
Document Type: SEMESTER
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 11/04/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: ME 1800
Course Prefix: ME
Course Number: 1800
Course Short Name: ME COLLOQUIUM I
Course Long Name: Mechanical Engineering Colloquium I
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 1.0 hours
Grade Eligibility: 03: A-F, CR, WP, WF, FN, FS, AU, I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Spring
Course Description: Weekly seminars presented by engineers from industry, faculty researchers, and others focusing on engineering opportunities.
Quarter Course Relation:

Outcome Goals:
1. Awareness of the connections between the mechanical engineering program of study and the practice of engineering.
2. Exposure to contemporary areas of research and development in mechanical engineering, and research and scholarly activities of the faculty of the Russ College of Engineering and Technology.

Prerequisites

Prerequisite Text: ME 1010
Prerequisites:
1. ME 1010 - M E GATEWAY COURSE (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:
1. Profession of engineering.

Course Topic Notes:
None.

Key Grade Factors:
Attendance and participation.
### Alias Course info

- **Course ID:** M E 280
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 06: F, CR, WP, WF, FN, FS, AU, I
- **Course Short Name:** ME COLLOQUIUM I
- **Course Long Name:** M E Colloquium I
- **Credit Hours:** 1.0
- **Course Description:** Weekly seminars presented by engineers from industry, faculty researchers, and others focusing on engineering opportunities.

### Semester Course Info

- **Course ID:** ME 2800
- **Course Prefix:** ME
- **Course Number:** 2800
- **Course Short Name:** ME COLLOQUIUM II
- **Course Long Name:** Mechanical Engineering Colloquium II
- **Department/School:** ME (Mechanical Engineering)
  - **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 1.0 hours
- **Grade Eligibility:** 03: A-F, CR, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Spring
- **Course Description:** Weekly seminars presented by engineers from industry, faculty researchers, and others focusing on engineering opportunities.

### Additional Resources

- **Outcome Goals:**
  1. Exposure to professional practice and career opportunities in mechanical engineering.
  2. Exposure to activities and interests of student organizations at Ohio University, including ASME, SAE, SWE, and Engineers Without Borders.

### Prerequisites

- **Prerequisite Text:** ME 1800
- **Prerequisites:**
  1. ME 1800 - ME COLLOQUIUM I (Required) (SEMESTER - COMPLETED)

### Course Content

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### Course Topic Notes:
**Course ID:** ME 301

**Course Prefix:** ME

**Course Number:** 3011

**Course Short Name:** KINEMATICS&DYNAMICS

**Course Long Name:** Kinematics and Dynamics of Machines

**Department/School:** ME (Mechanical Engineering)

**College:** ENT (Engineering and Technology, Russ College of)

**Credit Hours:** 4.0

**Course Description:** Analytical and graphical solutions of motion problems involving mechanical elements: linkages, gears, cams, mechanical trains, etc.

**Course Prerequisites:** C OR BETTER M E 224

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**Prerequisite Text:** ET 2240 (C or better) and MATH 3400

**Prerequisites:**

1. MATH 3400 - DIFFERENTIAL EQUATIONS (Required) (EXPEDITED - REVIEW)
2. ET 2240 - DYNAMICS (Required) (EXPEDITED - REVIEW)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

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**Course Content**

**Course ID:** ME 3011

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**Course Topics:**

**Course Topic Notes:**

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Alias Course: M E 401 | Semester Course: ME 3012

General Info

Document Description: Alias Course: M E 401 | Semester Course: ME 3012
Document ID: 102306
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/30/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 401
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: SYSTEM ANAL & CONTR
Course Long Name: System Analysis and Control
Credit Hours: 4.0
Course Description: Modeling and formulations of physical systems. Transient and steady-state dynamic responses, and other fundamental theory of automatic controls and applications. 3 lec, 1 lab.
Course Prerequisites: MATH 340 & M E 491

Semester Course Info

Course ID: ME 3012
Course Prefix: ME
Course Number: 3012
Course Short Name: SYSTEM ANALYSIS AND CNTRL
Course Long Name: Linear Systems Analysis and Control
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Spring
Course Description: Modeling and formulations of physical systems. Transient and steady-state dynamic responses, and other fundamental theory of automatic controls and applications.
Additional Resources:

Outcome Goals:
1. Ability to solve and simulate the vibrational motion of mechanisms and machine elements.
2. Competence in designing and simulating controllers for obtaining stability and desired performance in linear dynamic systems.
3. Competence in modeling linearized mechanical systems.

Prerequisites

Prerequisite Text: ME 3011
Prerequisites:
1. ME 3011 - KINEMATICS AND DYNAMICS (Required) (EXPEDITED - COMPLETED)
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
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Course Topics:
Course Topic Notes:
**Alias Course Info**

- **Course ID:** M E 424
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** GAS DYNAMICS I
- **Course Long Name:** Gas Dynamics I
- **Credit Hours:** 3.0
- **Course Description:** 1- and 2-dimensional compressible flow-isentropic flow, flow with heat transfer, friction, shocks, generalized 1-dimensional flow. Applications to propulsion systems. 3 lec.

**Semester Course Info**

- **Course ID:** ME 3121
- **Course Prefix:** ME
- **Course Number:** 3121
- **Course Short Name:** HEAT AND FLUID TRANS I
- **Course Long Name:** Heat and Fluid Transport I
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 2.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

**Course Description:** Study of heat and mass transport focusing on energy transfer and the principles of conduction and radiation.

**Additional Resources:**

**Outcome Goals:**

1. Understanding of conduction and radiation.
2. Ability to define, describe, and apply heat transfer terminology, modes and equations of energy transport.
3. Ability to apply laws of conservation of mass and energy to thermal systems analysis.

**Prerequisites**

- **Prerequisite Text:** ET 3200 or concurrent

**Prerequisites:**

1. ET 3200 - Engineering Thermodynamics (Not Required) (EXPEDITED - REVIEW)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

**Course Content**

- **Course ID:** ME 3121

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**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 412 | Semester Course: ME 3122

General Info

Document Description: Alias Course: M E 412 | Semester Course: ME 3122
Document ID: 102517
Document Type: EXPEDITED
Contact Name: Frank Kraft
Contact Oak ID: krafft
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 11/04/2009 by Frank Kraft (krafft)

Alias Course Info

Course ID: M E 412
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, WF, FN, FS, AU, I
Course Short Name: HEAT TRANSFER
Course Long Name: Heat Transfer
Credit Hours: 4.0
Course Description: Basic concepts of conduction in 1 or more dimensions, steady and transient modes. Radiation, fundamentals of convection in various modes, heat exchanger design. 4 lec.
Course Prerequisites: MATH 340 & 344 & (C OR BETTER ME 321 & CE 340)

Semester Course Info

Course ID: ME 3122
Course Prefix: ME
Course Number: 3122
Course Short Name: HEAT AND FLUID TRANS II
Course Long Name: Heat and Fluid Transport II
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F, WP, WF, FN, FS, AU, I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Spring
Course Description: Basic concepts of fluid flow and heat transfer in one or more dimensions, steady and transient modes. Conduction, convection and radiation, fundamentals in various modes. Mechanics of viscous and non-viscous flow. Similitude. Principles of lift and drag.
Additional Resources:
Outcome Goals:
1. Understanding of the interaction between fluid mass and heat transport in energy systems.
2. Ability to solve convection problems via the application of Newton's Law of Cooling, and Reynolds, Prandtl, Nusselt, and Rayleigh numbers.
3. Ability to characterize heat transfer problems and analyze real thermal systems.
4. An ability to describe and apply Bernoulli's equation.
5. An ability to describe and apply continuity equations.

Prerequisites

Prerequisite Text: ME 3121 and MATH 3400
Prerequisites:
1. ME 3121 - HEAT AND FLUID TRANS I (Required) (EXPEDITED - COMPLETED)
2. MATH 3400 - DIFFERENTIAL EQUATIONS (Required) (EXPEDITED - REVIEW)
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course ID: ME 3122
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Course Topics: 
Course Topic Notes:
Alias Course: M E 314 | Semester Course: ME 3140

General Info

Course ID: M E 314
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: INTRO TO MANUF PROCESSES
Course Long Name: Introduction to Manufacturing Processes
Credit Hours: 4.0
Course Description: Introduction to applied statistics in manufacturing. Interrelationship between process, design, materials, and mechanical properties. Introduction to major metal manufacturing processes: casting, rolling, forging, extrusion, drawing, machining, powder metallurgy, and heat treating. Analysis of forces, energy requirements, and temperatures. Polymers and processing. No credit if 313.

Course Prerequisites:

Prerequisite Text: ET 2220 and ET 2300
Prerequisites:
1. ET 2300 - Prin. of Eng Materials (Required) (EXPEDITED - REVIEW)
2. ET 2220 - STRENGTH OF MATERIALS (Required) (EXPEDITED - REVIEW)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

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### Alias Course Info

**Course ID:** M E 351  
**GenEd Code:** N/A  
**Grade Eligibility Code:** 01: A-F,WP,WF, FN,FS,AU,I  
**Course Short Name:** COMPUTER - AIDED DESIGN I  
**Course Long Name:** Computer-Aided Design I  
**Credit Hours:** 3.0  
**Course Description:** A detailed study of the use of computer-aided design tools in the engineering design process with a focus on solid modeling and finite element analysis. Team design project that emphasizes proper use of CAD tools. No credit if 350.  
**Course Prerequisites:** IT 101 & (M E 304 OR CONCUR) & NOT M E 350

**Course ID:** M E 451  
**GenEd Code:** N/A  
**Grade Eligibility Code:** 01: A-F,WP,WF, FN,FS,AU,I  
**Course Short Name:** COMPUTER AIDED DESIGN II  
**Course Long Name:** Computer-Aided Design II  
**Credit Hours:** 2.0  
**Course Description:** A detailed study of the use of computer-aided design tools in the engineering design process with a focus on finite element analysis, dimensioning and tolerancing and drafting. Team design and optimization project that emphasizes proper use of CAD tools. No credit if M E 350.  
**Course Prerequisites:** M E 351 & (471 OR CONCURRENT) & NOT 350

### Semester Course Info

**Course ID:** ME 3510  
**Course Prefix:** ME  
**Course Number:** 3510  
**Course Short Name:** COMPUTER AIDED DESIGN  
**Course Long Name:** Computer Aided Design  
**Department/School:** ME (Mechanical Engineering)  
**College:** ENT (Engineering and Technology, Russ College of)  
**Credit Hours:** FIXED | 3.0 hours  
**Grade Eligibility:** 01: A-F,WP,WF, FN,FS,AU,I  
**Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined  
**Typical Offer Frequency:** YEARLY  
**Typical Terms Offered:** Fall  
**Course Description:** A detailed study of the use of computer-aided design tools in the engineering design process with a focus on solid modeling and finite element analysis. Team design project that emphasizes proper use of CAD tools.  
**Additional Resources:**  

1. Ability to create fully constrained solid models that can be quickly modified using standard software tools.  
2. Ability to use, identify and explain standard features in solid modeling including protrusions, revolutions, cutouts, and patterns.  
3. Ability to use standard software tools to create engineering drawings, or other documents, to fully describe the geometries and dimensions of parts, as well as to document assemblies according to standard practice.  
4. Ability to use standard software tools to create part assemblies and check for clearances.  
5. Ability to use finite element analysis software to mesh a solid model, apply meaningful loads and boundary conditions, complete a linear static stress analysis, and interpret the results.  

### Prerequisites

**Prerequisite Text:** ET 1100 and (ET 2220 or concurrent)  
**Prerequisites:**  
1. ET 1100 - ENG GRAPHICS FUNDAMENTALS (Required) (EXPEDITED - REVIEW)  
2. ET 2220 - STRENGTH OF MATERIALS (Not Required) (EXPEDITED - REVIEW)  
**No Credit - Sequence:** No credit for this course if taken after the following:
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Course Topics:

Course Topic Notes:
**Alias Course: M E 304 | Semester Course: ME 3700**

### General Info

**Document Description:** Alias Course: M E 304 | Semester Course: ME 3700

- **Document ID:** 102307
- **Document Version:** 1.0
- **Document Type:** EXPEDITED
- **Document Status:** COMPLETED - UCC
- **Contact Name:** Frank Kraft
- **Contact Oak ID:** kraftf
- **Designee Name:** Merry Cibula
- **Designee Oak ID:** cibula
- **Creation Info:** 10/30/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info

**Course ID:** M E 304

- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** MACHINE ELEMENTS
- **Course Long Name:** Machine Elements
- **Credit Hours:** 4.0
- **Course Description:** A detailed study of the design and use of machine elements, including screws and fasteners, shafts and associated parts, bearing, gears, and other power transmission components. Team design project. No credit if 403.
- **Course Prerequisites:** M E 301 & 303 & NOT 403

### Semester Course Info

**Course ID:** ME 3700

- **Course Prefix:** ME
- **Course Number:** 3700
- **Course Short Name:** MACHINE DESIGN
- **Course Long Name:** Machine Design
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Spring

**Course Description:** A detailed study of the design and use of machine elements, including screws and fasteners, shafts and associated parts, bearing, gears, and other power transmission components. Team design project.

**Additional Resources:**

**Outcome Goals:**

1. Familiarity with analytic and numerical methods for estimating the transverse and torsional deflections of machine elements.
2. Understanding of the uncertainties inherent in material properties and engineering analysis as a real-world engineering application of statistical analysis.
3. Understanding of wear and fracture mechanics and how they influence engineering design.
4. Ability to select the material, thermo-mechanical condition and configuration of a variety of machine elements under a variety of environmental and service conditions.
5. Ability to describe the advantages and disadvantages of adhesives and mechanical fastening methods.

### Prerequisites

**Prerequisite Text:** ET 2220 and ME 3011

**Prerequisites:**

1. ME 3011 - KINEMATICS AND DYNAMICS (Required) (EXPEDITED - COMPLETED)
2. ET 2220 - STRENGTH OF MATERIALS (Required) (EXPEDITED - REVIEW)

**No Credit - Sequence:** No credit for this course if taken after the following:

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**Course ID:** ME 3700

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**Course Topics:**


General Info

Document Description: Alias Course: M E 380 | Semester Course: ME 3800

Document ID: 102522
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 11/04/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 380
GenEd Code: N/A
Grade Eligibility Code: 06: F,CR,WP,WF,FN,FS,AU,I
Course Short Name: ME COLLOQUIUM II
Course Long Name: M E Colloquium II
Credit Hours: 1.0
Course Description: Weekly seminars presented by engineers from industry and faculty researchers focusing on engineering opportunities and interactions with career services and seniors in the capstone design project.

Course Prerequisites: M E 280

Semester Course Info

Course ID: ME 3800
Course Prefix: ME
Course Number: 3800
Course Short Name: ME COLLOQUIUM III
Course Long Name: Mechanical Engineering Colloquium III
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 1.0 hours
Grade Eligibility: 03: A-F,CR,WP,WF,FN,FS,AU,I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Spring
Course Description: Weekly seminars presented by engineers from industry and faculty researchers focusing on engineering opportunities and interactions with career services and seniors in the capstone design project.

Additional Resources:
Outcome Goals:
1. Improved understanding of what engineers do and what it takes to be a successful engineer.
2. Awareness of the need to consider safety in all aspects of the engineering profession.
3. Awareness of the ME capstone design project, in preparation for their own capstone experience.
4. Registration with career services, awareness of college and university career resources, and best practices for a job search.

Prerequisites

Prerequisite Text: ME 2800
Prerequisites:
1. ME 2800 - ME COLLOQUIUM II (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 3800

Course Components:

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Alias Course: M E 406   | Semester Course: ME 4060

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<td>Designee Name: Merry Cibula</td>
<td>Designee Oak ID: cibula</td>
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Alias Course Info

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<td>Course Short Name: ANALYSIS&amp;DES OF MECHANISMS</td>
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<tr>
<td>Course Long Name: Analysis and Design of Mechanisms</td>
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<tr>
<td>Credit Hours: 4.0</td>
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<tr>
<td>Course Description: Analysis and synthesis of planar and 3-dimensional mechanisms using classical and modern analytical approaches. Structural synthesis of mechanisms, dimensional synthesis of linkages for function generation, path generation, and for rigid-body guidance. Applications of matrix methods, optimization techniques, and computer solutions.</td>
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Course Prerequisites: M E 301

Semester Course Info

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<td>Course Number: 4060</td>
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<td>Course Short Name: ANALYSIS AND DES OF MECHANISMS</td>
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<tr>
<td>Course Long Name: Analysis and Design of Mechanisms</td>
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<td>Department/School: ME (Mechanical Engineering)</td>
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<td>College: ENT (Engineering and Technology, Russ College of)</td>
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<td>Credit Hours: FIXED</td>
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<td>Repeat/Retake: RETAKABLE</td>
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<td>Typical Offer Frequency: EVERY THIRD YEAR</td>
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<td>Typical Terms Offered: Spring</td>
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<tr>
<td>Course Description: Analytical and graphical solutions of motion problems involving mechanical elements: linkages, gears, cams, mechanical trains, etc.</td>
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<td>Additional Resources:</td>
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<tr>
<td>Outcome Goals:</td>
</tr>
<tr>
<td>1. Familiarity with balancing techniques.</td>
</tr>
<tr>
<td>2. Comfort with computer software tools for mechanism design and analysis.</td>
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<tr>
<td>3. Ability for advanced kinematics analysis of mechanisms including matrix methods.</td>
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<td>4. Competence in mechanism synthesis (design) from motion requirements.</td>
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Prerequisites

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<th>Prerequisite Text: ME 3012</th>
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<td>Prerequisites:</td>
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<td>1. ME 3012 - SYSTEM ANALYSIS AND CNTRL (Required) (EXPEDITED - COMPLETED)</td>
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<td>No Credit - Sequence: No credit for this course if taken after the following:</td>
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<td>No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):</td>
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Course Content

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<td>Merry Cibula</td>
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<td>06/07/2010 by Anita James (james)</td>
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### Alias Course Info

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<td>FUND NUCLEAR ENGR</td>
<td>Fundamentals of Nuclear Engineering</td>
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**Course Description:** Nuclear engineering, including nuclear reactions, radiation detection and measurement, reactor criticality, principles of reactor control, radiation shielding, effects of radiation of materials, uses of radioactive materials.

### Semester Course Info

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<td>ME 4070</td>
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<td>4070</td>
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<td>Fundamentals of Nuclear Engineering</td>
<td>ME (Mechanical Engineering)</td>
<td>ENT (Engineering and Technology, Russ College of)</td>
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**Course Description:** Nuclear engineering, including nuclear reactions, radiation detection and measurement, reactor criticality, principles of reactor control, radiation shielding, effects of radiation of materials, uses of radioactive materials.

**Additional Resources:**

1. Understand the general properties of nuclei (binding energy, statistics, cross sections, etc.).
2. Understand the basic nuclear reactions, including physics of fission and fusion.
3. Ability to calculate core reactivity changes with changing operational conditions.
4. Ability to calculate neutron transport properties and reactor kinetic.
5. Ability to calculate thermal conversion efficiencies for nuclear energy processes.
6. Understand principles of nuclear reactor design, including those of light water reactors, and fast breeder reactors.
7. Understand the physical and chemical effects of radiation on atoms and molecules.
8. Ability to calculate heat generation and transport rates, within the fuel matrix, core fluids, and through heat exchangers.
9. Ability to calculate transport rates in two-phase flow.
10. Understand the safety characteristics of LWR and FBR.
11. Understand advanced design and safety improvements in Advanced Nuclear Reactors.
12. Understand the fabrication process of nuclear fuels.
13. Understand environmental concerns of nuclear fuel usage and mitigation techniques.

### Prerequisites

**Prerequisite Text:** ET 3200 AND ME 3122

**Prerequisites:**

1. ET 3200 - Engineering Thermodynamics (Required) (EXPEDITED - REVIEW)
2. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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### General Info

**Document Description:** Alias Course: M E 400, M E 484 | Semester Course: ME 4110

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### Alias Course Info

- **Course ID:** M E 400
- **Grade Eligibility Code:** 01: A-F, WP, WF, FN, FS, AU, I
- **Course Short Name:** HEAT-VENT-AIR CONDT
- **Course Long Name:** Heating, Ventilation, and Air Conditioning
- **Credit Hours:** 4.0
- **Course Description:** Description and evaluation of heating, air conditioning, and total-energy systems employed to provide thermal environments for buildings ranging in scope from residences to integrated commercial, apartment, or industrial complexes. Covers human comfort, psychometrics, load analysis, techniques, equipment, and controls.

### Course Prerequisites:

- **Course ID:** M E 328

### Semester Course Info

- **Course ID:** ME 4110
- **Course Prefix:** ME
- **Course Number:** 4110
- **Course Short Name:** HVACR
- **Course Long Name:** Principles of Heating, Venting, Air Conditioning and Refrigeration
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Fall

**Course Description:** Description and evaluation of heating, air conditioning, refrigeration and total-energy systems employed to provide thermal environments for buildings ranging in scope from residences to integrated commercial, apartment, or industrial complexes. Covers human comfort, psychometrics, load analysis, techniques, equipment, and controls.

### Additional Resources:

**Outcome Goals:**

1. Use psychrometric chart to find capacity of required HVAC equipment.
2. Determine thermal transport from building structures.
3. Determine space heat load and cooling load.
4. Calculate fluid flow for design of piping design air distribution.
5. Identify types of HVAC equipment.

### Prerequisites

- **Prerequisite Text:** ME 4210
- **Prerequisites:**
  1. ME 4210 - APPLIED THERMODYNAMICS (Required) (EXPEDITED - COMPLETED)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:

Course Topic Notes:
## General Info

**Document Description:** Alias Course: M E 413 | Semester Course: ME 4130

**Document ID:** 102250

**Document Type:** EXPEDITED

**Contact Name:** Frank Kraft

**Designee Name:** Merry Cibula

**Creation Info:** 10/28/2009 by Frank Kraft (kraftf)

**Document Version:** 1.0

**Document Status:** COMPLETED - UCC

**Contact Oak ID:** kraftf

**Designee Oak ID:** cibula

**Last Modification:** 06/07/2010 by Anita James (james)

## Alias Course Info

**Course ID:** M E 413

**GenEd Code:** N/A

**Grade Eligibility Code:** 01: A-F, WP, WF, FN, FS, AU, I

**Course Short Name:** CONDUCTION CONVEC & RAD

**Course Long Name:** Conduction, Convection, and Radiation

**Credit Hours:** 4.0

**Course Description:** Advanced analytical treatment of conduction and radiation heat transfer. Boundary value problems, orthogonal expansions, moving heat sources, multi-dimensional problems with time varying boundary conditions, finite difference analysis, conformal transformations, radiation network matrix analysis, diffuse-specular exchange, and Monte Carlo techniques, etc.

**Course Prerequisites:** M E 412

## Semester Course Info

**Course ID:** ME 4130

**Course Prefix:** ME

**Course Number:** 4130

**Course Short Name:** COND CONVEC AND RAD

**Course Long Name:** Conduction, Convection, and Radiation

**Department/School:** ME (Mechanical Engineering)

**College:** ENT (Engineering and Technology, Russ College of)

**Credit Hours:** FIXED | 3.0 hours

**Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I

**Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

**Typical Offer Frequency:** YEARLY

**Typical Terms Offered:** Spring

**Course Description:** Advanced analytical treatment of conduction, convection, and radiation. Boundary value problems, boundary layer theory, radiation network matrix analysis.

## Additional Resources:

**Outcome Goals:**

1. Solve multi-dimensional, steady state and transient conduction problems.
2. Use boundary layer approximation to find convection heat transfer.
3. Use non-dimensional numbers in conduction and convection problems.
4. Determine radiation from black bodies, and analyze solar radiation.
5. Use shape factor for calculating diffuse radiation exchange between surfaces.
6. Develop governing equations for modeling thermal energy transport.

## Prerequisites

**Prerequisite Text:** ME 3122 and (MATH 4600 OR ME 4970)

**Prerequisites:**

1. ME 4970 - METHODS OF ENGR ANALYSIS (Not Required) (EXPEDITED - COMPLETED)
2. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)
3. MATH 4600 - Intro NUMERICAL ANALYSIS (Not Required) (COMPOSITE - REVIEW)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:
Course Topic Notes:
Alias Course: M E 416 | Semester Course: ME 4160

General Info

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<td>Creation Info: 10/28/2009 by Frank Kraft (kraftf)</td>
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Alias Course Info

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<td>Course Long Name: Combustion</td>
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<tr>
<td>Credit Hours: 4.0</td>
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<tr>
<td>Course Description: Introduces student to fundamentals of combustion; enables students to analyze complex combustion processes in constructive manner. Modern diagnostic techniques of combustion, and evaluation of pollution potential of different combustion processes.</td>
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Semester Course Info

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<td>Typical Terms Offered: Spring</td>
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<tr>
<td>Course Description: Kinetic theory and properties of gases, chemical reactions in gases, diffusion flames, detonation, combustion of atomized sprays, combustion diagnostic techniques, combustion and air pollution.</td>
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<td>Outcome Goals:</td>
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<tr>
<td>1. Perform calculations to balance reactions.</td>
<td></td>
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<tr>
<td>2. Determine combustion thermodynamics such as flame temperature.</td>
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<tr>
<td>3. Use software such as EES to perform combustion calculations.</td>
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<tr>
<td>4. Account for the effect of chemical equilibrium and dissociation on reaction thermodynamics and combustion kinetics.</td>
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<td>5. Select the optimal technique for controlling combustion related pollution by understanding the pollutant formation process.</td>
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<td>6. Calculate the kinetically and diffusionally limited rates of char combustion.</td>
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Prerequisites

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<td>1. ME 4210 - APPLIED THERMO (Required) (EXPEDITED - COMPLETED)</td>
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<td>2. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)</td>
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Course Topics: |
**Alias Course: M E 417 | Semester Course: ME 4170**

**General Info**

- **Document Description:** Alias Course: M E 417 | Semester Course: ME 4170
- **Document ID:** 102260
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Contact Oak ID:** kraftf
- **Designee Name:** Merry Cibula
- **Designee Oak ID:** cibula
- **Creation Info:** 10/28/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

**Alias Course Info**

- **Course ID:** M E 417
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F, WP, WF, FN, FS, AU, I
- **Course Short Name:** DES OF THERMAL SYS
- **Course Long Name:** Design of Thermal Systems
- **Credit Hours:** 4.0
- **Course Description:** Design of systems in which thermodynamics, transport behavior, and optimization techniques are major considerations. Emphasis on total design approach including factors such as cost and reliability. Typical systems include power, propulsion, environmental, and cryogenic. Design project and report required.

**Course Prerequisites:** M E 328 & 412

**Semester Course Info**

- **Course ID:** ME 4170
- **Course Prefix:** ME
- **Course Number:** 4170
- **Course Short Name:** DESIGN OF THERMAL SYSTEMS
- **Course Long Name:** Design of Thermal Systems
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Spring
- **Course Description:** Design of systems in which thermodynamics, transport behavior, and optimization techniques are major considerations. Emphasis on total design approach including factors such as cost and reliability. Typical systems include power, propulsion, environmental, and cryogenic. Design project and report required.

**Additional Resources:**

- **Outcome Goals:**
  1. Ability to formulate a thermal design problem.
  2. Ability to develop a conceptual design and physical system.
  3. Ability to model and simulate the physical system.
  4. Ability to optimize the design using calculus methods, search methods, and programming.

**Prerequisites**

- **Prerequisite Text:** ME 4210

**Prerequisites:**

1. ME 4210 - APPLIED THERMO (Required) (EXPEDITED - COMPLETED)

- **No Credit - Sequence:** No credit for this course if taken after the following:
- **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

**Course Content**

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<td><strong>Course Components:</strong></td>
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**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 328   | Semester Course: ME 4210

General Info

Document Description: Alias Course: M E 328   | Semester Course: ME 4210
Document ID: 102310
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/30/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 328
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: APPLIED THERMODYNAMICS
Course Long Name: Applied Thermodynamics
Credit Hours: 4.0
Course Description: Nonreactive and reactive mixtures, turbomachinery, analytical studies of gas and vapor power cycles, and refrigeration. 4 lec.
Course Prerequisites: C OR BETTER M E 321

Semester Course Info

Course ID: ME 4210
Course Prefix: ME
Course Number: 4210
Course Short Name: APPLIED THERMO
Course Long Name: Applied Thermal Systems Design and Analysis
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall
Course Description: Applied thermal systems, power cycles, combustion and refrigeration. Applied fluids, pumps and flow measurements. Heat exchangers.
Additional Resources:
Outcome Goals:
1. Ability to solve common engineering problems in the thermal sciences field, including problems involving application of the first and second laws of thermodynamics in the analysis of energy.
2. Ability to apply the first and second laws of thermodynamics to the design process.
3. Ability to apply the first and second laws of thermodynamics to the analysis of energy components and systems.
4. An ability to model, analyze and design thermal systems.
5. Ability to design heat exchangers.

Prerequisites

Prerequisite Text: ET 3200 (C or better) and ME 3122
Prerequisites:
1. ET 3200 - Engineering Thermodynamics (Required) (EXPEDITED - REVIEW)
2. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course ID: ME 4210
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Course Topics: 

Course Topic Notes:
### Alias Course Info

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<td>Course Short Name:</td>
<td>STIRLING CYCLE ANALYSIS</td>
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<td>Course Long Name:</td>
<td>Stirling Cycle Machine Analysis</td>
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<td>Credit Hours:</td>
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<td>Course Description:</td>
<td>Analysis and simulation of Stirling cycle machines, in which the single phase working gas operates in a closed thermal power cycle. Development and use of computer simulation techniques to model the nonsteady flow conditions including thermodynamics, heat transfer, and fluid flow friction effects.</td>
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<td>Course Prerequisites:</td>
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### Semester Course Info

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<td>STIRLING CYCLE ANALYSIS</td>
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<td>Credit Hours:</td>
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### Course Description:
Analysis and simulation of Stirling cycle machines, in which the single phase working gas operates in a closed thermal power cycle. Development and use of computer simulation techniques to model the non-steady flow conditions including thermodynamics, heat transfer, and fluid flow friction effects.

### Additional Resources:

**Outcome Goals:**

1. Awareness of the operating principles, history, and development of Stirling cycle machines including both engines and heat pumps and their renewed relevance in the current energy and global warming crises.

2. Ability to analyze and simulate Stirling cycle machines, including the use of ideal isothermal and ideal adiabatic models in which all three heat exchangers are considered to be perfect.

3. Ability to extend the ideal adiabatic model to include a regenerator effectiveness of less than unity and to compute its effect on the performance of the Stirling cycle machine.

4. Understanding of convective heat exchanger scaling parameters and an ability to extend the ideal adiabatic computer simulation to include the heat transfer and flow friction effects of all three heat exchangers on Stirling cycle machine performance.

5. Understanding of convective heat exchanger scaling parameters.

6. Ability to extend the ideal adiabatic computer simulation to include the heat transfer and flow friction effects of all three heat exchangers on the performance of the Stirling cycle machine.

7. Ability to perform parametric sensitivity analyses, a required step in design optimization.
Prerequisites

Prerequisite Text: MATH 3600, ME 3122, ME 4210

Prerequisites:
1. ME 4210 - APPLIED THERMO (Required) (EXPEDITED - COMPLETED)
2. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)
3. MATH 3600 - NUM METHODS FOR ENGINEERS (Required) (EXPEDITED - REVIEW)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4220

Course Components:

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Course Topics:

Course Topic Notes:
Alias Course: M E 423  , M E 484  | Semester Course: ME 4230

### General Info

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<td>Frank Kraft</td>
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<td>Designee Name</td>
<td>Merry Cibula</td>
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<td>cibula</td>
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### Alias Course Info

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<tr>
<td>Course Short Name</td>
<td>FUEL CELL DESIGN</td>
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<tr>
<td>Course Long Name</td>
<td>Fuel Cell Analysis, Design, and Development</td>
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<tr>
<td>Credit Hours</td>
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<td>Course Description</td>
<td>Design of fuel cells using analytical tools, based on thermodynamic and electrochemistry.</td>
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<td>Course Prerequisites</td>
<td>CHEM 151 &amp; (M E 328 OR CH E 305)</td>
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<th>Course ID</th>
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<td>GenEd Code</td>
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<td>Grade Eligibility Code</td>
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<td>Course Short Name</td>
<td>PROJECTS IN THERMAL MACHI</td>
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<td>Course Long Name</td>
<td>Projects in Thermal Machinery</td>
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<td>Credit Hours</td>
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<td>Course Description</td>
<td>Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required.</td>
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### Semester Course Info

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<td>Course Long Name</td>
<td>Fuel Cell Analysis, Design, and Development</td>
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<td>Department/School</td>
<td>ME (Mechanical Engineering)</td>
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<td>Typical Terms Offered</td>
<td>Spring</td>
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<td>Course Description</td>
<td>Design of fuel cells using analytical tools, based on thermodynamic and electrochemistry.</td>
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<td>Additional Resources</td>
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<tr>
<td>Outcome Goals</td>
<td>1. Ability to predict fuel cell behavior (voltage, current, power, and impedance) using electrochemical and thermodynamic calculations.</td>
</tr>
<tr>
<td></td>
<td>2. Ability to identify key design aspects of the major types of fuel cells.</td>
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<td></td>
<td>3. Ability to determine optimal fuel cell systems for various power applications.</td>
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<td></td>
<td>4. Ability to calculate thermodynamic effects of the fuel cell system balance of plant.</td>
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<tr>
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<td>5. Ability to demonstrate proper fuel cell testing laboratory skills.</td>
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### Prerequisites

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<th>CHEM 1510 AND ET 3200</th>
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<td>1. ET 3200 - Engineering Thermodynamics (Required) (EXPEDITED - REVIEW)</td>
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<td>2. CHEM 1510 - FUND OF CHEMISTRY I (Required) (EXPEDITED - REVIEW)</td>
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<td>No Credit - Limit</td>
<td>No credit for this course if the following is taken (keeps credit for the following course, as defined by department):</td>
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Course ID: ME 4230
Alias Course: ME 427, ME 485 | Semester Course: ME 4270

General Info

Document Description: Alias Course: ME 427, ME 485 | Semester Course: ME 4270

Document ID: 104346

Document Type: COMPOSITE

Contact Name: Frank Kraft

Designee Name: Merry Cibula

Creation Info: 12/22/2009 by Frank Kraft (kraftf)

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: ME 427

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: POWER STATION ENGINEERING

Course Long Name: Power Station Engineering

Credit Hours: 3.0

Course Description: Fuels, principles of combustion, stationary boilers, grates, stokers, furnaces, coal pulverizers, economizers, preheaters, superheaters, stacks, forced and induced draft, boiler-feed pumps, heat balances, and hydro power. 3 lec.

Course Prerequisites: ME 328 & 412

Course ID: ME 485

GenEd Code: N/A

Grade Eligibility Code: 02: A-F,PR,WP,WF,FN,FS,AU,I

Course Short Name: PROJECTS IN THERMAL MACH2

Course Long Name: Projects in Thermal Machinery II

Credit Hours: 3.0

Course Description: Continuation of 484. Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required.

Course Prerequisites:

Semester Course Info

Course ID: ME 4270

Course Prefix: ME

Course Number: 4270

Course Short Name: POWER STATION ENGINEERING

Course Long Name: Power Station Engineering

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: INFREQUENT

Typical Terms Offered: Spring

Course Description: Fuels, principles of combustion, stationary boilers, grates, stokers, furnaces, coal pulverizers, economizers, preheaters, superheaters, stacks, forced and induced draft, boiler-feed pumps, heat balances, and hydro power.

Additional Resources:

Outcome Goals:

1. Ability to identify and describe methods of energy conversions to electricity.
2. Ability to determine capital and operating costs of a typical power plant.
3. Ability to determine optimal technique to control negative environmental aspects associated with the technique used to generate electricity.
4. Perform cost-benefit analysis on alternative power generation or pollution control capital projects.
5. Ability to maximize efficiency/power or minimize cost with respect to generation of electricity.

Prerequisites

Prerequisite Text: ME 4210

Prerequisites:

1. ME 4210 - APPLIED THERMO (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
### Course Content

**Course ID:** ME 4270

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**Course Topics:**

**Course Topic Notes:**
Alias Course Info

Course ID: M E 429
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ROBOTIC MANIPULATORS
Course Long Name: Mechanics and Control of Robotic Manipulators
Credit Hours: 4.0
Course Description: Classification and applications for mechanical manipulator systems. Manipulator motion description, forward kinematics transformations, and solution of inverse kinematics equations. Velocity kinematics and manipulator dynamics equations. Trajectory generation and control schemes including sensory feedback. Laboratory exercises to augment lecture material. Co-listed with EE 429.

Course Prerequisites: SR ONLY

Semester Course Info

Course ID: ME 4290
Course Prefix: ME
Course Number: 4290
Course Short Name: ROBOTIC MANIPULATORS
Course Long Name: Mechanics and Control of Robotic Manipulators
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall
Course Description: Classification and applications for mechanical manipulator systems. Manipulator motion description, forward kinematics transformations, and solution of inverse kinematics equations. Velocity kinematics and manipulator dynamics equations. Trajectory generation and control schemes including sensory feedback. Laboratory exercises to augment lecture material.

Additional Resources:
Outcome Goals:
1. Familiarity with parallel robots, redundant robots, and robot dynamics.
2. Ability to perform robot trajectory generation.
3. Familiarity with pose (position and orientation) mathematics via transform matrices.
4. Familiarity with applications, architectures, and control methods for serial robot arms.
5. Ability to solve forward and inverse pose kinematics equations.

Prerequisites
Prerequisite Text: ME 3011 and SR
Prerequisites:
1. ME 3011 - KINEMATICS AND DYNAMICS (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4290
Course Components:

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<th>Type</th>
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Course Topics:
Course Topic Notes:
Alias Course: M E 431 | Semester Course: ME 4310

### General Info
- **Document Description:** Alias Course: M E 431 | Semester Course: ME 4310
- **Document ID:** 102261
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 10/28/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info
- **Course ID:** M E 431
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** ATM POLLUTION CONTROL
- **Course Long Name:** Atmospheric Pollution Control
- **Credit Hours:** 4.0
- **Course Description:** Sources of air pollution from major industries, internal combustion engines, and other sources. Techniques for measuring particulate and gaseous pollutants in atmosphere and at their source. Current techniques and future possibilities for control of air pollution. Bases for air pollution legislation.

### Semester Course Info
- **Course ID:** ME 4310
- **Course Prefix:** ME
- **Course Number:** 4310
- **Course Short Name:** POLLUTION CONTROL
- **Course Long Name:** Atmospheric Pollution Control
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** EVERY OTHER YEAR
- **Typical Terms Offered:** Fall
- **Course Description:** Sources of air pollution from major industries, internal combustion engines, and other sources. Techniques available for measuring particulate and gaseous pollutants in atmosphere and at their source. Techniques available for control and future possibilities for control of air pollution.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Tour a full-scale facility using state-of-the-art air pollution control devices.
    2. Understand how engineering principles are used to control air pollution.
    3. Understand numerical models and principles pertinent to air pollution engineering.
    4. Ability to perform calculations related to combustion thermodynamics (flame temp).
    5. Ability to account for the effect of chemical equilibrium and dissociation on reaction thermodynamics and combustion kinetics.
    6. Develop skills to impact the changing field of air pollution engineering.

### Prerequisites
- **Prerequisite Text:** ET 3200 and (ME 3121 or CHE 3400)
- **Prerequisites:**
  1. ET 3200 - THERMODYNAMICS (Required) (EXPEDITED - REVIEW)
  2. ME 3121 - HEAT AND FLUID TRANS I (Not Required) (EXPEDITED - COMPLETED)
  3. CHE 3400 - ChE Fluid Mechanics (Not Required) (EXPEDITED - COMPLETED)
- **No Credit - Sequence:** No credit for this course if taken after the following:
- **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

### Course Content
- **Course ID:** ME 4310
### Course Components:

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### Course Topics:

**Course Topic Notes:**

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Page 43 of 193
Alias Course: ME 432 | Semester Course: ME 4320

General Info

- **Document Description**: Alias Course: ME 432 | Semester Course: ME 4320
- **Document ID**: 102262
- **Document Type**: EXPEDITED
- **Contact Name**: Frank Kraft
- **Designee Name**: Merry Cibula
- **Creation Info**: 10/28/2009 by Frank Kraft (kraftf)
- **Last Modification**: 06/07/2010 by Anita James (james)

Alias Course Info

- **Course ID**: M E 432
- **GenEd Code**: N/A
- **Grade Eligibility Code**: 01: A-F, WP, FN, FS, AU, I
- **Course Short Name**: ANALY/SIMULATION TRANSPT
- **Course Long Name**: Analysis and Simulation of Transportation Processes
- **Credit Hours**: 4.0
- **Course Description**: Use of CFD software to study conduction, convection, and radiation. Analyze governing equations by simulation and visualization. Fundamentals of CFD programming.

Semester Course Info

- **Course ID**: ME 4320
- **Course Prefix**: ME
- **Course Number**: 4320
- **Course Short Name**: TRANSPORT PROCESSES
- **Course Long Name**: Analysis and Simulation of Transport Processes
- **Department/School**: ME (Mechanical Engineering) - ENT (Engineering and Technology, Russ College of)
- **Credit Hours**: FIXED | 3.0 hours
- **Grade Eligibility**: 01: A-F, WP, FN, FS, AU, I
- **Repeat/Retake**: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

- **Typical Offer Frequency**: INFREQUENT
- **Typical Terms Offered**: Spring
- **Course Description**: Use of CFD software to study conduction, convection, and radiation. Analyze governing equations by simulation and visualization. Fundamentals of CFD programming.

- **Additional Resources**:
  - **Outcome Goals**:
    1. Solve 1-D, 2-D and 3-D problems of conduction, convection and radiation.
    2. Select appropriate numerical technique and boundary conditions.
    3. Interpret solutions in terms of the governing equations.
    4. Use of CFD software to develop model for thermal transport.

Prerequisites

- **Prerequisite Text**: ME 4210
- **Prerequisites**:
  1. ME 4210 - APPLIED THERMO (Required) (EXPEDITED - COMPLETED)

- **No Credit - Sequence**: No credit for this course if taken after the following:
- **No Credit - Duplicate**: No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit**: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

- **Course ID**: ME 4320

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**Alias Course Info**

- **Course ID:** M E 434
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 03: A-F, CR, WP, WF, FN, FS, AU, I
- **Course Short Name:** AEROSOLS BEHAVIOR
- **Course Long Name:** Fundamentals of Aerosol Behavior
- **Credit Hours:** 4.0
- **Course Description:** Aerosol characterization transport properties, convective and inertial deposition, light scattering and visibility, experimental methods, coagulation, gas to particle conversion, general dynamic equation for aerosols.

**Course Prerequisites:**
- ME 321 & 412

---

**Semester Course Info**

- **Course ID:** ME 4340
- **Course Prefix:** ME
- **Course Number:** 4340
- **Course Short Name:** AEROSOLS BEHAVIOR
- **Course Long Name:** Fundamentals of Aerosol Behavior
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** EVERY OTHER YEAR
- **Typical Terms Offered:** Fall
- **Course Description:** Aerosol characterization transport properties, convective and inertial deposition, light scattering and visibility, experimental methods, coagulation, gas to particle conversion, general dynamic equation for aerosols.

**Additional Resources:**

**Outcome Goals:**

1. Apply the general dynamic equation of aerosol formation.
2. Understand the role of aerosols in atmospheric pollution.
3. Explore how engineering principles are used to manipulate aerosols.
4. Understand numerical models and principles pertinent to aerosol mechanics.
5. Collect and apply standard laboratory techniques to the analysis of aerosol data.
6. Examine the use of aerosols in advanced manufacturing processes.

---

**Prerequisites**

**Prerequisite Text:** ET 3200 and ME 3122

**Prerequisites:**

1. ET 3200 - Engineering Thermodynamics (Required) (EXPEDITED - REVIEW)
2. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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**Course Topics:**
Alias Course: M E 435  , M E 485   | Semester Course: ME 4350

General Info

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<td>Contact Oak ID: kraftf</td>
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<tr>
<td>Designee Name: Merry Cibula</td>
<td>Designee Oak ID: cibula</td>
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<td>Creation Info: 12/22/2009 by Frank Kraft (kraftf)</td>
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<tr>
<td>Course Short Name: ENERGY ENGINEERING&amp;MANMNT</td>
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<tr>
<td>Course Long Name: Energy Engineering and Management</td>
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<tr>
<td>Credit Hours: 3.0</td>
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<td>Course Description: Basic concepts and objectives of energy management, energy audit, engineering evaluation of several energy systems, availability analysis, second law efficiency, economic evaluation, and application of these principles to case studies.</td>
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Course Prerequisites:

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<tr>
<td>Course Short Name: PROJECTS IN THERMAL MACH2</td>
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<td>Course Long Name: Projects in Thermal Machinery II</td>
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<td>Credit Hours: 3.0</td>
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<td>Course Description: Continuation of 484. Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required.</td>
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Course Prerequisites:

Semester Course Info

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Additional Resources:

Outcome Goals:

1. Ability to apply conservation laws, efficiency considerations, and economic and environmental impact to analyze the relative merits of conventional and alternative energy sources for industrial, residential and transportation use.
2. Understand the chemical reactions and mechanical systems involved when specific conventional and alternative energy sources are developed and used in industrial, residential, and transportation contexts.
3. Ability to compare and contrast the availability, efficiency, cost, and environmental impact of specific conventional and alternative energy sources used in industrial, residential, and transportation contexts.
4. Ability to select an appropriate energy source or combination of energy sources for a specific industrial, residential, or transportation application, and to justify that selection.
5. Understand, quantitatively, current and projected global energy usage and availability.
6. Become aware of some current U.S. and global political and legal issues related to energy usage.
7. Ability to identify outstanding scientific or technical issues that must be resolved in order to make specific conventional or alternative energy sources more attractive options for the future.
Prerequisites

Prerequisite Text: ET 3200 and CHEM 1510

Prerequisites:
1. ET 3200 - Engineering Thermodynamics (Required) (EXPEDITED - REVIEW)
2. CHEM 1510 - FUND OF CHEMISTRY I (Required) (EXPEDITED - REVIEW)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4350

Course Components:

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Course Topics:

Course Topic Notes:
Alias Course: M E 440   | Semester Course: ME 4400

General Info

Document Description: Alias Course: M E 440   | Semester Course: ME 4400

Document ID: 104349
Document Version: 1.0

Document Status: COMPLETED - UCC

Contact Name: Frank Kraft
Contact Oak ID: kraftf

Designee Name: Merry Cibula
Designee Oak ID: cibula

Creation Info: 12/22/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 440
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: DIRECT ENERGY CONVERSION
Course Long Name: Direct Energy Conversion
Credit Hours: 4.0
Course Description: General principles of unconventional energy conversion. Thermoelectricity, thermonics, MHD, fuel cells, photovoltaics, wind systems, solar systems, and energy storage.

Course Prerequisites:

Semester Course Info

Course ID: ME 4400
Course Prefix: ME
Course Number: 4400
Course Short Name: DIRECT ENERGY CONVERSION
Course Long Name: Direct Energy Conversion
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Fall

Course Description: General principles of conventional and unconventional energy conversion. Analysis of multiple energy processes, including but not limited to photovoltaic, wind, electrochemical, thermovoltaic, combustion (Otto, Diesel, Brayton, and Rankine), refrigeration, and nuclear.

Additional Resources:

Outcome Goals:

1. Ability to compare and contrast the fuel availability for multiple conversion processes.
2. Understand basic operation of energy conversion processes, including photovoltaic, wind, electrochemical, thermovoltaic, combustion (Otto, Diesel, Brayton, and Rankine), refrigeration, and nuclear, both direct and indirect conversions.
3. Have awareness of the framework for energy conversion processes, including the economic, socio-economic, political, historical, and environmental contexts.
4. Ability to design an energy conversion, power generation, or power savings system, by narrowing the problem focus, making good assumptions, using proper analyses, and making design choices consistent with political, legal and ethical contexts.
5. Ability to analyze conversion efficiencies of multiple energy processes, including but not limited to photovoltaic, wind, electrochemical, thermovoltaic, combustion (Otto, Diesel, Brayton, and Rankine), refrigeration, and nuclear.
6. Ability to convert between unit systems as related to power and energy.

Prerequisites

Prerequisite Text: ET 3200
Prerequisites:
1. ET 3200 - Engineering Thermodynamics (Required) (EXPEDITED - REVIEW)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4400
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Alias Course: M E 446 | Semester Course: ME 4460

General Info

Document Description: Alias Course: M E 446 | Semester Course: ME 4460

 Alias Course: M E 446 | Semester Course: ME 4460

Document ID: 102257

Document Type: EXPEDITED

Contact Name: Frank Kraft

Designee Name: Merry Cibula

Creation Info: 10/28/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 446

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: POTENTIAL FLOW TH

Course Long Name: Potential Flow Theory

Credit Hours: 4.0

Course Description: Inviscid flow theory. General equations of fluid dynamics, study of potential flow. Grad-level course open to selected undergrads.

Course Prerequisites: C E 340

Semester Course Info

Course ID: ME 4460

Course Prefix: ME

Course Number: 4460

Course Short Name: POTENTIAL FLOW THEORY

Course Long Name: Potential Flow Theory

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: YEARLY

Typical Terms Offered: Fall

Course Description: Inviscid flow theory. General equations of fluid dynamics. Study of potential flow.

Additional Resources:

Outcome Goals:

1. Ability to interpret, explain and problem solve applying the continuity equation.
2. Ability to interpret, explain and problem solve applying Navier Stokes equations.
3. Ability to interpret, explain and problem solve applying Potential Flow Theory.
4. Ability to interpret, explain and problem solve applying hydrostatics principles.

Prerequisites

Prerequisite Text: ME 3122

Prerequisites:

1. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course Topics:

Course Topic Notes:
Alias Course: M E 447, M E 493 | Semester Course: ME 4470

General Info

Document Description: Alias Course: M E 447, M E 493 | Semester Course: ME 4470

Document ID: 102384

Document Type: COMPOSITE

Contact Name: Frank Kraft

Designee Name: Merry Cibula

Creation Info: 11/02/2009 by Frank Kraft (kraftf)

Contact Oak ID: kraftf

Designee Oak ID: cibula

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 447

GenEd Code: N/A

Grade Eligibility Code: 01: A-F, WP, WF, FN, FS, AU, I

Course Short Name: VISCIOUS FLOW THEORY

Course Long Name: Viscous Flow Theory

Credit Hours: 3.0

Course Description: Mechanics of fluid resistance, laminar and turbulent flow. Applications to external boundary layer flow and to flow in ducts. Grad-level course open to selected undergrads.

Course Prerequisites:

- Course ID: M E 493

GenEd Code: N/A

Grade Eligibility Code: 01: A-F, WP, WF, FN, FS, AU, I

Course Short Name: LUBRICATION BEARING ANALY

Course Long Name: Lubrication and Bearing Analysis

Credit Hours: 3.0

Course Description: Concepts of boundary, hydrostatic, and hydrodynamic lubrication. McKee, and Boyd and Raimondi methods. Solid lubrication, porous bearings, and gas bearings.

Course Prerequisites:

Semester Course Info

Course ID: ME 4470

Course Prefix: ME

Course Number: 4470

Course Short Name: VISCIOUS FLOW THEORY

Course Long Name: Viscous Flow Theory

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F, WP, WF, FN, FS, AU, I

Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: INFREQUENT

Typical Terms Offered: Spring

Course Description: Mechanics of fluid resistance, laminar and turbulent flow. Applications to external boundary layer flow, and to flow in ducts.

Additional Resources:

Outcome Goals:

1. Ability to use Navier-Stokes equations to find flow field in one and two dimensional flows.
2. Ability to use basic principles to formulate governing equations for viscous flow.
3. Ability to determine qualitative results for flow field and wall friction by scale analysis.
4. Ability to solve laminar and turbulent flow problems.

Prerequisites

Prerequisite Text: ME 3122

Prerequisites:

1. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
**Course ID:** ME 4470

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**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 455  |  Semester Course: ME 455

General Info

Document Description: Alias Course: M E 455  |  Semester Course: ME 455
Document ID: 102256          Document Version: 1.0
Document Type: EXPEDITED          Document Status: COMPLETED - UCC
Contact Name: Frank Kraft          Contact Oak ID: kraftf
Designee Name: Merry Cibula          Designee Oak ID: cibula
Creation Info: 10/28/2009 by Frank Kraft (kraftf)          Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 455
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, WF, FN, FS, AU, I
Course Short Name: MECHATRONICS I
Course Long Name: Mechatronics I
Credit Hours: 4.0
Course Description: Principles of design of computer-based, intelligent machines. Microprocessor/microcomputer fundamentals, input-output sensors and actuators, computer achievement of machine kinematics, robot-control techniques, lab experience in microprocessor-machine interfacing.
Course Prerequisites: E E 314 & MATH 344 & M E 224

Semester Course Info

Course ID: ME 4550
Course Prefix: ME
Course Number: 4550
Course Short Name: MECHATRONICS I
Course Long Name: Mechatronics I
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F, WP, WF, FN, FS, AU, I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall, Spring
Course Description: Design of intelligent devices. Interfacing of micro- and minicomputers with machines. Microprocessor characteristics, actuator characteristics, visual pattern recognition, design of devices. Theory and laboratory.
Additional Resources:
Outcome Goals:
1. Develop an ability to design Mechatronics systems.
2. Learn how to interface a microcontroller with various sensors and actuators.
3. Develop an understanding of how mechanical and electrical systems are integrated.
4. Form an understanding of microcontroller functions and capabilities.

Prerequisites

Prerequisite Text: EE 3143 and ME 3012
Prerequisites:
1. ME 3012 - SYSTEM ANALYSIS AND CNTRL (Required) (EXPEDITED - COMPLETED)
2. EE 3143 - BASIC E E II (Required) (EXPEDITED - REVIEW)
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:

Course Topic Notes:
Alias Course: M E 462 | Semester Course: ME 4620

General Info

Document Description: Alias Course: M E 462 | Semester Course: ME 4620

| Document ID: 102244 |
| Contact Name: Frank Kraft |
| Designee Name: Merry Cibula |
| Creation Info: 10/28/2009 by Frank Kraft (kraftf) |

Alias Course Info

| Course ID: M E 462 |
| GenEd Code: N/A |
| Grade Eligibility Code: 04: A-F,CR,PR,WP,WF,FN,FS,AU,I |
| Course Short Name: MANUFACTURING PROCESSES |
| Course Long Name: Manufacturing Processes |
| Credit Hours: 4.0 |
| Course Description: The basic theory of plasticity and its application to manufacturing processes. Applied theories of metal working processes such as forging, extrusion, rolling, and some aspects of machining; theories of polymer processing, composite and reinforced materials processing use of application of materials information systems (MIS), and mapping techniques. |

Course Prerequisites:

Semester Course Info

| Course ID: ME 4620 |
| Course Prefix: ME |
| Course Number: 4620 |
| Course Short Name: METAL FORMING |
| Course Long Name: Mechanics of Metal Forming |
| Department/School: ME (Mechanical Engineering) |
| College: ENT (Engineering and Technology, Russ College of) |
| Credit Hours: FIXED | 3.0 hours |
| Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I |
| Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined |
| Typical Offer Frequency: YEARLY |
| Typical Terms Offered: Spring |
| Course Description: The basic theory of plasticity and its application to manufacturing processes. Classical techniques in metal working analysis, such as Slip Line Field, Upper Bound and Slab analyses. Review and analysis of forging, extrusion, rolling, drawing, sheet metal forming, etc. Concepts of work in metal deformation. Deformation zone geometry and its implications on properties and defects. Friction and lubrication in metal working. Temperature effects. |

Additional Resources:

Outcome Goals:

1. Understand the concept of ideal, friction and redundant work in metal forming operations.
2. Ability to solve metal forming problems using classical analytical techniques.
3. Understand plastic material behavior, and strain rate and temperature effects.
4. Ability to use basic friction models in metal working analyses.
5. Understand basic concepts of stress and strain, and plasticity theory.

Prerequisites

Prerequisite Text: ET 2220 and ET 2300

| Prerequisites: |
| 1. ET 2300 - Prin. of Eng Materials (Required) (EXPEDITED - REVIEW) |
| 2. ET 2220 - STRENGTH OF MATERIALS (Required) (EXPEDITED - REVIEW) |

| No Credit - Sequence: No credit for this course if taken after the following: |
| No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken): |
| No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department): |

Course Content

| Course ID: ME 4620 |
| Course Components: |
| Type | Contact Hours Per Week | Number of Sections/Year | Default Section Size | Might Be Offered Online | Comments |
| Primary | Lecture | 3.0 | 1.0 | 20.0 | Yes |
### Alias Course Info

- **Course ID:** M E 463
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F, WP, WF, FN, FS, AU, I
- **Course Short Name:** MECHANICAL METALLURGY
- **Course Long Name:** Mechanical Behavior and Metallurgy of Materials
- **Credit Hours:** 4.0
- **Course Description:** Relationship of mechanical properties to internal structure, i.e., both microstructure and macrostructure. Micromechanical strengthening mechanism of metals and alloys. Elastic and plastic behavior. Fatigue and fracture behavior and mechanisms. Single crystal deformation and dislocation theory. Ductile and brittle materials testing. Plastic forming of metals. Quantitative microscopy.
- **Course Prerequisites:** CH E 231 & SR ONLY & ENT MAJOR

### Semester Course Info

- **Course ID:** ME 4630
- **Course Prefix:** ME
- **Course Number:** 4630
- **Course Short Name:** MECH MATERIALS
- **Course Long Name:** Mechanics of Materials
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Fall
- **Course Description:** Mechanical properties of materials. Stress and strain tensors. Basic elasticity, plasticity, fatigue behavior and fracture mechanics. Single crystal deformation and dislocation theory. Strengthening mechanisms. Constitutive equations.
- **Additional Resources:**
- **Outcome Goals:**
  1. Determine and manipulate stress and strain tensors
  2. Ability to solve elastic and plastic stress/strain problems
  3. Understand basic mechanical properties of materials and testing methods
  4. Understand crystal defects and relationship to strengthening mechanisms
  5. Understand basic constitutive relationships

### Prerequisites

- **Prerequisite Text:** ET 2220, ET 2300
- **Prerequisites:**
  1. ET 2300 - PRIN OF ENGR MATRLS (Required) (EXPEDITED - REVIEW)
  2. ET 2220 - STRENGTH OF MATERIALS (Required) (EXPEDITED - REVIEW)
- **No Credit - Sequence:** No credit for this course if taken after the following:
- **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

### Course Content

#### Course Components:

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### Course Topics:
### General Info

**Document Description:** Alias Course: M E 466  | Semester Course: ME 4660

**Document ID:** 102255  
**Document Type:** EXPEDITED  
**Contact Name:** Frank Kraft  
**Contact Oak ID:** kraftf  
**Creation Info:** 10/28/2009 by Frank Kraft (kraftf)

**Document Version:** 1.0  
**Document Status:** COMPLETED - UCC  
**Contact Oak ID:** cibula  
**Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info

**Course ID:** M E 466  
**GenEd Code:** N/A  
**Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I  
**Course Short Name:** BIOSOLID MECHANICS  
**Course Long Name:** Mechanics of Biological Solids  
**Credit Hours:** 4.0  
**Course Description:** Structure and functional properties of connective tissue. Techniques for determining the mechanical response of biological soft and hard tissues. Includes static, viscoelastic, creep, fatigue and fracture. Simplified models of biological structures. Creation of geometric models from medical imaging and computational modeling. Specific topics may include bone, cartilage, ligaments, tendon, teeth, and skin.

**Course Prerequisites:** M E 303

### Semester Course Info

**Course ID:** ME 4660  
**Course Prefix:** ME  
**Course Number:** 4660  
**Course Short Name:** BIOSOLID MECHANICS  
**Course Long Name:** Mechanics of Biological Solids  
**Department/School:** ME (Mechanical Engineering)  
**College:** ENT (Engineering and Technology, Russ College of)  
**Credit Hours:** FIXED | 3.0 hours  
**Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I  
**Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined  
**Typical Offer Frequency:** EVERY OTHER YEAR  
**Typical Terms Offered:** Fall  
**Course Description:** Structure and functional properties of connective tissue. Techniques for determining the mechanical response of biological soft and hard tissues. Includes static, viscoelastic, creep, fatigue and fracture. Simplified models of biological structures. Creation of geometric models from medical imaging and computational modeling. Specific topics may include bone, cartilage, ligaments, tendon, teeth, and skin.

**Additional Resources:**  
**Outcome Goals:**  
1. Describe the structure of specific biological tissues and relate the structure to mechanical properties.
2. Plan a mechanical test for a biological tissue.
3. Describe appropriate material models for biological tissues based upon the application.
4. Apply principles of continuum mechanics, elasticity, energy methods, and beam theory to biological structures.
5. Explain methods for medical imaging and identification of tissues, and describe techniques involved in computational modeling.

### Prerequisites

**Prerequisite Text:** ET 2220  
**Prerequisites:**  
1. ET 2220 - STRENGTH OF MATERIALS (Required) (EXPEDITED - REVIEW)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

### Course Content

**Course ID:** ME 4660  

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General Info

Document Description: Alias Course: M E 467 | Semester Course: ME 4670
Document ID: 102315
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/30/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 467
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, FN, FS, AU, I
Course Short Name: ENGINEERING BIOMECHANICS
Course Long Name: Engineering Biomechanics of Human Motion
Credit Hours: 4.0
Course Prerequisites: PHYS 251

Semester Course Info

Course ID: ME 4670
Course Prefix: ME
Course Number: 4670
Course Short Name: ENGINEERING BIOMECHANICS
Course Long Name: Engineering Biomechanics of Human Motion
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F, WP, FN, FS, AU, I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: YEARLY
Typical Terms Offered: Spring
Additional Resources:

Outcome Goals:
1. Familiarity with the topics, conventions, and methods of biomechanics analysis.
2. Working knowledge of human musculoskeletal system anatomy and physiology.
4. Awareness of commercial biomechanics modeling and analysis software.

Prerequisites

Prerequisite Text: PHYS 2051
Prerequisites:
1. PHYS 2051 - GENERAL PHYSICS (Required) (EXPEDITED - REVIEW)
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4670
Course Components:

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Course Topics:

Course Topic Notes:
Alias Course: M E 470 , M E 471 | Semester Course: ME 4701

General Info

Document Description: Alias Course: M E 470 , M E 471 | Semester Course: ME 4701

Document ID: 102313

Contact Name: Frank Kraft

Designee Name: Merry Cibula

Creation Info: 10/30/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 470

GenEd Code: N/A

Grade Eligibility Code: 01: A-F, WP, FN, FS, AU, I

Course Short Name: M E DESIGN I

Course Long Name: Mechanical Engineering Design I

Credit Hours: 4.0

Course Description: This course is the first of a three course sequence that will provide a comprehensive, capstone, senior design experience for mechanical engineering majors. Course includes studies in the analytical techniques of design, as well as the design, construction, and evaluation of the performance of an actual engineering system. ME 470, 471, and 472 must be taken consecutively. 2 lec, 2 lab.

Course Prerequisites: M E 328 & 303

Course ID: M E 471

GenEd Code: N/A

Grade Eligibility Code: 01: A-F, WP, FN, FS, AU, I

Course Short Name: M E DESIGN II

Course Long Name: Mechanical Engineering Design II

Credit Hours: 4.0

Course Description: This course is a continuation of ME 470 and must be taken in the quarter following the successful completion of ME 470. This course is the second of a three course sequence that will provide a comprehensive, capstone, senior design experience for mechanical engineering majors. Course includes studies in the analytical techniques of design, as well as the design, construction, and evaluation of the performance of an actual engineering system. 2 lec, 2 lab.

Course Prerequisites: M E 470

Semester Course Info

Course ID: ME 4701

Course Prefix: ME

Course Number: 4701

Course Short Name: ME CAPSTONE DESIGN I

Course Long Name: Mechanical Engineering Capstone Design I

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 4.0 hours

Grade Eligibility: 01: A-F, WP, FN, FS, AU, I

Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: YEARLY

Typical Terms Offered: Fall

Course Description: This course is the first of a two course sequence that will provide a comprehensive, capstone, senior design experience for mechanical engineering majors. Course includes studies in the analytical techniques of design, as well as the design, construction, and evaluation of the performance of an actual engineering system. ME 4701 and 4702 must be taken consecutively.

Additional Resources:

Outcome Goals:

1. Demonstrate professional skills, including appreciation of the importance of continual lifelong learning.
2. Ability to find, evaluate, and use resources to learn independently.
3. Ability to model, analyze, design, and realize a mechanical system that meets a particular need.
4. Ability to apply project management tools such as Gantt charts, Pareto charts, critical path analysis, and action items for planning, prioritizing, and scheduling tasks in a design project.
5. Ability to work effectively on project teams in both member and leader roles.
6. Appreciation for and an ability to promote safety and health in all aspects of the engineering profession, including safety during manufacturing and assembly, and product safety through Design For Safety or similar approaches.
7. Demonstrate technical skills, including an ability to start with an open ended problem statement, do research, interviews, and observations to determine customer requirements and design specifications.
8. Ability to generate numerous creative and feasible alternative solutions to a design problem, using precedent, brainstorming, and other methods for creativity and synthesis.
9. Ability to evaluate the importance of an engineering decision, select an appropriate decision making process, and implement that process to make a defensible engineering decision.
10. Ability to apply useful tools for design refinement, such as value engineering and design for manufacturing and assembly (DFMA).
Prerequisites

Prerequisite Text: ME 3510 and ME 3700

Prerequisites:

1. ME 3700 - MACHINE DESIGN (Required) (EXPEDITED - COMPLETED)
2. ME 3510 - COMPUTER AIDED DESIGN (Required) (COMPOSITE - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4701

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<th>Course Components:</th>
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Course Topics:

Course Topic Notes:
### Alias Course Info

| Course ID: | M E 471 |
| GenEd Code: | N/A |
| Grade Eligibility Code: | 01: A-F, WP, WF, FN, FS, AU, I |
| Course Short Name: | M E DESIGN II |
| Course Long Name: | Mechanical Engineering Design II |
| Credit Hours: | 4.0 |
| Course Description: | This course is a continuation of ME 470 and must be taken in the quarter following the successful completion of ME 470. This course is the second of a three course sequence that will provide a comprehensive, capstone, senior design experience for mechanical engineering majors. Course includes studies in the analytical techniques of design, as well as the design, construction, and evaluation of the performance of an actual engineering system. 2 lec, 2 lab. |
| Course Prerequisites: | M E 470 |

### Alias Course Info

| Course ID: | M E 472 |
| GenEd Code: | 3 (Tier III) |
| Grade Eligibility Code: | 01: A-F, WP, WF, FN, FS, AU, I |
| Course Short Name: | M E DESIGN III |
| Course Long Name: | Mechanical Engineering Design III |
| Credit Hours: | 4.0 |
| Course Description: | This course is a continuation of ME 471 and must be taken in the quarter following the successful completion of ME 471. This course is the third of a three course sequence that will provide a comprehensive, capstone, senior design experience for mechanical engineering majors. Course includes studies in the analytical techniques of design, as well as the design, construction, and evaluation of the performance of an actual engineering system. 2 lec, 2 lab. |
| Course Prerequisites: | SR & M E 471 |

### Semester Course Info

| Course ID: | ME 4702 |
| Course Prefix: | ME |
| Course Number: | 4702 |
| Course Short Name: | ME CAPSTONE DESIGN II |
| Course Long Name: | Mechanical Engineering Capstone Design II |
| Department/School: | ME (Mechanical Engineering) |
| College: | ENT (Engineering and Technology, Russ College of) |
| Credit Hours: | FIXED | 4.0 hours |
| Grade Eligibility: | 01: A-F, WP, WF, FN, FS, AU, I |
| Repeat/Retake: | RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined |
| Typical Offer Frequency: | YEARLY |
| Typical Terms Offered: | Spring |
| Course Description: | This course is a continuation of ME 4701 and must be taken in the quarter following the successful completion of ME 4701. This course completes the two course sequence that provides a comprehensive, capstone, senior design experience for mechanical engineering majors. Course includes studies in the analytical techniques of design, as well as the design, construction, and evaluation of the performance of an actual engineering system. |

### Additional Resources:

#### Outcome Goals:

1. Ability to apply project management tools such as Gantt charts, Pareto charts, critical path analysis, and action items for planning, prioritizing, and scheduling tasks in a design project.
2. Appreciation for and an ability to promote safety and health in all aspects of the engineering profession, including safety during manufacturing and assembly, and product safety through Design For Safety or similar approaches.
3. Ability to apply failure modes and effects analysis (FMEA) to organize and prioritize analysis and testing and to improve the safety and reliability of a design.
4. Ability to apply useful tools for design refinement such as value engineering and design for manufacturing and assembly (DFMA).
5. Ability to prepare and present clear and effective design presentations that include professional quality visual aids.
6. Awareness of the influence of engineering standards and constraints in engineering design, such as: manufacturability, sustainability, health and safety, environmental, ethical, social, political, and economic.
7. Ability to work with vendors / part suppliers to select and purchase machine elements (such as bearings, gears, or fasteners) to satisfy specific functional requirements.
8. Ability to use basic manufacturing skills to build and assemble prototypes of a product design.
9. Ability to select appropriate materials for a design, considering manufacturability, availability, cost, performance, suitability for the conditions, potential failure modes, environmental impact, and other considerations.

10. Ability to evaluate and use mock up and prototype test results for design improvement and validation.

11. Ability to participate effectively in writing and editing a team design report that uses visuals and figures effectively, that makes clear claims supported with evidence, and that includes proper citations.

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### Prerequisites

**Prerequisite Text:** M E 4701 and SR

**Prerequisites:**

1. ME 4701 - ME CAPSTONE DESIGN I (Required) (COMPOSITE - COMPLETED)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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### Course Content

**Course ID:** ME 4702

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<th>Type</th>
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### General Education Details

**GenEd Code:** 3 (Tier III)

**Remove Code?** Do Not Remove

**GenEd Outcome Goals:**

1. Students will have the ability to effectively present information orally.
2. Students will have the "ability to work collaboratively."
3. Students will have a "sense of personal responsibility."
Alias Course: M E 494 | Semester Course: ME 4740

General Info

Document Description: Alias Course: M E 494 | Semester Course: ME 4740
Document ID: 102417
Document Type: COMPOSITE
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 11/03/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 494
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ADV MACHINE DESIGN
Course Long Name: Advanced Machine Design
Credit Hours: 3.0
Course Description: Advanced considerations in design and analysis of machine members, strength under combined stress, thermal stress, fatigue in metals, and design using plastics. 3 lec.

Course Prerequisites:

Semester Course Info

Course ID: ME 4740
Course Prefix: ME
Course Number: 4740
Course Short Name: ADV MACHINE DESIGN
Course Long Name: Advanced Machine Design
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Fall
Course Description: Advanced considerations in design and analysis of machine members, strength under combined stress, thermal stress, fatigue in metals, and design using plastics.

Additional Resources:

Outcome Goals:
1. Ability to apply advanced analytical techniques for design analysis.
2. Ability to include thermal stress considerations in a design analysis.
3. Ability to complete a preliminary design of a plastic component.

Prerequisites

Prerequisite Text: ME 3700
Prerequisites:
1. ME 3700 - MACHINE DESIGN (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course ID: ME 4740
Course Components:

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Course Topics:

Course Topic Notes:
### General Info

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### Alias Course Info

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<td>Course Name</td>
<td>SOLAR DESIGN</td>
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<td>Course Description</td>
<td>Introduction to theoretical principles and practical design aspects of solar energy systems. Topics covered include principles of radiation; heating load computation; air and liquid, flat-plate collectors; concentrating collectors; energy storage; photovoltaic conversion; economic analysis.</td>
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### Course Prerequisites

- MATH 263C & PHYS 253

### Semester Course Info

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<td>4750</td>
</tr>
<tr>
<td>Course Name</td>
<td>SOLAR DESIGN</td>
</tr>
<tr>
<td>Course Long Name</td>
<td>Solar Design</td>
</tr>
<tr>
<td>Department/School</td>
<td>ME (Mechanical Engineering)</td>
</tr>
<tr>
<td>College</td>
<td>ENT (Engineering and Technology, Russ College of)</td>
</tr>
<tr>
<td>Credit Hours</td>
<td>FIXED</td>
</tr>
<tr>
<td>Grade Eligibility</td>
<td>01: A-F, WP, WF, FN, FS, AU, I</td>
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<td>Repeat/Retake</td>
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<td>Typical Offer Frequency</td>
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</tr>
<tr>
<td>Typical Terms Offered</td>
<td>Fall</td>
</tr>
<tr>
<td>Course Description</td>
<td>Introduction to theoretical principles and practical design aspects of solar energy systems. Topics covered include principles of radiation; heating load computation; air and liquid, flat-plate collectors; concentrating collectors; energy storage; photovoltaic conversion; economic analysis.</td>
</tr>
</tbody>
</table>

### Additional Resources

- Outcome Goals:
  1. Awareness of energy storage options and challenges.
  2. Ability to evaluate a variety of methods of converting solar energy into usable electric energy and discuss the advantages and challenges of each.

### Prerequisites

- Prerequisite Text: ET 3200
- Prerequisites:
  - ET 3200 - Engineering Thermodynamics (Required) (EXPEDITED - REVIEW)
  - No Credit - Sequence: No credit for this course if taken after the following:
  - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
  - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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<th>Course Components:</th>
<th>Type</th>
<th>Contact Hours Per Week</th>
<th>Number of Sections/Year</th>
<th>Default Section Size</th>
<th>Might Be Offered Online</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Primary</td>
<td>Lecture</td>
<td>3.0</td>
<td>1.0</td>
<td>20.0</td>
<td>Yes</td>
<td></td>
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Course Content

Course ID: ME 4750

Course Components:

- **Primary**: Lecture 3.0 hours per week, 1.0 section per year, default section size of 20.0, might be offered online.

Course Topics:

Course Topic Notes:
Alias Course: M E 476 | Semester Course: ME 4760

General Info

Document Description: Alias Course: M E 476 | Semester Course: ME 4760
Document ID: 102253
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/28/2009 by Frank Kraft (kraftf)

Document Version: 1.0
Document Status: COMPLETED - UCC
Contact Oak ID: kraftf
Designee Oak ID: cibula
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 476
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: AUTOMOTIVE ENGINEERING
Course Long Name: Automotive Engineering
Credit Hours: 4.0
Course Description: Overview of automotive engineering, including modeling, simulation, design, and testing of land vehicle systems with emphasis on performance, safety, fuel economy, and emissions. Broad exposure to all topics through case studies.

Course Prerequisites: M E 304

Semester Course Info

Course ID: ME 4760
Course Prefix: ME
Course Number: 4760
Course Short Name: AUTOMOTIVE ENGINEERING
Course Long Name: Automotive Engineering
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: EVERY OTHER YEAR
Typical Terms Offered: Spring

Course Description: Overview of automotive engineering, including modeling, simulation, design, and testing of land vehicle systems with emphasis on performance, safety, fuel economy, and emissions. Broad exposure to all topics through case studies.

Additional Resources:

Outcome Goals:
1. An ability to model and simulate the longitudinal performance of a vehicle.
2. A knowledge of future vehicles and advanced automotive technologies.
3. A knowledge of testing of vehicle performance and fuel economy.
4. An expertise in at least one aspect of automotive engineering.
5. A knowledge of basic automotive systems and subsystems.

Prerequisites

Prerequisite Text: M E 3700
Prerequisites:
1. ME 3700 - MACHINE DESIGN (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4760

Course Components:

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Course Topics:

Course Topic Notes:
Alias Course: M E 477 | Semester Course: ME 4770

General Info

Document Description: Alias Course: M E 477 | Semester Course: ME 4770

Document ID: 102267

Document Version: 1.0

Document Status: COMPLETED - UCC

Contact Name: Frank Kraft

Contact Oak ID: kraftf

Designee Name: Merry Cibula

Designee Oak ID: cibula

Creation Info: 10/29/2009 by Frank Kraft (kraftf)

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 477

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: VEHICLE SYSTEMS DESIGN

Course Long Name: Vehicle Systems Design

Credit Hours: 4.0

Course Description: Introduction to the systems engineering design process for land and air vehicles through case studies and projects. Examines the process for developing a first layout for a new vehicle platform, including setting requirements, generating concepts, and predicting performance. Technical, economic, environmental and social aspects are considered.

Course Prerequisites: PHYS 252 & SR

Semester Course Info

Course ID: ME 4770

Course Prefix: ME

Course Number: 4770

Course Short Name: VEHICLE SYSTEMS DESIGN

Course Long Name: Vehicle Systems Design

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: INFREQUENT

Typical Terms Offered: Fall

Course Description: Introduction to the systems engineering design process for land and air vehicles through case studies and projects. Examines the process for developing a first layout for a new vehicle platform, including setting requirements, generating concepts, and predicting performance. Technical, economic, environmental and social aspects are considered.

Additional Resources:

Outcome Goals:
1. A knowledge of systems engineering.
2. A familiarity with current land and air vehicle platforms.
3. An ability to complete a system-level layout for a land vehicle based on a set of requirements.
4. An ability to complete a system-level layout for an aeronautical vehicle based on a set of requirements.
5. An ability to complete a performance simulation of an automotive vehicle.
6. An ability to complete a performance simulation of an aeronautical vehicle.

Prerequisites

Prerequisite Text: PHYS 2051

Prerequisites:
1. PHYS 2051 - GENERAL PHYSICS (Required) (EXPEDITED - REVIEW)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4770

Course Components:

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Course Topics:
Alias Course: M E 480 | Semester Course: ME 4800

General Info

Document Description: Alias Course: M E 480 | Semester Course: ME 4800  
Document ID: 102521  
Document Type: EXPEDITED  
Contact Name: Frank Kraft  
Designee Name: Merry Cibula  
Creation Info: 11/04/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 480  
GenEd Code: N/A  
Grade Eligibility Code: 02: A-F,PR,WF,FN,FS,AU,I  
Course Short Name: COLLOQUIUM  
Course Long Name: Colloquium  
Credit Hours: 1.0  
Course Prerequisites: SR ONLY  
Course Description: Open presentation of individual engineering analysis or design effort. Requires demonstration of individual analytical or design ability, knowledge of engineering fundamentals (including passing a mini-fundamentals of engineering test), and satisfactory oral presentation techniques.

Semester Course Info

Course ID: ME 4800  
Course Prefix: ME  
Course Number: 4800  
Course Short Name: ME COLLOQUIUM IV  
Course Long Name: Mechanical Engineering Colloquium IV  
Department/School: ME (Mechanical Engineering)  
College: ENT (Engineering and Technology, Russ College of)  
Credit Hours: FIXED | 1.0 hours  
Grade Eligibility: 03: A-F,CR,WF,FN,FS,AU,I  
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined  
Typical Offer Frequency: YEARLY  
Typical Terms Offered: Spring  
Course Description: Last in a series of ME Colloquia which engage students in career exploration, physical demonstrations, and research seminars. Activities to develop professional skills and technical communication skills are emphasized. Requires demonstration of satisfactory oral presentation skills.

Additional Resources:

Outcome Goals:
1. Exposure to professional practice and career opportunities in mechanical engineering.
2. Exposure to contemporary areas of research and development in mechanical engineering.
3. Exposure to social and political developments of interest to mechanical engineers.
4. Improved understanding of what engineers do and what it takes to be a successful engineer.
5. Increased awareness of the impact of engineering solutions in a global, economic, environmental and societal context.
6. Appreciation of engineering integration with business, including most of the following: market awareness, customer satisfaction, quality, continuous improvement, profit, and the concepts of mission, vision and core values for a company.

Prerequisites

Prerequisite Text: ME 3800  
Prerequisites:
1. ME 3800 - ME COLLOQUIUM III (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4800  
Course Components:

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Course Topics:
Alias Course: M E 388, M E 488 | Semester Course: ME 4880

General Info

Document Description: Alias Course: M E 388, M E 488 | Semester Course: ME 4880
Document ID: 102520
Document Type: COMPOSITE
Document Version: 1.0

Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 11/04/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 388
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, FN, FS, AU, I
Course Short Name: APPLD INSTRUMENTATION LAB
Course Long Name: Applied Instrumentation Lab
Credit Hours: 4.0

Course Description: Students will be instructed on the use of basic lab equipment while constructing and testing their own measurement systems and will complete lab experiments using more advanced instrumentation systems. The importance of error analysis is also be covered. No credit if 398 or 498.

Course Prerequisites: (M E 288 OR ISE 304) & E E 313 & (C E 340 OR CONCURRENT) & NOT 398 OR 498

Course ID: M E 488
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, FN, FS, AU, I
Course Short Name: EXPERIMENTAL DESIGN LAB
Course Long Name: Experimental Design Laboratory
Credit Hours: 2.0

Course Description: This course is the laboratory testing component of the integrated Senior (Capstone) Design sequence. Design theories will be tested and demonstrated using applied experimental principles and design. The course will be held concurrently with ME 471. No credit if M E 498.

Course Prerequisites: M E 388 & (471 OR CONCURRENT) & NOT 398

Semester Course Info

Course ID: ME 4880
Course Prefix: ME
Course Number: 4880
Course Short Name: EXP DESIGN LAB
Course Long Name: Experimental Design Lab
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 02: A-F, PR, WP, FN, FS, AU, I
Repeat/Retake: RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined

Typical Offer Frequency: YEARLY
Typical Terms Offered: Spring

Course Description: Students will learn the use of basic lab equipment while constructing and testing their own measurement systems. Students will also complete lab experiments using more advanced instrumentation systems, including various transducers, signal conditioning circuits, and data acquisition systems. The importance of error analysis will be covered. This course also serves as the laboratory testing component of the integrated Capstone Design sequence.

Additional Resources:

Outcome Goals:
1. Demonstrate the ability to design and conduct experiments on a realistic design project using real-world hardware.
2. Learn fundamental principles of experimentation to test and validate project design.
3. Understand measurement devices and hardware for the project implementation including sensors, actuators, and data acquisition system.
4. Demonstrate safety in testing and laboratory work, including awareness of Material Safety Data Sheets (MSDS) and the proper use of Personal Protective Equipment (PPE).

Prerequisites

Prerequisite Text: ME 4701 and ME 3122

Prerequisites:

1. ME 4701 - ME CAPSTONE DESIGN I (Required) (COMPOSITE - COMPLETED)
2. ME 3122 - HEAT AND FLUID TRANS II (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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<th>Course Components:</th>
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<th>Number of Sections/Year</th>
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General Info

Document Description: Alias Course: M E 499A | Semester Course: ME 4910
Document ID: 102312
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/30/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 499A
GenEd Code: N/A
Grade Eligibility Code: 02: A-F,PR,WF,FN,FS,AU,I
Course Short Name: DESIGN PROJECT
Course Long Name: Design Project
Credit Hours: 0.0
Course Description: Project course to allow students to receive credit for relevant mechanical engineering or interdisciplinary design projects. Projects are expected to include construction of a working model, development of a validated simulation, or some equivalent end product.
Course Prerequisites: PERMISSION REQUIRED

Semester Course Info

Course ID: ME 4910
Course Prefix: ME
Course Number: 4910
Course Short Name: MECH ENGINEER PROJECT
Course Long Name: Mechanical Engineering Project
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: VARIABLE | 1.0 - 3.0 hours
Grade Eligibility: 02: A-F,PR,WF,FN,FS,AU,I
Repeat/Rетake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall, Spring, Full Summer
Course Description: Project course to allow students to receive credit for relevant, non-duplicative, credit-worthy work on extracurricular engineering projects under the mentorship of a qualified faculty member. Projects are expected to include construction of a working model, development of a validated simulation, or some equivalent end product.

Additional Resources:
Outcome Goals:
1. Ability to complete a project by working independently, with appropriate guidance.
2. Knowledge and ability in a specialized project area, dependent on project.

Prerequisites

Prerequisite Text: PERMISSION REQUIRED
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4910
Course Components:
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<td>Primary</td>
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Course Topics: 
Course Topic Notes:
Alias Course: M E 489  |  Semester Course: ME 4930

General Info

Document ID: 102311  
Document Version: 1.0  
Document Status: COMPLETED - UCC  
Contact Oak ID: kraftf  
Designee Oak ID: cibula  
Creation Info: 10/30/2009 by Frank Kraft (kraftf)  
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 489  
GenEd Code: N/A  
Grade Eligibility Code: 04: A-F,CR,PR,WP,WF,FN,FS,AU,I  
Course Short Name: SPECIAL INVESTIGATION  
Course Long Name: Special Investigations  
Credit Hours: 0.0  
Course Description: [seminar contents varies]  
Course Prerequisites: PERMISSION REQUIRED

Semester Course Info

Course ID: ME 4930  
Course Prefix: ME  
Course Number: 4930  
Course Short Name: SPECIAL INVESTIGATION  
Course Long Name: Special Investigation  
Department/School: ME (Mechanical Engineering)  
College: ENT (Engineering and Technology, Russ College of)  
Credit Hours: VARIABLE | 1.0 - 4.0 hours  
Grade Eligibility: 04: A-F,CR,PR,WP,WF,FN,FS,AU,I  
Repeat/Retake: REPEATABLE | Max Repeat Hours: 999 hours  
Typical Offer Frequency: INFREQUENT  
Typical Terms Offered: Fall, Spring  
Course Description: An opportunity for faculty to offer a one-time special topics course, or for students to select a special topic that is not covered in the current offerings of the University and study that topic under the mentor-ship of a qualified faculty member.  
Additional Resources:  
Outcome Goals:  
1. Knowledge in the specialized content areas selected for investigation.  
2. Ability to learn independently, with appropriate guidance.

Prerequisites

Prerequisite Text: PERMISSION REQUIRED  
Prerequisites:  
No Credit - Sequence: No credit for this course if taken after the following:  
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):  
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 4930  
Course Components:  
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<tr>
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Course Topics:

Course Topic Notes:
Alias Course: M E 495   | Semester Course: ME 4950

**General Info**

- **Document Description:** Alias Course: M E 495   | Semester Course: ME 4950
- **Document ID:** 102254
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 10/28/2009 by Frank Kraft (kraftf)

**Alias Course Info**

- **Course ID:** M E 495
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F, WP, FN, FS, AU, I
- **Course Short Name:** KINETIC THEORY & STAT THERM
- **Course Long Name:** Introduction to Kinetic Theory and Statistical Thermodynamics
- **Credit Hours:** 4.0
- **Course Description:** Kinetic theory, classical and quantum statistical mechanics with applications to engineering devices. 3 lec.

**Semester Course Info**

- **Course ID:** ME 4950
- **Course Prefix:** ME
- **Course Number:** 4950
- **Course Short Name:** KINETIC THEORY AND THERMO
- **Course Long Name:** Introduction to Kinetic Theory and Statistical Thermodynamics
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, FN, FS, AU, I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Spring
- **Course Description:** Kinetic theory, classical and quantum statistical mechanics with applications to engineering devices.

**Additional Resources:**

**Outcome Goals:**

1. Ability to use software such as EES to perform combustion calculations.
2. Ability to account for the effect of chemical equilibrium and dissociation on reaction thermodynamics and combustion kinetics.
3. Ability to identify applications of quantum mechanics to real systems.
4. Ability to utilize statistical thermodynamics to predict properties.
5. Ability to determine techniques of spectroscopy through application of statistical thermodynamics.
6. Ability to perform calculations to balance reactions.
7. Ability to determine combustion thermodynamics, such as flame temperature.

**Prerequisites**

- **Prerequisite Text:** ME 4210

**Prerequisites:**

1. ME 4210 - APPLIED THERMO (Required) (EXPEDITED - COMPLETED)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

**Course Content**

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<tr>
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<td>Lecture</td>
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**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 418, M E 496 | Semester Course: ME 4960

General Info

- **Document Description:** Alias Course: M E 418, M E 496 | Semester Course: ME 4960
- **Document ID:** 102301
- **Document Type:** COMPOSITE
- **Contact Name:** Frank Kraft
- **Contact Oak ID:** kraftf
- **Designee Name:** Merry Cibula
- **Designee Oak ID:** cibula
- **Creation Info:** 10/30/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

Alias Course Info

- **Course ID:** M E 418
  - **GenEd Code:** N/A
  - **Grade Eligibility Code:** 02: A-F, PR, WP, WF, FN, FS, AU, I
  - **Course Short Name:** MECH ENGR EXPERIMENTATION
  - **Course Long Name:** Mechanical Engineering Experimentation
  - **Credit Hours:** 1.0
  - **Course Description:** Instruction in experimental procedure and experience in designing and executing lab experiments. Students plan and execute their own experiments to acquire answers to assigned problems. Variety of areas covered including control systems, energy conversion, fluid flow, heat transfer, motion measurements, stress-strain. Instructional guidance provided by entire mechanical engineering staff. Provides familiarity with variety of instrumentation and procedures. Three-quarter sequence with experimental subjects phased with prerequisites.
  - **Course Prerequisites:** SR ONLY

- **Course ID:** M E 496
  - **GenEd Code:** N/A
  - **Grade Eligibility Code:** 01: A-F, WP, WF, FN, FS, AU, I
  - **Course Short Name:** EXPTL METHODS IN DESIGN
  - **Course Long Name:** Experimental Methods in Design
  - **Credit Hours:** 3.0
  - **Course Description:** Investigation and evaluation of experimental methods that may be used to obtain design and performance data. Techniques of photo-elasticity, strain measurements, and vibration measurement.
  - **Course Prerequisites:** M E 403

Semester Course Info

- **Course ID:** ME 4960
  - **Course Prefix:** ME
  - **Course Number:** 4960
  - **Course Short Name:** EXP METHODS IN DESIGN
  - **Course Long Name:** Experimental Methods in Design
  - **Department/School:** ME (Mechanical Engineering)
  - **College:** ENT (Engineering and Technology, Russ College of)
  - **Credit Hours:** FIXED | 3.0 hours
  - **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
  - **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
  - **Typical Offer Frequency:** INFREQUENT
  - **Typical Terms Offered:** Spring
  - **Course Description:** Investigation and evaluation of experimental methods that may be used to obtain design and performance data. Probability, statistics and principles of design of experiments (DOE) with application to thermo-mechanical experiments.
  - **Additional Resources:**
    - **Outcome Goals:**
      1. Use probability and statistics to determine experimental uncertainty.
      2. Use DOE principles to evaluate experimental results.
      3. Use statistical tools to evaluate experimental data.
      4. Design and set-up an experiment to study thermal and/or mechanical variables.

Prerequisites

- **Prerequisite Text:** ME 4880
  - **Prerequisites:**
    1. ME 4880 - EXP DESIGN LAB (Required) (COMPOSITE - COMPLETED)
  - **No Credit - Sequence:** No credit for this course if taken after the following:
  - **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
  - **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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### Course Components:

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### Course Topics:

Course Topic Notes:

Alias Course: M E 497  |  Semester Course: ME 4970

**General Info**

**Document Description:** Alias Course: M E 497  |  Semester Course: ME 4970

- **Document ID:** 102300
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 10/30/2009 by Frank Kraft (kraftf)

**Document Version:** 1.0  
**Document Status:** COMPLETED - UCC

- **Contact Oak ID:** kraftf
- **Designee Oak ID:** cibula
- **Last Modification:** 06/07/2010 by Anita James (james)

**Alias Course Info**

- **Course ID:** M E 497
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F, WP, FN, FS, AU, I
- **Course Short Name:** METHODS OF ENGR ANALYSIS I
- **Course Long Name:** Methods of Engineering Analysis I
- **Credit Hours:** 4.0
- **Course Description:** Applications of matrices, Fourier series, partial differential equations, and Bessel functions.
- **Course Prerequisites:** MATH 340

**Semester Course Info**

- **Course ID:** ME 4970
- **Course Prefix:** ME
- **Course Number:** 4970
- **Course Short Name:** METHODS OF ENGR ANALYSIS
- **Course Long Name:** Methods of Engineering Analysis
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, FN, FS, AU, I
- **Repeat/Retake:** RETAKABLE | Max Retake Times: Number of retake policy for semesters has not been determined
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Spring

**Course Description:** Analysis of ordinary and partial differential equations for engineering systems, Fourier series, Bessel Functions, eigenvalue problems, matrices; probability and statistics.

**Additional Resources:**

- **Outcome Goals:**
  1. Develop Fourier sine, cosine and Four-Bessel series solutions.
  2. Use matrix operations and determinants.
  3. Analyze eigenvalue problems in engineering systems.
  4. Perform statistical analysis using appropriate probability distributions.
  5. Solve ordinary and partial differential equations with engineering applications.

**Prerequisites**

- **Prerequisite Text:** MATH 3400
- **Prerequisites:**
  1. MATH 3400 - DIFFERENTIAL EQUATIONS (Required) (EXPEDITED - REVIEW)

  **No Credit - Sequence:** No credit for this course if taken after the following:
  **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
  **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

**Course Content**

- **Course ID:** ME 4970

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**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 406 | Semester Course: ME 5060

General Info

Document Description: Alias Course: M E 406 | Semester Course: ME 5060
Document ID: 103848
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 12/10/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 406
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ANALYSIS&DESOF MECHANISMS
Course Long Name: Analysis and Design of Mechanisms
Credit Hours: 4.0
Course Description: Analysis and synthesis of planar and 3-dimensional mechanisms using classical and modern analytical approaches. Structural synthesis of mechanisms, dimensional synthesis of linkages for function generation, path generation, and for rigid-body guidance. Applications of matrix methods, optimization techniques, and computer solutions.
Course Prerequisites: M E 301

Semester Course Info

Course ID: ME 5060
Course Prefix: ME
Course Number: 5060
Course Short Name: ANALYSIS AND DES OF MECHANISMS
Course Long Name: Analysis and Design of Mechanisms
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: EVERY THIRD YEAR
Typical Terms Offered: Spring
Course Description: Analytical and graphical solutions of motion problems involving mechanical elements: linkages, gears, cams, mechanical trains, etc.
Additional Resources:
Outcome Goals:
1. Familiarity with balancing techniques.
2. Comfort with computer software tools for mechanism design and analysis.
3. Ability for advanced kinematics analysis of mechanisms including matrix methods.
4. Competence in mechanism synthesis (design) from motion requirements.

Prerequisites

Prerequisite Text:
Prerequisites:

No Credit - Sequence: No credit for this course if taken after the following:
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Alias Course: M E 407 | Semester Course: ME 5070

General Info

Document Description: Alias Course: M E 407 | Semester Course: ME 5070
Document ID: 104555
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 12/29/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 407
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: FUND NUCLEAR ENGR
Course Long Name: Fundamentals of Nuclear Engineering
Credit Hours: 4.0
Course Description: Nuclear engineering, including nuclear reactions, radiation detection and measurement, reactor criticality, principles of reactor control, radiation shielding, effects of radiation of materials, uses of radioactive materials.
Course Prerequisites:

Semester Course Info

Course ID: ME 5070
Course Prefix: ME
Course Number: 5070
Course Short Name: NUCLEAR ENGR
Course Long Name: Fundamentals of Nuclear Engineering
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Spring
Course Description: Nuclear engineering, including nuclear reactions, radiation detection and measurement, reactor criticality, principles of reactor control, radiation shielding, effects of radiation of materials, uses of radioactive materials.
Additional Resources:

Outcome Goals:

1. Understand advanced design and safety improvements in Advanced Nuclear Reactors.
2. Understand the general properties of nuclei (binding energy, statistics, cross sections, etc.).
3. Understand the basic nuclear reactions, including physics of fission and fusion.
4. Ability to calculate core reactivity changes with changing operational conditions.
5. Ability to calculate neutron transport properties and reactor kinetic.
6. Ability to calculate thermal conversion efficiencies for nuclear energy processes.
7. Understand principles of nuclear reactor design, including those of light water reactors, and fast breeder reactors.
8. Understand the physical and chemical effects of radiation on atoms and molecules.
9. Ability to calculate heat generation and transport rates, within the fuel matrix, core fluids, and through heat exchangers.
10. Ability to calculate transport rates in two-phase flow.
11. Understand the safety characteristics of LWR and FBR.
12. Understand the fabrication process of nuclear fuels.
13. Understand environmental concerns of nuclear fuel usage and mitigation techniques.

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
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Course Topics:

Course Topic Notes:
Alias Course: M E 400, M E 484 | Semester Course: ME 5110

**General Info**
- **Document Description:** Alias Course: M E 400, M E 484 | Semester Course: ME 5110
- **Document ID:** 103847
- **Document Type:** COMPOSITE
- **Contact Name:** Frank Kraft
- **DESIGNEE NAME:** Merry Cibula
- **Creation Info:** 12/10/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

**Alias Course Info**
- **Course ID:** M E 400
  - **GenEd Code:** N/A
  - **Grade Eligibility Code:** 01: A-F, WP, WF, FN, FS, AU, I
  - **Course Short Name:** HEAT-VENT-AIR CONDT
  - **Course Long Name:** Heating, Ventilation, and Air Conditioning
  - **Credit Hours:** 4.0
  - **Course Description:** Description and evaluation of heating, air conditioning, and total-energy systems employed to provide thermal environments for buildings ranging in scope from residences to integrated commercial, apartment, or industrial complexes. Covers human comfort, psychometrics, load analysis, techniques, equipment, and controls.
  - **Course Prerequisites:** M E 328

- **Course ID:** M E 484
  - **GenEd Code:** N/A
  - **Grade Eligibility Code:** 02: A-F, PR, WP, WF, FN, FS, AU, I
  - **Course Short Name:** PROJECTS IN THERMAL MACHI
  - **Course Long Name:** Projects in Thermal Machinery
  - **Credit Hours:** 3.0
  - **Course Description:** Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required.
  - **Course Prerequisites:**

**Semester Course Info**
- **Course ID:** ME 5110
- **Course Prefix:** ME
- **Course Number:** 5110
- **Course Short Name:** HVACR
- **Course Long Name:** Principles of Heating, Venting, Air Conditioning and Refrigeration
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Fall
- **Course Description:** Description and evaluation of heating, air conditioning, refrigeration and total-energy systems employed to provide thermal environments for buildings ranging in scope from residences to integrated commercial, apartment, or industrial complexes. Covers human comfort, psychometrics, load analysis, techniques, equipment, and controls.

**Additional Resources:**
- **Outcome Goals:**
  1. Determine thermal transport from building structures.
  2. Determine space heat load and cooling load.
  3. Use psychrometric chart to find capacity of required HVAC equipment.
  4. Calculate fluid flow for design of piping design air distribution.
  5. Identify types of HVACR equipment.

**Prerequisites**
- **Prerequisite Text:**
  - **Prerequisites:**
    - **No Credit - Sequence:** No credit for this course if taken after the following:
    - **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
    - **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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Alias Course: M E 413  |  Semester Course: ME 5130

General Info

- **Document Description:** Alias Course: M E 413  |  Semester Course: ME 5130
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 10/29/2009 by Merry Cibula (cibula)

Alias Course Info

- **Course ID:** M E 413
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** CONDUCTION CONVEC & RAD
- **Course Long Name:** Conduction, Convection, and Radiation
- **Credit Hours:** 4.0
- **Course Description:** Advanced analytical treatment of conduction and radiation heat transfer. Boundary value problems, orthogonal expansions, moving heat sources, multi-dimensional problems with time varying boundary conditions, finite difference analysis, conformal transformations, radiation network matrix analysis, diffuse-specular exchange, and Monte Carlo techniques, etc.
- **Course Prerequisites:** M E 412

Semester Course Info

- **Course ID:** ME 5130
- **Course Prefix:** ME
- **Course Number:** 5130
- **Course Short Name:** COND CONVEC AND RAD
- **Course Long Name:** Conduction, Convection, and Radiation
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Spring
- **Course Description:** Advanced analytical treatment of conduction, convection, and radiation. Boundary value problems, boundary layer theory, radiation network matrix analysis.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Develop governing equations for modeling thermal energy transport.
    2. Solve multi-dimensional, steady state and transient conduction problems.
    3. Use boundary layer approximation to find convection heat transfer.
    4. Use non-dimensional numbers in conduction and convection problems.
    5. Determine radiation from black bodies, and analyze solar radiation.
    6. Use shape factor for calculating diffuse radiation exchange between surfaces.

Prerequisites

- **Prerequisite Text:** ME 6970
- **Prerequisites:**
  1. ME 6970 - ENGR ANAL AND NUM METH (Required) (COMPOSITE - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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### Alias Course Info

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<td>Course Short Name: COMBUSTION</td>
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<td>Course Long Name: Combustion</td>
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<td>Credit Hours: 4.0</td>
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<td>Course Description: Introduces student to fundamentals of combustion; enables students to analyze complex combustion processes in constructive manner. Modern diagnostic techniques of combustion, and evaluation of pollution potential of different combustion processes.</td>
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<tr>
<td>Course Prerequisites: M E 328 &amp; 412</td>
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### Semester Course Info

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<td>Course Long Name: Combustion</td>
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<td>Department/School: ME (Mechanical Engineering)</td>
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<td>College: ENT (Engineering and Technology, Russ College of)</td>
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<td>Repeat/Retake: REPEATABLE</td>
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<td>Typical Offer Frequency: EVERY OTHER YEAR</td>
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<td>Course Description: Kinetic theory and properties of gases, chemical reactions in gases, diffusion flames, detonation, combustion of atomized sprays, combustion diagnostic techniques, combustion and air pollution.</td>
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<td>Outcome Goals:</td>
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<tr>
<td>1. Determine combustion thermodynamics such as flame temperature.</td>
</tr>
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<td>2. Use software such as EES to perform combustion calculations.</td>
</tr>
<tr>
<td>3. Account for the effect of chemical equilibrium and dissociation on reaction thermodynamics and combustion kinetics.</td>
</tr>
<tr>
<td>4. Select the optimal technique for controlling combustion related pollution by understanding the pollutant formation process.</td>
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<td>5. Calculate the kinetically and diffusionally limited rates of char combustion.</td>
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<td>6. Perform calculations to balance reactions.</td>
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### Prerequisites

**Prerequisite Text:**

**Prerequisites:**

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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### Course Topics:

**Course Topic Notes:**
**Alias Course: M E 417 | Semester Course: ME 5170**

### General Info

- **Document Description:** Alias Course: M E 417 | Semester Course: ME 5170
- **Document ID:** 103768
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 12/10/2009 by Merry Cibula (cibula)
- **Document Version:** 1.0
- **Document Status:** COMPLETED - UCC
- **Contact Oak ID:** kraftf
- **Designee Oak ID:** cibula
- **Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info

- **Course ID:** M E 417
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F, WP,WF,FN,FU,AU,I
- **Course Short Name:** DES OF THERMAL SYS
- **Course Long Name:** Design of Thermal Systems
- **Credit Hours:** 4.0
- **Course Description:** Design of systems in which thermodynamics, transport behavior, and optimization techniques are major considerations. Emphasis on total design approach including factors such as cost and reliability. Typical systems include power, propulsion, environmental, and cryogenic. Design project and report required.
- **Course Prerequisites:** M E 328 & 412

### Semester Course Info

- **Course ID:** ME 5170
- **Course Prefix:** ME
- **Course Number:** 5170
- **Course Short Name:** DESIGN OF THERMAL SYSTEMS
- **Course Long Name:** Design of Thermal Systems
- **Department/School:** ME (Mechanical Engineering)
  - **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP,WF,FN,FU,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Spring
- **Course Description:** Design of systems in which thermodynamics, transport behavior, and optimization techniques are major considerations. Emphasis on total design approach including factors such as cost and reliability. Typical systems include power, propulsion, environmental, and cryogenic. Design project and report required.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Ability to develop a conceptual design and physical system.
    2. Ability to model and simulate the physical system.
    3. Ability to optimize the design using calculus methods, search methods, and programming.
    4. Ability to formulate a thermal design problem.

### Prerequisites

**Prerequisite Text:**

**Prerequisites:**

- **No Credit - Sequence:** No credit for this course if taken after the following:
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### Course Content

- **Course ID:** ME 5170

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**Course Topics:**

**Course Topic Notes:**
## Alias Course: M E 422, M E 622 | Semester Course: ME 5220

### General Info

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<td>Designee Name:</td>
<td>Merry Cibula</td>
<td>Designee Oak ID:</td>
<td>cibula</td>
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<td>Creation Info:</td>
<td>12/15/2009 by Frank Kraft (kraftf)</td>
<td>Last Modification:</td>
<td>06/07/2010 by Anita James (james)</td>
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### Alias Course Info

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<tr>
<td>Course Short Name:</td>
<td>STIRLING CYCLE ANALYSIS</td>
</tr>
<tr>
<td>Course Long Name:</td>
<td>Stirling Cycle Machine Analysis</td>
</tr>
<tr>
<td>Credit Hours:</td>
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<tr>
<td>Course Description:</td>
<td>Analysis and simulation of Stirling cycle machines, in which the single phase working gas operates in a closed thermal power cycle. Development and use of computer simulation techniques to model the nonsteady flow conditions including thermodynamics, heat transfer, and fluid flow friction effects.</td>
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<tr>
<td>Course Prerequisites:</td>
<td>MATH 344 &amp; ME 328 &amp; CE 340 &amp; (ME 412 OR CONCURRENT)</td>
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<td>Course Short Name:</td>
<td>DES STIRL MACHINE</td>
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<tr>
<td>Course Long Name:</td>
<td>Design of Stirling Machines</td>
</tr>
<tr>
<td>Credit Hours:</td>
<td>3.0</td>
</tr>
<tr>
<td>Course Description:</td>
<td>Introduction to the design process. Stirling machine design procedures--scaling, heat exchanger sizing, pV sizing; configurations--crank, hybrid and free piston machines; examination and comparison of existing designs; general issues--materials, stress (fatigue, creep, rupture), seals and bearings, balancing; heat exchanger design, heat transport systems and burners. Group design projects may typically be one of the following: appropriate technology FPSE, regenerator test rig, free cylinder engine with linear alternator, simple crank engine, cooler, free-piston alpha engine, Ringbom engine, Rallis engine.</td>
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<td>Course Prerequisites:</td>
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### Semester Course Info

<table>
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<td>Course Prefix:</td>
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<tr>
<td>Course Number:</td>
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<tr>
<td>Course Short Name:</td>
<td>STIRLING CYCLE ANALYSIS</td>
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<tr>
<td>Course Long Name:</td>
<td>Stirling Cycle Machine Analysis</td>
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<tr>
<td>Department/School:</td>
<td>ME (Mechanical Engineering)</td>
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<tr>
<td>College:</td>
<td>ENT (Engineering and Technology, Russ College of)</td>
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| Course Description: | Analysis and simulation of Stirling cycle machines, in which the single phase working gas operates in a closed thermal power cycle. Development and use of computer simulation techniques to model the non-steady flow conditions including thermodynamics, heat transfer, and fluid flow friction effects. |

### Additional Resources:

**Outcome Goals:**

1. Understanding of convective heat exchanger scaling parameters.
2. Ability to extend the ideal adiabatic computer simulation to include the heat transfer and flow friction effects of all three heat exchangers on the performance of the Stirling cycle machine.
3. Ability to perform parametric sensitivity analyses, a required step in design optimization.
4. Ability to analyze and simulate Stirling cycle machines, including the use of ideal isothermal and ideal adiabatic models in which all three heat exchangers are considered to be perfect.
5. Awareness of the operating principles, history, and development of Stirling cycle machines including both engines and heat pumps and their renewed relevance in the current energy and global warming crises.
6. Ability to extend the ideal adiabatic model to include a regenerator effectiveness of less than unity and to compute its effect on the performance of the Stirling cycle machine.
7. Understanding of convective heat exchanger scaling parameters and an ability to extend the ideal adiabatic computer simulation to include the heat transfer and flow friction effects of all three heat exchangers on the performance of the Stirling cycle machine.
### Prerequisites

Prerequisite Text:

**Prerequisites:**

- **No Credit - Sequence:** No credit for this course if taken after the following:
- **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

### Course Content

#### Course ID: ME 5220

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Course Topics:  

Course Topic Notes:
**Alias Course Info**

- **Course ID:** M E 423
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** FUEL CELL DESIGN
- **Course Long Name:** Fuel Cell Analysis, Design, and Development
- **Credit Hours:** 3.0
- **Course Description:** Design of fuel cells using analytical tools, based on thermodynamic and electrochemistry.
- **Course Prerequisites:** CHEM 151 & (M E 328 OR CH E 305)

- **Course ID:** M E 484
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 02: A-F,PR,WP,WF,FN,FS,AU,I
- **Course Short Name:** PROJECTS IN THERMAL MACHI
- **Course Long Name:** Projects in Thermal Machinery
- **Credit Hours:** 3.0
- **Course Description:** Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required.

**Semester Course Info**

- **Course ID:** ME 5230
- **Course Prefix:** ME
- **Course Number:** 5230
- **Course Short Name:** FUEL CELL DESIGN
- **Course Long Name:** Fuel Cell Analysis, Design, and Development
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** EVERY OTHER YEAR
- **Typical Terms Offered:** Spring
- **Course Description:** Design of fuel cells using analytical tools, based on thermodynamic and electrochemistry.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Ability to identify key design aspects of the major types of fuel cells.
    2. Ability to determine optimal fuel cell systems for various power applications.
    3. Ability to calculate thermodynamic effects of the fuel cell system balance of plant.
    4. Ability to demonstrate proper fuel cell testing laboratory skills.
    5. Ability to predict fuel cell behavior (voltage, current, power, and impedance) using electrochemical and thermodynamic calculations.

**Prerequisites**

- **Prerequisite Text:**
  - **Prerequisites:**
    - No Credit - Sequence: No credit for this course if taken after the following:
    - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
    - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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## Course Topics:

Course Topic Notes:
Alias Course: M E 427, M E 485 | Semester Course: ME 5270

General Info

Document Description: Alias Course: M E 427, M E 485 | Semester Course: ME 5270
Document ID: 104347
Document Type: COMPOSITE
Document Status: COMPLETED - UCC
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 12/22/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 427
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: POWER STATION ENGINEERING
Course Description: Fuels, principles of combustion, stationary boilers, grates, stokers, furnaces, coal pulverizers, economizers, preheaters, superheaters, stacks, forced and induced draft, boiler-feed pumps, heat balances, and hydro power. 3 lec.
Credit Hours: 3.0
Course Prerequisites: M E 328 & 412

Course ID: M E 485
GenEd Code: N/A
Grade Eligibility Code: 02: A-F,PR,WP,WF,FN,FS,AU,I
Course Short Name: PROJECTS IN THERMAL MACH2
Course Description: Continuation of 484. Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required.
Credit Hours: 3.0
Course Prerequisites:

Semester Course Info

Course ID: ME 5270
Course Prefix: ME
Course Number: 5270
Course Short Name: POWER STATION ENGINEERING
Course Description: Fuels, principles of combustion, stationary boilers, grates, stokers, furnaces, coal pulverizers, economizers, preheaters, superheaters, stacks, forced and induced draft, boiler-feed pumps, heat balances, and hydro power.
Credit Hours: 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Spring

College: ENT (Engineering and Technology, Russ College of)
Department/School: ME (Mechanical Engineering)
Grade Eligibility:
Repeat/Retake:

Additional Resources:
Outcome Goals:
1. Ability to identify and describe methods of energy conversions to electricity.
2. Ability to maximize efficiency/power or minimize cost with respect to generation of electricity.
3. Ability to determine capital and operating costs of a typical power plant.
4. Ability to determine optimal technique to control negative environmental aspects associated with the technique used to generate electricity.
5. Perform cost-benefit analysis on alternative power generation or pollution control capital projects.

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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Alias Course Info

Course ID: M E 429
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ROBOTIC MANIPULATORS
Course Long Name: Mechanics and Control of Robotic Manipulators
Credit Hours: 4.0
Course Description: Classification and applications for mechanical manipulator systems. Manipulator motion description, forward kinematics transformations, and solution of inverse kinematics equations. Velocity kinematics and manipulator dynamics equations. Trajectory generation and control schemes including sensory feedback. Laboratory exercises to augment lecture material. Co-listed with EE 429.
Course Prerequisites: SR ONLY

Semester Course Info

Course ID: ME 5290
Course Prefix: ME
Course Number: 5290
Course Short Name: ROBOTIC MANIPULATORS
Course Long Name: Mechanics and Control of Robotic Manipulators
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall
Course Description: Classification and applications for mechanical manipulator systems. Manipulator motion description, forward kinematics transformations, and solution of inverse kinematics equations. Velocity kinematics and manipulator dynamics equations. Trajectory generation and control schemes including sensory feedback. Laboratory exercises to augment lecture material.

Additional Resources:
Outcome Goals:
1. Ability to perform robot trajectory generation.
2. Familiarity with pose (position and orientation) mathematics via transform matrices.
3. Familiarity with applications, architectures, and control methods for serial robot arms.
4. Ability to solve forward and inverse pose kinematics equations.
5. Familiarity with parallel robots, redundant robots, and robot dynamics.

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:
Course Topic Notes:
Alias Course: M E 431 | Semester Course: ME 5310

General Info

Document Description: Alias Course: M E 431 | Semester Course: ME 5310
Document ID: 102289
Document Type: EXPEDITED
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 10/28/2009 by Merry Cibula (cibula)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 431
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ATM POLLUTION CONTROL
Course Long Name: Atmospheric Pollution Control
Credit Hours: 4.0
Course Description: Sources of air pollution from major industries, internal combustion engines, and other sources. Techniques for measuring particulate and gaseous pollutants in atmosphere and at their source. Current techniques and future possibilities for control of air pollution. Bases for air pollution legislation.
Course Prerequisites: CH E 307 OR (M E 321 & C E 340)

Semester Course Info

Course ID: ME 5310
Course Prefix: ME
Course Number: 5310
Course Short Name: POLLUTION CONTROL
Course Long Name: Atmospheric Pollution Control
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: EVERY OTHER YEAR
Typical Terms Offered: Fall
Course Description: Sources of air pollution from major industries, internal combustion engines, and other sources. Techniques available for measuring particulate and gaseous pollutants in atmosphere and at their sources. Techniques available for control and future possibilities for control of air pollution.
Additional Resources:
Outcome Goals:
1. Ability to account for the effect of chemical equilibrium and dissociation on reaction thermodynamics and combustion kinetics.
2. Understand how engineering principles are used to control air pollution.
3. Understand numerical models and principles pertinent to air pollution engineering.
4. Develop skills to impact the changing field of air pollution engineering.
5. Tour a full-scale facility using state-of-the-art air pollution control devices.
6. Ability to perform calculations related to combustion thermodynamics (flame temp).

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course ID: ME 5310
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Course Topics:

Course Topic Notes:
Alias Course: M E 432 | Semester Course: ME 5320

General Info

Document Description: Alias Course: M E 432 | Semester Course: ME 5320
Document ID: 103776
Document Type: EXPEDITED
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 12/10/2009 by Merry Cibula (cibula)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 432
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ANALYSIS/SIMULATION TRANSPT
Course Long Name: Analysis and Simulation of Transportation Processes
Credit Hours: 4.0
Course Description: Use of CFD software to study conduction, convection, and radiation. Analyze governing equations by simulation and visualization. Fundamentals of CFD programming.
Course Prerequisites: M E 412

Semester Course Info

Course ID: ME 5320
Course Prefix: ME
Course Number: 5320
Course Short Name: TRANSPORT PROCESSES
Course Long Name: Analysis and Simulation of Transport Processes
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Spring
Course Description: Use of CFD software to study conduction, convection, and radiation. Analyze governing equations by simulation and visualization. Fundamentals of CFD programming.
Additional Resources: Outcome Goals:
1. Solve 1-D, 2-D and 3-D problems of conduction, convection and radiation.
2. Select appropriate numerical technique and boundary conditions.
3. Interpret solutions in terms of the governing equations.
4. Use of CFD software to develop model for thermal transport.

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Components:

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Course Topics:
Course Topic Notes:
Alias Course: M E 434 | Semester Course: ME 5340

General Info

Document Description: Alias Course: M E 434 | Semester Course: ME 5340
Document ID: 102806
Document Type: EXPEDITED
Contact Name: Frank Kraft
Desigee Name: Merry Cibula
Creation Info: 11/17/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 434
GenEd Code: N/A
Grade Eligibility Code: 03: A-F,CR,WP,WF,FN,FS,AU,I
Course Short Name: AEROSOLS BEHAVIOR
Course Long Name: Fundamentals of Aerosol Behavior
Credit Hours: 4.0
Course Description: Aerosol characterization transport properties, convective and inertial deposition, light scattering and visibility, experimental methods, coagulation, gas to particle conversion, general dynamic equation for aerosols.
Course Prerequisites: M E 321 & 412

Semester Course Info

Course ID: ME 5340
Course Prefix: ME
Course Number: 5340
Course Short Name: AEROSOLS BEHAVIOR
Course Long Name: Fundamentals of Aerosol Behavior
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: EVERY OTHER YEAR
Typical Terms Offered: Fall
Course Description: Aerosol characterization transport properties, convective and inertial deposition, light scattering and visibility, experimental methods, coagulation, gas to particle conversion, general dynamic equation for aerosols.

Additional Resources:
Outcome Goals:
1. Understand numerical models and principles pertinent to aerosol mechanics.
2. Collect and apply standard laboratory techniques to the analysis of aerosol data.
3. Examine the use of aerosols in advanced manufacturing processes.
4. Explore how engineering principles are used to manipulate aerosols.
5. Apply the general dynamic equation of aerosol formation.
6. Understand the role of aerosols in atmospheric pollution.

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 5340
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Course Topics:
Course Topic Notes:
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<tr>
<td>Short Name</td>
<td>ENERGY ENGINEERING &amp; MANMNT</td>
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<tr>
<td>Long Name</td>
<td>Energy Engineering and Management</td>
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<td>Credit Hours</td>
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**Course Description:**
Basic concepts and objectives of energy management, energy audit, engineering evaluation of several energy systems, availability analysis, second law efficiency, economic evaluation, and application of these principles to case studies.

**Course Prerequisites:**

- Course ID: M E 435
- GenEd Code: N/A
- Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
- Short Name: ENERGY ENGINEERING & MANMNT
- Long Name: Energy Engineering and Management
- Credit Hours: 3.0
- Course Description: Continuation of 484. Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required.

**Course Prerequisites:**

### Semester Course Info

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**Typical Offer Frequency:** YEARLY

**Typical Terms Offered:** Spring

**Course Description:** Application of the Law of Conservation of Matter, Law of Conservation of Energy, and considerations of efficiency, economic impact and environmental impact to the analysis of the relative merits of conventional and alternative energy sources for industrial, residential, and transportation use.

**Additional Resources:**

**Outcome Goals:**

1. Ability to apply conservation laws, efficiency considerations, and economic and environmental impact to analyze the relative merits of conventional and alternative energy sources for industrial, residential and transportation use.
2. Understand the chemical reactions and mechanical systems involved when specific conventional and alternative energy sources are developed and used in industrial, residential, and transportation contexts.
3. Ability to compare and contrast the availability, efficiency, cost, and environmental impact of specific conventional and alternative energy sources used in industrial, residential, and transportation contexts.
4. Ability to select an appropriate energy source or combination of energy sources for a specific industrial, residential, or transportation application, and to justify that selection.
5. Understand, quantitatively, current and projected global energy usage and availability.
6. Become aware of some current U.S. and global political and legal issues related to energy usage.
7. Ability to identify outstanding scientific or technical issues that must be resolved in order to make specific conventional or alternative energy sources more attractive options for the future.
Prerequisites

Prerequisite Text:

Prerequisites:

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:

Course Topic Notes:
**Alias Course: M E 440 | Semester Course: ME 5400**

**General Info**

- **Document Description:** Alias Course: M E 440 | Semester Course: ME 5400
- **Document ID:** 104554
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Document Version:** 1.0
- **Contact Oak ID:** kraftf
- **Designee Name:** Merry Cibula
- **Designee Oak ID:** cibula
- **Creation Info:** 12/29/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

**Alias Course Info**

- **Course ID:** M E 440
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** DIRECT ENERGY CONVERSION
- **Course Long Name:** Direct Energy Conversion
- **Credit Hours:** 4.0
- **Course Description:** General principles of unconventional energy conversion. Thermoelectricity, thermionics, MHD, fuel cells, photovoltaics, wind systems, solar systems, and energy storage.

**Course Prerequisites:**

- None specified.

**Semester Course Info**

- **Course ID:** ME 5400
- **Course Prefix:** ME
- **Course Number:** 5400
- **Course Short Name:** DIRECT ENERGY CONVERSION
- **Course Long Name:** Direct Energy Conversion
- **Department/School:** ME (Mechanical Engineering)
  - College: ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Fall
- **Course Description:** General principles of conventional and unconventional energy conversion. Analysis of multiple energy processes, including but not limited to photovoltaic, wind, electrochemical, thermovoltaic, combustion (Otto, Diesel, Brayton, and Rankine), refrigeration, and nuclear.

**Additional Resources:**

- **Outcome Goals:**
  1. Ability to compare and contrast the fuel availability for multiple conversion processes.
  2. Understand basic operation of energy conversion processes, including photovoltaic, wind, electrochemical, thermovoltaic, combustion (Otto, Diesel, Brayton, and Rankine), refrigeration, and nuclear, both direct and indirect conversions.
  3. Have awareness of the framework for energy conversion processes, including the economic, socio-economic, political, historical, and environmental contexts.
  4. Ability to design an energy conversion, power generation, or power savings system, by narrowing the problem focus, making good assumptions, using proper analyses, and making design choices consistent with political, legal and ethical contexts.
  5. Ability to analyze conversion efficiencies of multiple energy processes, including but not limited to photovoltaic, wind, electrochemical, thermovoltaic, combustion (Otto, Diesel, Brayton, and Rankine), refrigeration, and nuclear.
  6. Ability to convert between unit systems as related to power and energy.

**Prerequisites**

- **Prerequisite Text:**
  - No Credit - Sequence: No credit for this course if taken after the following:
  - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
  - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

**Course Content**

- **Course ID:** ME 5400

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</table>
Course Description:
Inviscid flow theory. General equations of fluid dynamics, study of potential flow. Grad-level course open to selected undergrads.

Course Prerequisites:
- C E 340

Outcomes Goals:
1. Ability to interpret, explain and problem solve applying Navier Stokes equations.
3. Ability to interpret, explain and problem solve applying hydrostatics principles.
4. Ability to interpret, explain and problem solve applying the continuity equation.

Prerequisites
Prerequisite Text:

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Alias Course: M E 447 , M E 493 | Semester Course: ME 5470

General Info

Document Description: Alias Course: M E 447 , M E 493 | Semester Course: ME 5470

Document ID: 104302

Document Version: 1.0

Document Status: COMPLETED - UCC

Contact Name: Frank Kraft

Contact Oak ID: kraftf

Designee Name: Merry Cibula

Designee Oak ID: cibula

Creation Info: 12/21/2009 by Frank Kraft (kraftf)

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 447

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: VISCOS FLOW THEORY

Course Long Name: Viscous Flow Theory

Credit Hours: 3.0

Course Description: Mechanics of fluid resistance, laminar and turbulent flow. Applications to external boundary layer flow and to flow in ducts. Grad-level course open to selected undergrads.

Course Prerequisites:

Course ID: M E 493

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: LUBRICATION BEARING ANALY

Course Long Name: Lubrication and Bearing Analysis

Credit Hours: 3.0

Course Description: Concepts of boundary, hydrostatic, and hydrodynamic lubrication. McKee, and Boyd and Raimondi methods. Solid lubrication, porous bearings, and gas bearings.

Course Prerequisites:

Semester Course Info

Course ID: ME 5470

Course Prefix: ME

Course Number: 5470

Course Short Name: VISCOS FLOW THEORY

Course Long Name: Viscous Flow Theory

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours

Typical Offer Frequency: INFREQUENT

Typical Terms Offered: Spring

Course Description: Mechanics of fluid resistance, laminar and turbulent flow. Applications to external boundary layer flow, and to flow in ducts.

Additional Resources:

Outcome Goals:

1. Ability to use Navier-Stokes equations to find flow field in one and two dimensional flows.
2. Ability to use basic principles to formulate governing equations for viscous flow.
3. Ability to determine qualitative results for flow field and wall friction by scale analysis.
4. Ability to solve laminar and turbulent flow problems.

Prerequisites

Prerequisite Text:

Prerequisites:

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
## Course Content

**Course ID:** ME 5470

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**Course Topics:**

**Course Topic Notes:**
Alias Course: ME 455 | Semester Course: ME 5550

General Info

Document ID: 102281
Document Version: 1.0
Document Status: COMPLETED - UCC
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 10/29/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 455
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, WF, FN, FS, AU, I
Course Short Name: MECHATRONICS I
Course Long Name: Mechatronics I
Credit Hours: 4.0
Course Description: Principles of design of computer-based, intelligent machines. Microprocessor/microcomputer fundamentals, input-output sensors and actuators, computer achievement of machine kinematics, robot-control techniques, lab experience in microprocessor-machine interfacing.
Course Prerequisites: E E 314 & MATH 344 & M E 224

Semester Course Info

Course ID: ME 5550
Course Prefix: ME
Course Number: 5550
Course Short Name: MECHATRONICS I
Course Long Name: Mechatronics I
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F, WP, WF, FN, FS, AU, I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall, Spring
Course Description: Design of intelligent devices. Interfacing of micro- and minicomputers with machines. Microprocessor characteristics, actuator characteristics, visual pattern recognition, design of devices. Theory and laboratory.

Additional Resources:
Outcome Goals:
1. Develop an understanding of how mechanical and electrical systems are integrated.
2. Develop an ability to design Mechatronics systems.
3. Learn how to interface a microcontroller with various sensors and actuators.
4. Form an understanding of microcontroller functions and capabilities.

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 5550

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Course Topics:
Course Topic Notes:
Alias Course Info

- **Course ID:** M E 462
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 04: A-F, CR, PR, WP, WF, FN, FS, AU, I
- **Course Short Name:** MANUFACTURING PROCESSES
- **Course Long Name:** Manufacturing Processes
- **Credit Hours:** 4.0
- **Course Description:** The basic theory of plasticity and its application to manufacturing processes. Applied theories of metal working processes such as forging, extrusion, rolling, and some aspects of machining; theories of polymer processing, composite and reinforced materials processing use of application of materials information systems (MIS), and mapping techniques.

Semester Course Info

- **Course ID:** ME 5620
- **Course Prefix:** ME
- **Course Number:** 5620
- **Course Short Name:** METAL FORMING
- **Course Long Name:** Mechanics of Metal Forming
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Spring
- **Course Description:** The basic theory of plasticity and its application to manufacturing processes. Classical techniques in metal working analysis, such as Slip Line Field, Upper Bound and Slab analyses. Review and analysis of forging, extrusion, rolling, drawing, sheet metal forming, etc. Concepts of work in metal deformation. Deformation zone geometry and its implications on properties and defects. Friction and lubrication in metal working. Temperature effects.

Additional Resources:

**Outcome Goals:**

1. Understand the concept of ideal, friction and redundant work in metal forming operations.
2. Ability to solve metal forming problems using classical analytical techniques.
3. Understand plastic material behavior, and strain rate and temperature effects.
4. Ability to use basic friction models in metal working analyses.
5. Understand basic concepts of stress and strain, and plasticity theory.

Prerequisites

- **Prerequisite Text:** No credit - Sequence: No credit for this course if taken after the following:
- **Prerequisites:**
  - No Credit - Sequence: No credit for this course if taken after the following:
  - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
  - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Alias Course: M E 463 | Semester Course: ME 5630

General Info

Document Description: Alias Course: M E 463 | Semester Course: ME 5630
Document ID: 102858
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 11/18/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 463
GenEd Code: N/A
Grade Eligibility Code: 01: A-F, WP, WF, FN, FS, AU, I
Course Short Name: MECHANICAL METALLURGY
Course Long Name: Mechanical Behavior and Metallurgy of Materials
Credit Hours: 4.0
Course Description: Relationship of mechanical properties to internal structure, i.e., both microstructure and macrostructure. Micromechanical strengthening mechanism of metals and alloys. Elastic and plastic behavior. Fatigue and fracture behavior and mechanisms. Single crystal deformation and dislocation theory. Ductile and brittle materials testing. Plastic forming of metals. Quantitative microscopy.
Course Prerequisites: CH E 231 & SR ONLY & ENT MAJOR

Semester Course Info

Course ID: ME 5630
Course Prefix: ME
Course Number: 5630
Course Short Name: MECH MATERIALS
Course Long Name: Mechanics of Materials
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F, WP, WF, FN, FS, AU, I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall
Course Description: Mechanical properties of materials. Stress and strain tensors. Basic elasticity, plasticity, fatigue behavior and fracture mechanics. Single crystal deformation and dislocation theory. Strengthening mechanisms. Constitutive equations.
Additional Resources:

Outcome Goals:
1. Determine and manipulate stress and strain tensors
2. Ability to solve elastic and plastic stress/strain problems
3. Understand basic mechanical properties of materials and testing methods
4. Understand crystal defects and relationship to strengthening mechanisms
5. Understand basic constitutive relationships

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 5630
Course Components:

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Course Topics:
Course Topic Notes:
**Alias Course Info**

- **Course ID:** M E 466
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** BIOSOLID MECHANICS
- **Course Long Name:** Mechanics of Biological Solids
- **Credit Hours:** 4.0
- **Course Description:** Structure and functional properties of connective tissue. Techniques for determining the mechanical response of biological soft and hard tissues. Includes static, viscoelastic, creep, fatigue and fracture. Simplified models of biological structures. Creation of geometric models from medical imaging and computational modeling. Specific topics may include bone, cartilage, ligaments, tendon, teeth, and skin.

**Course Prerequisites:** M E 303

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**Semester Course Info**

- **Course ID:** ME 5660
- **Course Prefix:** ME
- **Course Number:** 5660
- **Course Short Name:** BIOSOLID MECHANICS
- **Course Long Name:** Mechanics of Biological Solids
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** EVERY OTHER YEAR
- **Typical Terms Offered:** Fall
- **Course Description:** Structure and functional properties of connective tissue. Techniques for determining the mechanical response of biological soft and hard tissues. Includes static, viscoelastic, creep, fatigue and fracture. Simplified models of biological structures. Creation of geometric models from medical imaging and computational modeling. Specific topics may include bone, cartilage, ligaments, tendon, teeth, and skin.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Describe the structure of specific biological tissues and relate the structure to mechanical properties.
    2. Plan a mechanical test for a biological tissue.
    3. Describe appropriate material models for biological tissues based upon the application.
    4. Apply principles of continuum mechanics, elasticity, energy methods, and beam theory to biological structures.
    5. Explain methods for medical imaging and identification of tissues, and describe techniques involved in computational modeling.

---

**Prerequisites**

- **Prerequisite Text:**
  - **Prerequisites:**
    - No Credit - Sequence: No credit for this course if taken after the following:
    - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
    - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Alias Course: M E 494  |  Semester Course: ME 5740

Course Description:
Advanced considerations in design and analysis of machine members, strength under combined stress, thermal stress, fatigue in metals, and design using plastics. 3 lec.

Course Prerequisites:

Outcome Goals:
1. Ability to apply advanced analytical techniques for design analysis.
2. Ability to include thermal stress considerations in a design analysis.
3. Ability to complete a preliminary design of a plastic component.

Prerequisites

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:

Course Topic Notes:
Alias Course Info

| Course ID: | M E 475 |
| GenEd Code: | N/A |
| Grade Eligibility Code: | 01: A-F, WP, WF, FN, FS, AU, I |
| Course Short Name: | SOLAR DESIGN |
| Course Long Name: | Solar Design |
| Credit Hours: | 3.0 |
| Course Description: | Introduction to theoretical principles and practical design aspects of solar energy systems. Topics covered include principles of radiation; heating load computation; air and liquid, flat-plate collectors; concentrating collectors; energy storage; photovoltaic conversion; economic analysis. |

Course Prerequisites: MATH 263C & PHYS 253

| Course ID: | M E 484 |
| GenEd Code: | N/A |
| Grade Eligibility Code: | 02: A-F, PR, WP, WF, FN, FS, AU, I |
| Course Short Name: | PROJECTS IN THERMAL MACHI |
| Course Long Name: | Projects in Thermal Machinery |
| Credit Hours: | 3.0 |
| Course Description: | Research in thermal machines. Individual work on experimental or analytical project involving current problems. Training in use of library, theory and use of instruments, error analysis, planning of experiments, effective report writing. Students should take two-term sequence to allow adequate time for completion of meaningful project. Report required. |

Semester Course Info

| Course ID: | ME 5750 |
| Course Prefix: | ME |
| Course Number: | 5750 |
| Course Short Name: | SOLAR DESIGN |
| Course Long Name: | Solar Design |
| Department/School: | ME (Mechanical Engineering) |
| College: | ENT (Engineering and Technology, Russ College of) |
| Credit Hours: | FIXED | 3.0 hours |
| Grade Eligibility: | 01: A-F, WP, WF, FN, FS, AU, I |
| Repeat/Retake: | REPEATABLE | Max Repeat Hours: 3 hours |
| Typical Offer Frequency: | INFREQUENT |
| Typical Terms Offered: | Fall |
| Course Description: | Introduction to theoretical principles and practical design aspects of solar energy systems. Topics covered include principles of radiation; heating load computation; air and liquid, flat-plate collectors; concentrating collectors; energy storage; photovoltaic conversion; economic analysis. |

Additional Resources:

Outcome Goals:

1. Awareness of energy storage options and challenges.
2. Ability to evaluate a variety of methods of converting solar energy into usable electric energy and discuss the advantages and challenges of each.

Prerequisites

Prerequisite Text:

Prerequisites:

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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Alias Course: M E 476   | Semester Course: ME 5760

General Info

- **Document Description:** Alias Course: M E 476   | Semester Course: ME 5760
- **Document ID:** 102823
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 11/17/2009 by Merry Cibula (cibula)
- **Document Version:** 1.0
- **Document Status:** COMPLETED - UCC
- **Contact Oak ID:** kraftf
- **Designee Oak ID:** cibula
- **Last Modification:** 06/07/2010 by Anita James (james)

Alias Course Info

- **Course ID:** M E 476
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** AUTOMOTIVE ENGINEERING
- **Course Long Name:** Automotive Engineering
- **Credit Hours:** 4.0
- **Course Description:** Overview of automotive engineering, including modeling, simulation, design, and testing of land vehicle systems with emphasis on performance, safety, fuel economy, and emissions. Broad exposure to all topics through case studies.
- **Course Prerequisites:** M E 304

Semester Course Info

- **Course ID:** ME 5760
- **Course Prefix:** ME
- **Course Number:** 5760
- **Course Short Name:** AUTOMOTIVE ENGINEERING
- **Course Long Name:** Automotive Engineering
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** EVERY OTHER YEAR
- **Typical Terms Offered:** Spring
- **Course Description:** Overview of automotive engineering, including modeling, simulation, design, and testing of land vehicle systems with emphasis on performance, safety, fuel economy, and emissions. Broad exposure to all topics through case studies.
- **Additional Resources:**
- **Outcome Goals:**
  1. A knowledge of future vehicles and advanced automotive technologies.
  2. A knowledge of testing of vehicle performance and fuel economy.
  3. An ability to model and simulate the longitudinal performance of a vehicle.
  4. An expertise in at least one aspect of automotive engineering.
  5. A knowledge of basic automotive systems and subsystems.

Prerequisites

- **Prerequisite Text:**
- **Prerequisites:**
  - No Credit - Sequence: No credit for this course if taken after the following:
  - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
  - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

- **Course ID:** ME 5760
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- **Course Topics:**
- **Course Topic Notes:**

Page 134 of 193
**Alias Course: M E 477 | Semester Course: ME 5770**

### General Info

**Document Description:** Alias Course: M E 477 | Semester Course: ME 5770  
**Document ID:** 102805  
**Document Type:** EXPEDITED  
**Contact Name:** Frank Kraft  
**Designee Name:** Merry Cibula  
**Creation Info:** 11/17/2009 by Frank Kraft (kraftf)

**Document Version:** 1.0  
**Document Status:** COMPLETED - UCC  
**Contact Oak ID:** kraftf  
**Designee Oak ID:** cibula  
**Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info

- **Course ID:** M E 477  
- **GenEd Code:** N/A  
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I  
- **Course Short Name:** VEHICLE SYSTEMS DESIGN  
- **Course Long Name:** Vehicle Systems Design  
- **Credit Hours:** 4.0  
- **Course Description:** Introduction to the systems engineering design process for land and air vehicles through case studies and projects. Examines the process for developing a first layout for a new vehicle platform, including setting requirements, generating concepts, and predicting performance. Technical, economic, environmental and social aspects are considered.

### Semester Course Info

- **Course ID:** ME 5770  
- **Course Prefix:** ME  
- **Course Number:** 5770  
- **Course Short Name:** VEHICLE SYSTEMS DESIGN  
- **Course Long Name:** Vehicle Systems Design  
- **Department/School:** ME (Mechanical Engineering)  
- **College:** ENT (Engineering and Technology, Russ College of)  
- **Credit Hours:** FIXED | 3.0 hours  
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I  
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours  
- **Typical Offer Frequency:** INFREQUENT  
- **Typical Terms Offered:** Fall  
- **Course Description:** Introduction to the systems engineering design process for land and air vehicles through case studies and projects. Examines the process for developing a first layout for a new vehicle platform, including setting requirements, generating concepts, and predicting performance. Technical, economic, environmental and social aspects are considered.

### Additional Resources

**Outcome Goals:**

1. An ability to complete a system-level layout for a land vehicle based on a set of requirements.
2. A familiarity with current land and air vehicle platforms.
3. An ability to complete a system-level layout for an aeronautical vehicle based on a set of requirements.
4. An ability to complete a performance simulation of an automotive vehicle.
5. A knowledge of systems engineering.

### Prerequisites

**Prerequisite Text:**

**Prerequisites:**

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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### Course Topics

**Course Topic Notes:**
Alias Course: M E 580 | Semester Course: ME 5800

General Info

Document Description: Alias Course: M E 580 | Semester Course: ME 5800

Document ID: 102387
Document Version: 1.0

Contact Name: Frank Kraft
Contact Oak ID: kraftf

Designee Name: Merry Cibula
Designee Oak ID: cibula

Creation Info: 11/02/2009 by Frank Kraft (kraftf)

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 580
GenEd Code: N/A
Grade Eligibility Code: 03: A-F, CR, WP, WF, FN, FS, AU, I
Course Short Name: GRAD COLLOQUIUM
Course Long Name: Graduate Colloquium
Credit Hours: 1.0

Course Description: Structured as an open graduate colloquium for discussion of present research topics as well as possible future areas of interest. Guest speakers, faculty, and graduate students presenting the results of their investigations, with discussion moderated by speakers.

Course Prerequisites: 

Semester Course Info

Course ID: ME 5800
Course Prefix: ME
Course Number: 5800
Course Short Name: GRAD COLLOQUIUM
Course Long Name: Graduate Colloquium
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 1.0 hours
Grade Eligibility: 04: A-F, CR, PR, WP, WF, FN, FS, AU, I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 999 hours

Typical Offer Frequency: YEARLY
Typical Terms Offered: Fall, Spring

Course Description: Structured as an open graduate colloquium for discussion of research topics, as well as possible future areas of interest. Guest speakers, faculty, and graduate students present results of their research, with discussions moderated by the speakers.

Additional Resources:

Outcome Goals:
1. Exposure of graduate students to current and diverse research in the ME department.
2. Exposure of graduate students to engineering related work in industry and government.
3. Exposure of graduate students to peer research efforts through student presentations.

Prerequisites

Prerequisite Text:

Prerequisites:

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course ID: ME 5800

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**Alias Course Info**

- **Course ID:** M E 589
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 04: A-F, CR, PR, WP, WF, FN, FS, AU, I
- **Course Short Name:** SPEC INVESTIGATIONS
- **Course Long Name:** Special Investigation
- **Credit Hours:** 0.0
- **Course Description:** Seminar contents varies.
- **Course Prerequisites:**

**Semester Course Info**

- **Course ID:** ME 5930
- **Course Prefix:** ME
- **Course Number:** 5930
- **Course Short Name:** SPEC INVESTIGATION
- **Course Long Name:** Special Investigation
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** VARIABLE | 1.0 - 4.0 hours
- **Grade Eligibility:** 04: A-F, CR, PR, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 999 hours
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Fall, Spring, Full Summer
- **Course Description:** An opportunity for graduate faculty to offer a one-time special topics course, or for students to select a special topic that is not covered in the current offerings of the University and study that topic under the mentor-ship of a qualified faculty member.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Knowledge in the specialized content areas selected for investigation.
    2. Ability to learn independently, with appropriate guidance.

**Prerequisites**

- **Prerequisite Text:** PERMISSION REQUIRED
- **Prerequisites:**
  - **No Credit - Sequence:** No credit for this course if taken after the following:
  - **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
  - **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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**Course Topic Notes:**
### General Info

- **Document Description**: Alias Course: M E 495  | Semester Course: ME 5950
- **Document ID**: 102286
- **Document Type**: EXPEDITED
- **Contact Name**: Frank Kraft
- **Designee Name**: Merry Cibula
- **Creation Info**: 10/29/2009 by Merry Cibula (cibula)
- **Last Modification**: 06/07/2010 by Anita James (james)

### Alias Course Info

- **Course ID**: M E 495
- **GenEd Code**: N/A
- **Grade Eligibility Code**: 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name**: KINETIC THEORY&STAT THERM
- **Course Long Name**: Introduction to Kinetic Theory and Statistical Thermodynamics
- **Credit Hours**: 4.0
- **Course Description**: Kinetic theory, classical and quantum statistical mechanics with applications to engineering devices. 3 lec.

### Semester Course Info

- **Course ID**: ME 5950
- **Course Prefix**: ME
- **Course Number**: 5950
- **Course Short Name**: KINETIC THEORY AND THERMO
- **Course Long Name**: Introduction to Kinetic Theory and Statistical Thermodynamics
- **Department/School**: ME (Mechanical Engineering)
- **College**: ENT (Engineering and Technology, Russ College of)
- **Credit Hours**: FIXED | 3.0 hours
- **Grade Eligibility**: 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake**: REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency**: YEARLY
- **Typical Terms Offered**: Spring
- **Course Description**: Kinetic theory, classical and quantum statistical mechanics with applications to engineering devices.

### Additional Resources

- **Outcome Goals**:
  1. Determine combustion thermodynamics, such as flame temperature.
  2. Perform calculations to balance reactions.
  3. Use software such as EES to perform combustion calculations.
  4. Account for the effect of chemical equilibrium and dissociation on reaction thermodynamics and combustion kinetics.
  5. Identify applications of quantum mechanics to real systems.
  6. Utilize statistical thermodynamics to predict properties.
  7. Determine techniques of spectroscopy through application of statistical thermodynamics.

### Prerequisites

- **Prerequisite Text**:
- **Prerequisites**:
  - No Credit - Sequence: No credit for this course if taken after the following:
  - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
  - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

### Course Content

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Alias Course: M E 418, M E 496 | Semester Course: ME 5960

General Info

Document ID: 104065
Document Version: 1.0
Document Type: COMPOSITE
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 12/15/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 418
GenEd Code: N/A
Grade Eligibility Code: 02: A-F,PR,WF,FN,FS,AU,I
Course Short Name: MECH ENGR EXPERIMENTATION
Course Long Name: Mechanical Engineering Experimentation
Credit Hours: 1.0
Course Description: Instruction in experimental procedure and experience in designing and executing lab experiments. Students plan and execute their own experiments to acquire answers to assigned problems. Variety of areas covered including control systems, energy conversion, fluid flow, heat transfer, motion measurements, stress-strain. Instructional guidance provided by entire mechanical engineering staff. Provides familiarity with variety of instrumentation and procedures. Three-quarter sequence with experimental subjects phased with prerequisites.

Course Prerequisites: SR ONLY

Course ID: M E 496
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: EXPTL METHODS IN DESIGN
Course Long Name: Experimental Methods in Design
Credit Hours: 3.0
Course Description: Investigation and evaluation of experimental methods that may be used to obtain design and performance data. Techniques of photo-elasticity, strain measurements, and vibration measurement.

Course Prerequisites: M E 403

Semester Course Info

Course ID: ME 5960
Course Prefix: ME
Course Number: 5960
Course Short Name: EXPTL METHODS IN DESIGN
Course Long Name: Experimental Methods in Design
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Spring
Course Description: Investigation and evaluation of experimental methods that may be used to obtain design and performance data. Probability, statistics and principles of design of experiments (DOE) with application to thermo-mechanical experiments.

Additional Resources:
Outcome Goals:
1. Use probability and statistics to determine experimental uncertainty.
2. Use DOE principles to evaluate experimental results.
3. Use statistical tools to evaluate experimental data.
4. Design and set-up an experiment to study thermal and/or mechanical variables.

Prerequisites

Prerequisite Text:
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
## Course Content

**Course ID:** ME 5960

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**Course Topics:**  

**Course Topic Notes:**
## Alias Course: M E 601  |  Semester Course: ME 6010

### General Info
- **Document Description:** Alias Course: M E 601  |  Semester Course: ME 6010
- **Document ID:** 102370
- **Document Type:** COMPOSITE
- **Contact Name:** Frank Kraft
- **Contact Oak ID:** kraftf
- **Designee Name:** Merry Cibula
- **Designee Oak ID:** cibula
- **Creation Info:** 11/02/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info
- **Course ID:** M E 601
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F, WP, WF, FN, FS, AU, I
- **Course Short Name:** ADV SYS ANAL&CONT
- **Course Long Name:** Advanced System Analysis and Control
- **Credit Hours:** 3.0
- **Course Description:** The application of modern control theories to the synthesis of dynamical systems. Topics include the analysis of the behavior of linear systems, controllability and observability. Synthesis in the eigenvalue domain: modal control. Synthesis of stable systems and optimal linear systems in the time domain.
- **Course Prerequisites:** M E 401 & (MATH 211 OR 410 OR 411)

### Semester Course Info
- **Course ID:** ME 6010
- **Course Prefix:** ME
- **Course Number:** 6010
- **Course Short Name:** ADV SYS ANLYS AND CNTRL
- **Course Long Name:** Advanced System Analysis and Control
- **Department/School:** ME (Mechanical Engineering)
  - **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Fall
- **Course Description:** The application of modern control theories to the synthesis of dynamical systems. Topics include the analysis of the behavior of linear systems, controllability and observability. Synthesis in the eigenvalue domain: modal control. Synthesis of stable systems and optimal linear systems in the time domain.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Competence with applied linear algebra and MATLAB.
    2. Ability to model dynamical systems and convert to state-space description.
    3. Ability to solve coupled linear first-order ODEs, IVP.
    4. Understand concepts of controllability and observability applied to control of MIMO systems.
    5. Understand canonical state-space realizations.
    6. Understand stability, including Lyapunov analysis.
    7. Understand shaping of dynamic response.
    8. Ability to design and simulate linear state-space controllers.

### Prerequisites
- **Prerequisite Text:**
- **Prerequisites:**
  - **No Credit - Sequence:** No credit for this course if taken after the following:
  - **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
  - **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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Course Topics:

Course Topic Notes:
### General Info

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<td>Frank Kraft</td>
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<td>06/07/2010 by Anita James (james)</td>
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### Alias Course Info

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<td>Grade Eligibility Code:</td>
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<td>Course Short Name:</td>
<td>ROBOTICS</td>
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<tr>
<td>Course Long Name:</td>
<td>Mechanics and Control of Multi-Degree-of-Freedom-Systems I</td>
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<td>Credit Hours:</td>
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<tr>
<td>Course Description:</td>
<td>Techniques of analysis and design of multi-degree of freedom planar and spatial mechanical systems: kinematic structure, coordinate transformations, inverse solutions, workspace, path selection, dynamics, and control.</td>
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### Semester Course Info

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<td>Typical Offer Frequency:</td>
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### Typical Terms Offered: Spring

**Course Description:** Techniques of analysis and design of multi-degree-of-freedom planar and spatial mechanical systems: kinematic structure, coordinate transformations, inverse solutions, workspace, path selection, dynamics, and control. Kinematically-redundant, mobile, parallel, and humanoid robots.

### Additional Resources:

**Outcome Goals:**

1. Description and manipulation of pose descriptions-homogeneous transformation matrices.
2. Understand Denavit-Hartenberg parameters.
3. Understand forward pose kinematics and inverse pose kinematics.
4. Understand robot workspace and trajectory generation.
5. Ability to use velocity analysis, Jacobian matrices, static wrenches, resolved-rate control simulation.
7. Ability to use Newton-Euler dynamics recursion analysis.
8. Understand robot control architectures.

### Prerequisites

**Prerequisite Text:**

**Prerequisites:**

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:

Course Topic Notes:
Alias Course: M E 605, M E 606 | Semester Course: ME 6050

General Info

Document Description: Alias Course: M E 605, M E 606 | Semester Course: ME 6050

Document ID: 102382

Document Type: COMPOSITE

Contact Name: Frank Kraft

Designee Name: Merry Cibula

Creation Info: 11/02/2009 by Frank Kraft (kraftf)

Course ID: M E 605

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: DYNA-THRY&APP I

Course Long Name: Dynamics: Theory and Applications I

Credit Hours: 3.0

Course Description: Partial differentiation of vector functions in a reference frame, configuration constraints, generalized speeds, motion constraints, partial angular velocities, and partial linear velocities, inertia scalars, vectors, matrices, and dyadics, principal moments of inertia.

Course Prerequisites:

Course ID: M E 606

GenEd Code: N/A

Grade Eligibility Code: 03: A-F,CR,WP,WF,FN,FS,AU,I

Course Short Name: DYNA-THRY&APP II

Course Long Name: Dynamics: Theory and Applications II

Credit Hours: 3.0

Course Description: Continuation of 605. Generalized active forces, contributing and noncontributing forces, generalized inertia forces, relationships between generalized active forces and potential energy, generalized inertia forces and kinetic energy.

Course Prerequisites: M E 605

Semester Course Info

Course ID: ME 6050

Course Prefix: ME

Course Number: 6050

Course Short Name: INTERMEDIATE DYNAMICS

Course Long Name: Intermediate Dynamics

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours

Typical Offer Frequency: YEARLY

Typical Terms Offered: Fall

Course Description: Review of Newtonian mechanics, fundamental concepts of analytical mechanics, partial differentiation of vector functions in a reference frame, configuration constraints, inertia scalars, vectors, matrices, and principal moments of inertia, Lagrange’s equations, and rigid-body dynamics.

Additional Resources:

Outcome Goals:

1. Ability to analyze the dynamic behavior of mechanical systems.
2. Ability to use analytical mechanics tools including virtual work and Lagrange's method.
3. Develop a systematic approach for solving engineering problems.
4. Develop an understanding of the principles of 3D rigid body kinematics and kinetics.

Prerequisites

Prerequisite Text:

Prerequisites:

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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Course Topics:

Course Topic Notes:
General Info

Document Description: Alias Course: M E 510   | Semester Course: ME 6100

Document ID: 102245
Document Version: 1.0
Document Status: COMPLETED - UCC
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 10/28/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 510
GenEd Code: N/A
Grade Eligibility Code: 03: A-F,CR,WP,WF,FN,FS,AU,I
Course Short Name: ADV VIBRATIONS ANAL
Course Long Name: Advanced Vibrations Analysis
Credit Hours: 4.0
Course Description: Vibrations of multi-degree-of-freedom, lumped, parameter systems and of continuous systems such as bars, beams, and plates; numerical methods of solution; use of Rayleigh-Ritz and Galerkin procedures.
Course Prerequisites: M E 592

Semester Course Info

Course ID: ME 6100
Course Prefix: ME
Course Number: 6100
Course Short Name: ADV VIBRATIONS ANLYS
Course Long Name: Advanced Vibrations Analysis
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retai: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: YEARLY
Typical Terms Offered: Spring
Course Description: Short overview of vibrations of a multi-degree-of-freedom lumped-mass system followed by vibrations of continuous systems such as bars, beams, membranes and plates, using exact and approximate methods of solution, such as Rayleigh-Ritz, Galerkin and other variational approaches. Some elements of non-linear vibrations.
Additional Resources:
Outcome Goals:
1. Understand advanced methods for solving vibration problems of continuous (deformable) media.
2. Understand methods used to derive (partial differential) equations of motion (Newton's, Lagrange's, Hamilton's) of such bodies.
3. Understand exact methods (such as separation of variables) and approximate methods (such as Rayleigh's quotient, Rayleigh-Ritz and Galerkin methods) to solve equations of motion.

Prerequisites

Prerequisite Text: ME 6970
Prerequisites:
1. ME 6970 - ENGR ANAL AND NUM METH (Required) (COMPOSITE - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 6100
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Course Topics:
Course Topic Notes:
### General Info

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<td>Contact Name</td>
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<td>Contact Oak ID: kraftf</td>
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<td>Course Short Name</td>
<td>THERMAL STRESS ANALYSIS</td>
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<td>Course Long Name</td>
<td>Thermal Stress Analysis</td>
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<td>Credit Hours</td>
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<td>Course Description</td>
<td>Thermal stresses developed in machine and structural components. Procedures for solving stress problems associated with elevated temperatures in such components as tubes, rods, and plates as encountered in nuclear reactors, engines, and airplane and missile structures.</td>
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<td>Course Description</td>
<td>Thermal stresses developed in machine and structural components. Procedures for solving stress problems associated with elevated temperatures in such components as tubes, rods, and plates as encountered in nuclear reactors, engines, and aircraft and missile structures.</td>
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<td>Additional Resources</td>
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<td>Outcome Goals</td>
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<tr>
<td>1. Ability to calculate thermal induced stresses and strains in machine elements.</td>
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<td>2. Understand failure modes associated with thermal stresses.</td>
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### Prerequisites

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<td>1. ME 5630 - MECH MATERIALS (Required)</td>
<td>(EXPEDITED - COMPLETED)</td>
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## Course Content

**Course ID:** ME 6150

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**Course Topics:**

**Course Topic Notes:**
### Alias Course Info

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<td>Credit Hours</td>
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**Course Description:** Emphasis on teaching computer-aided design/computer-aided manufacturing with following topics covered: menu basis, training files, interactive graphics design system, mechanical design system, system interfaces with other software, data base management retrieval system, EDG-graphics editor, EDT-VAX/VMS editor and VI UNIX editor; VAX/VMS-based DCL commands, introduction to UNIX and "C," and other topics as needed. Successful completion of an approved minor project also required.

### Course Prerequisites:

- Course ID: ME 659
- GenEd Code: N/A
- Grade Eligibility Code: 03: A-F, CR, WP, WF, FN, FS, AU, I
- Course Short Name: FEA IN BIOENGINEERING
- Course Long Name: Finite Element Applications in Bioengineering
- Credit Hours: 5.0

**Course Description:** Includes review of finite element technique (FEM); introduction to boundary element method (BEM); the biology and composition of bone; mechanical properties of bone and tissue; stress analysis of the femur, tibia, skull, spinal cord, and joints using finite element method; application of FE and BE techniques in bone prostheses and implants; composite material modeling of bones using Abaqus; analysis of blood flow in arteries treating it as a non-Newtonian fluid. Finite element packages such as IPEM, Patran, Abaqus, BET, FIDNAP, NIKE, DYNA, and TOPAZ are used.

### Semester Course Info

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**Typical Offer Frequency:** YEARLY

**Typical Terms Offered:** Spring

**Course Description:** This course examines the theory, derivation, and computer implementation of finite element methods for solution of boundary value problems. We will study examples from heat conduction, solid mechanics, and vibration in one-, two-, and three-dimensional geometries. This fundamental approach will give users of finite element packages a deep understanding of both the power and limitations of FE techniques as well as providing a background to accurately use FE models. It will also provide a base for more advanced users to modify existing or write their own FE code. We will use a programming language, such as C or Matlab, in this course.

### Additional Resources

**Outcome Goals:**

1. Describe and calculate basis Lagrangian and Hermetian basis functions of different orders in one-, two- and three-dimensional problems.
2. Explain and plan procedures to perform matrix and load vector assembly, numerical integration, and calculation of secondary variables.
3. Explain, classify, and estimate, the introduction of error through the FE process.
4. Perform and explain the process of converting the strong form of a boundary value differential equation into the weak form, approximate form (such as the Gallerkin form) and matrix formulation for one- and two-dimensional problems.

**Prerequisites**

**Prerequisite Text:**

**Prerequisites:**
### Course Content

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Course Topics:

Course Topic Notes:
**General Info**

**Document Description:** Alias Course: M E 663 | Semester Course: ME 6630

- **Document ID:** 102252
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 10/28/2009 by Frank Kraft (kraftf)

**Alias Course Info**

- **Course ID:** M E 663
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I
- **Course Short Name:** MECH BEHAVIOR MATERIALS
- **Course Long Name:** Course description not available.

**Semester Course Info**

- **Course ID:** ME 6630
- **Course Prefix:** ME
- **Course Number:** 6630
- **Course Short Name:** ADV MECH MATERIALS
- **Course Long Name:** Advanced Mechanics of Materials
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** EVERY OTHER YEAR
- **Typical Terms Offered:** Spring
- **Course Description:** Stress/strain tensor notation. Elasticity of isotropic and anisotropic solids. Viscoelastic behavior and rubber elasticity. Work and strain energy. Elements of plasticity theory. Strain, temperature, and strain rate effects. Constitutive equations for engineering materials, including rheological models.

**Additional Resources:**

**Outcome Goals:**

1. Understand concepts common to all continuous media using tensor notation.
2. Understand stress field and integral formulation of general principles of mechanics, and kinematics of a continuum.
3. Understand constitutive laws and their media dependency.

**Prerequisites**

**Prerequisite Text:**

**Prerequisites:**

- **No Credit - Sequence:** No credit for this course if taken after the following:
- **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

**Course Content**

**Course ID:** ME 6630

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General Info

Document Description: Alias Course: M E 520, M E 675 | Semester Course: ME 6750

Document ID: 102303
Document Type: COMPOSITE
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 10/30/2009 by Frank Kraft (kraftf)
Document Version: 1.0
Document Status: COMPLETED - UCC
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 520
GenEd Code: N/A
Grade Eligibility Code: 02: A-F,PR,WP,WF,FN,FS,AU,I
Course Short Name: MECH ENGR EXPERIMEN
Course Long Name: Mechanical Engineering Experimentation
Credit Hours: 1.0
Course Description: Continuation of 519. Instruction in experimental procedure and experience in designing and executing laboratory experiments. Planning and execution of experiments to acquire answers to assigned problems. Variety of areas covered including control systems, energy conversion, fluid flow, heat transfer, motion measurements, stress-strain. Instructional guidance provided by entire mechanical engineering staff. Provides familiarity with variety of instrumentation and procedures. Three-quarter sequence with experimental subjects phased with prerequisites.

Course Prerequisites:

Course ID: M E 675
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: DESTRUC TEST-MAT
Course Long Name: Destructive Testing of Materials
Credit Hours: 3.0
Course Description: Testing and analytical considerations in destructive testing of materials; interpretation of results and sources of errors in hardness, tensility, impact, fatigue, and pressure testing of materials; residual stress determination in formed metallic parts.

Course Prerequisites: C E 524

Semester Course Info

Course ID: ME 6750
Course Prefix: ME
Course Number: 6750
Course Short Name: M ECH TEST OF MATLS
Course Long Name: Mechanical Testing of Materials
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Spring
Course Description: Testing and analytical considerations in destructive testing of materials. Interpretation of results and sources of errors in mechanical tests, such as hardness, tensile, compression, torsion, impact, fatigue, and fracture tests. Pressure testing of materials. Elastic and plastic stress/strain relationships in mechanical testing. Instability. Fracture.

Additional Resources:

Outcome Goals:
1. Understand basic concepts in mechanical testing.
2. Ability to determine the appropriate test for a particular material and application.
3. Ability to derive stress-strain relationships from basic mechanical tests.
4. Ability to analyze and interpret test results.

Prerequisites

Prerequisite Text: No Credit - Sequence
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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Alias Course: M E 689 | Semester Course: ME 6910

General Info

Document Description: Alias Course: M E 689 | Semester Course: ME 6910
Document ID: 102389
Document Type: EXPEDITED
Document Version: 1.0
Document Status: COMPLETED - UCC
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 11/02/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 689
GenEd Code: N/A
Grade Eligibility Code: 06: F,CR,WP,WF,FN,FS,AU,I
Course Short Name: GRADUATE INTERNSHIP
Course Long Name: Graduate Internship
Credit Hours: 1.0
Course Description: Supervised work-study experience in an established industrial or government environment.
Course Prerequisites: PERMISSION REQUIRED

Semester Course Info

Course ID: ME 6910
Course Prefix: ME
Course Number: 6910
Course Short Name: GRADUATE INTERNSHIP
Course Long Name: Graduate Internship
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 1.0 hours
Grade Eligibility: 06: F,CR,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 5 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Fall, Spring, Full Summer
Course Description: Supervised work-study experience in an established industrial or government environment.
Additional Resources:
Outcome Goals:
1. Obtain professional engineering experience related to research/thesis topic in Mechanical Engineering.

Prerequisites

Prerequisite Text: PERMISSION REQUIRED
Prerequisites:
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 6910
Course Components:

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Course Topics:
Course Topic Notes:
Alias Course: M E 681 | Semester Course: ME 6940

**Alias Course Info**

- **Course ID:** M E 681
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 04: A-F,CR,WP,WF,FN,FS,AU,I
- **Course Short Name:** RESEARCH
- **Course Long Name:** Research
- **Credit Hours:** 0.0
- **Course Description:** Seminar contents varies.
- **Course Prerequisites:**

**Semester Course Info**

- **Course ID:** ME 6940
- **Course Prefix:** ME
- **Course Number:** 6940
- **Course Short Name:** RESEARCH
- **Course Long Name:** Research
- **Department/School:** ME (Mechanical Engineering)
  - **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** VARIABLE | 1.0 - 12.0 hours
- **Grade Eligibility:** 05: F,CR,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 999 hours
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Fall, Spring, Full Summer
- **Course Description:** Independent research project under the direction of a graduate faculty advisor.
- **Additional Resources:**
  - **Outcome Goals:**
    1. Develop the ability to perform independent engineering work and successfully complete a project.

**Prerequisites**

- **Prerequisite Text:**
- **Prerequisites:**
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  - No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
  - No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

**Course Content**

- **Course ID:** ME 6940
- **Course Components:**
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**Course Topics:**

**Course Topic Notes:**
### General Info

**Document Description:** Alias Course: M E 695 | Semester Course: ME 6950  
**Document ID:** 102271  
**Document Type:** EXPEDITED  
**Contact Name:** Frank Kraft  
**Designee Name:** Merry Cibula  
**Creation Info:** 10/29/2009 by Frank Kraft (kraftf)  
**Document Version:** 1.0  
**Document Status:** COMPLETED - UCC  
**Contact Oak ID:** kraftf  
**Designee Oak ID:** cibula  
**Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info

| Course ID | M E 695  
| GenEd Code | N/A  
| Grade Eligibility Code | 04: A-F,CR,WP,WF,FN,FS,AU,I  
| Course Short Name | THESIS  
| Course Long Name | Thesis  
| Credit Hours | 0.0  
| Course Description | Seminar contents varies.

### Semester Course Info

| Course ID | ME 6950  
| Course Prefix | ME  
| Course Number | 6950  
| Course Short Name | THESIS  
| Course Long Name | Thesis  
| Department/School | ME (Mechanical Engineering)  
| College | ENT (Engineering and Technology, Russ College of)  
| Credit Hours | VARIABLE | 1.0 - 12.0 hours  
| Grade Eligibility | 04: A-F,CR,PR,WP,WF,FN,FS,AU,I  
| Repeat/Retake | REPEATABLE | Max Repeat Hours: 999 hours  
| Typical Offer Frequency | YEARLY  
| Typical Terms Offered | Fall, Spring, Full Summer  
| Course Description | Independent research toward a thesis, under the direction of a graduate faculty member.  
| Additional Resources |  
| Outcome Goals |  
| 1. Ability to perform independent research leading to a mechanical engineering thesis.

### Prerequisites

| Prerequisite Text |  
| Prerequisites |  
| No Credit - Sequence | No credit for this course if taken after the following:  
| No Credit - Duplicate | No credit for both this course and the following (always deduct credit for first course taken):  
| No Credit - Limit | No credit for this course if the following is taken (keeps credit for the following course, as defined by department):  

### Course Content

| Course Components | ME 6950  
| Course Topics |  
| Course Topic Notes |  
| Type | Contact Hours Per Week | Number of Sections/Year | Default Section Size | Might Be Offered Online | Comments |  
| Primary | Thesis/Dissertation | 3.0 | 2.0 | 5.0 | No |  

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### Alias Course Info

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<tr>
<td>Course Short Name</td>
<td>METHODS OF ENGR ANALYSIS I</td>
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<td>Course Long Name</td>
<td>Methods of Engineering Analysis I</td>
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<tr>
<td>Credit Hours</td>
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<tr>
<td>Course Description</td>
<td>Methods of analyzing equilibrium and eigenvalue problems in mechanical engineering and engineering mechanics; matrix methods; variational methods; numerical methods.</td>
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<td>Course Prerequisites</td>
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<tr>
<td>Course Short Name</td>
<td>APP NUM METHODS MECH SYS</td>
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<tr>
<td>Course Long Name</td>
<td>Applications of Numerical Methods in Mechanical Design</td>
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<tr>
<td>Credit Hours</td>
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<tr>
<td>Course Description</td>
<td>Application of engineering analysis and boundary element method to solve linear and nonlinear problems in engineering related to fluid flow, heat transfer, dynamics, plasticity, and convection. Selection and application of appropriate numerical technique. Other advanced topics related to Gaussian integration, frontal solutions, and algorithms for parallel processing will be introduced as needed.</td>
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<td>(CE 520 OR ME 663) &amp; ME 633 &amp; (MATH 545 OR M E 545)</td>
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### Semester Course Info

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<td>Typical Terms Offered</td>
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<tr>
<td>Course Description</td>
<td>Partial and ordinary differential equations, Fourier series, Bessel functions, eigenvalue problems, matrices; analytical and numerical solution methods. Emphasis on engineering applications.</td>
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<tr>
<td>Additional Resources</td>
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<tr>
<td>Outcome Goals</td>
<td></td>
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<tr>
<td>1. Develop Fourier sine, cosine and Fourier-Bessel series solutions.</td>
<td></td>
</tr>
<tr>
<td>2. Analyze eigenvalue problems in engineering systems.</td>
<td></td>
</tr>
<tr>
<td>3. Use matrix operations and determinants to numerically solve linear systems.</td>
<td></td>
</tr>
<tr>
<td>4. Use direct, iterative and marching methods to numerically integrate differential equations.</td>
<td></td>
</tr>
<tr>
<td>5. Solve ordinary and partial differential equations with engineering applications.</td>
<td></td>
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<tr>
<td>6. Perform numerical interpolation, differentiation and use quadratures.</td>
<td></td>
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<tr>
<td>7. Evaluate stability and error estimates of numerical methods.</td>
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### Prerequisites

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### Course Content

**Course ID:** ME 6970  

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**Course Topics:**

**Course Topic Notes:**
**Alias Course: M E 606 , M E 705 | Semester Course: ME 7050**

### General Info
- **Document Description:** Alias Course: M E 606 , M E 705 | Semester Course: ME 7050
- **Document ID:** 102383
- **Document Type:** COMPOSITE
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 11/02/2009 by Frank Kraft (kraftf)
- **Last Modification:** 06/07/2010 by Anita James (james)

### Alias Course Info
- **Course ID:** M E 606
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 03: A-F,CR,WP,WF,FN,FS,AU,I
- **Course Short Name:** DYNA-THRY&APP II
- **Course Long Name:** Dynamics: Theory and Applications II
- **Credit Hours:** 3.0
- **Course Description:** Continuation of 605. Generalized active forces, contributing and noncontributing forces, generalized inertia forces, relationships between generalized active forces and potential energy, generalized inertia forces and kinetic energy.

### Course Prerequisites:
- **Course ID:** M E 605

### Course ID: M E 705
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 03: A-F,CR,WP,WF,FN,FS,AU,I
- **Course Short Name:** DYNA-THRY&APP 3
- **Course Long Name:** Dynamics: Theory and Applications III
- **Credit Hours:** 3.0
- **Course Description:** Continuation of 605 and 606. Dynamical equations of motion, linearization, steady motions, and motions resembling state of rest, integrals of equations of motion, exact closed form solutions, numerical integration of differential equations of motion, determination of constraint forces and constraint torques, collisions, and small vibrations.

### Course Prerequisites:
- **Course ID:** M E 606

### Semester Course Info
- **Course ID:** ME 7050
- **Course Prefix:** ME
- **Course Number:** 7050
- **Course Short Name:** ADV DYNAMICS
- **Course Long Name:** Advanced Dynamics
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I
- **Repeat/Rетake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Spring
- **Course Description:** Dynamical equations of motion, linearization, steady motions, and motions resembling state of rest, integrals of equations of motion, exact closed form solutions, numerical integration of differential equations of motion, determination of constraint forces and constraint torques, collisions, and small vibrations.

### Additional Resources:
- **Outcome Goals:**
  1. Understand dynamical equations of motion and rigid body kinematics and dynamics.
  2. Ability to apply Euler parameters, quasi-coordinates, Euler's equations, Hamilton-Jacobi equation, and transformation theory.
  3. Ability to use analytical mechanics tools including Lagrange's method, Hamiltonian and Canonical Forms.

### Prerequisites
- **Prerequisite Text:** M E 6050
- **Prerequisites:**
  1. ME 6050 - INTERMEDIATE DYNAMICS (Required) (COMPOSITE - COMPLETED)
- **No Credit - Sequence:** No credit for this course if taken after the following:
- **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):
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**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 712 | Semester Course: ME 7120

General Info

Document Description: Alias Course: M E 712 | Semester Course: ME 7120

Document ID: 102273

Document Version: 1.0

Document Status: COMPLETED - UCC

Contact Name: Frank Kraft

Contact Oak ID: kraftf

Designee Name: Merry Cibula

Designee Oak ID: cibula

Creation Info: 10/29/2009 by Frank Kraft (kraftf)

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 712

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: AD HEAT TRANSFER

Course Long Name: Advanced Heat Transfer

Credit Hours: 5.0

Course Description: Advanced analysis of heat transfer, with emphasis on mechanical engineering processes. Lumped, integral, and differential formulations, time dependent boundary conditions, steady periodic problems. Combined conduction, convection, and mass transfer in complex heat transfer processes.

Course Prerequisites: M E 513 & 514

Semester Course Info

Course ID: ME 7120

Course Prefix: ME

Course Number: 7120

Course Short Name: ADV HEAT TRANSFER

Course Long Name: Advanced Heat Transfer

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours

Typical Offer Frequency: INFREQUENT

Typical Terms Offered: Fall


Additional Resources:

Outcome Goals:

1. Ability to use integral, differential and lumped formulations.
2. Ability to formulate governing equations for heat transfer in multiple modes.
3. Ability to use Duhamel's superposition for time-dependent boundary conditions.

Prerequisites

Prerequisite Text: ME 5130

Prerequisites:

1. ME 5130 - COND CONVEC AND RAD (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 7120

Course Components:

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Course Topics:

Course Topic Notes:
Alias Course: M E 514 | Semester Course: ME 7140

General Info

Document Description: Alias Course: M E 514 | Semester Course: ME 7140

Document ID: 102247

Document Type: EXPEDITED

Contact Name: Frank Kraft

Designee Name: Merry Cibula

Creation Info: 10/28/2009 by Frank Kraft (kraftf)

Document Version: 1.0

Document Status: COMPLETED - UCC

Contact Oak ID: kraftf

Designee Oak ID: cibula

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 514

GenEd Code: N/A

Grade Eligibility Code: 03: A-F,CR,WF,FN,FS,AU,I

Course Short Name: CONVECTION HEAT TRANSFER

Course Long Name: Convection Heat Transfer

Credit Hours: 4.0

Course Description: Convection heat transfer. Hydrodynamic and thermal boundary layers in forced and free convection. 3 lec.

Course Prerequisites: M E 546

Semester Course Info

Course ID: ME 7140

Course Prefix: ME

Course Number: 7140

Course Short Name: VISCOUS FLOW AND CONVECTION

Course Long Name: Viscous Flow and Convection Heat Transfer

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours

Typical Offer Frequency: EVERY OTHER YEAR

Typical Terms Offered: Fall

Course Description: Analysis of hydrodynamic and thermal boundary layers in forced and free convection, turbulence

Additional Resources:

Outcome Goals:

1. Ability to determine viscous stresses and forces on surfaces in a fluid flow.
2. Ability to determine the heat transfer between a surface and a fluid flow.
3. Ability to use dimensionless numbers to analyze free and forced convection.
4. Ability to develop conservation laws for thermo-fluid systems.
5. Ability to analyze laminar and turbulent boundary layers in fluid flow.

Prerequisites

Prerequisite Text: ME 5460

Prerequisites:

1. ME 5460 - POTENTIAL FLOW TH (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence:
No credit for this course if taken after the following:

No Credit - Duplicate:
No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit:
No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 7140

Course Components:

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Course Topics:

Course Topic Notes:
Alias Course Info

**Course ID:** M E 720  
**GenEd Code:** N/A  
**Grade Eligibility Code:** 01: A-F,WP,WF,FN,FS,AU,I  
**Course Short Name:** ADV. FINITE ELEMENT ANALY  
**Course Long Name:** Advanced Nonlinear Finite Element Analysis  
**Credit Hours:** 5.0  
**Course Description:** Advanced study in finite element analysis of solids and fluids, with emphasis on methodologies for nonlinear problems. Fundamental theory and computer implementations of various techniques are examined. Restricted to small groups, with extensive student participation required.

**Course Prerequisites:** C E 520 OR M E 551

Semester Course Info

**Course ID:** ME 7200  
**Course Prefix:** ME  
**Course Number:** 7200  
**Course Short Name:** ADV FINITE ELEMENT ANALYS  
**Course Long Name:** Advanced Non-linear Finite Element Analysis  
**Department/School:** ME (Mechanical Engineering)  
**College:** ENT (Engineering and Technology, Russ College of)  
**Credit Hours:** FIXED | 3.0 hours  
**Grade Eligibility:** 01: A-F,WP,WF,FN,FS,AU,I  
**Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours  
**Typical Offer Frequency:** EVERY OTHER YEAR  
**Typical Terms Offered:** Spring  
**Course Description:** Advanced study in finite element analysis of solids and fluids, with emphasis on methodologies for nonlinear problems. Fundamental theory and computer implementations of various techniques.

**Course Prerequisites**

Prerequisite Text: ME 6570 OR CE 5200  
Prerequisites:  
1. ME 6570 - INTRO FINITE ELEMENT METHODS (Not Required) (COMPOSITE - COMPLETED)  
2. CE 5200 - FIN EL METH-ENGR (Not Required) (SEMESTER - REVIEW)  
No Credit - Sequence: No credit for this course if taken after the following:  
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):  
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

**Course ID:** ME 7200  
**Course Components:** Primary  
**Type:** Lecture  
**Contact Hours Per Week:** 3.0  
**Number of Sections/Year:** 1.0  
**Default Section Size:** 20.0  
**Might Be Offered Online:** Yes

**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 731 | Semester Course: ME 7310

General Info

Document Description: Alias Course: M E 731 | Semester Course: ME 7310
Document ID: 102264
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/29/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 731
GenEd Code: N/A
Grade Eligibility Code: 02: A-F,PR,WP,WF,FN,FS,AU,I
Course Short Name: TRANSPORT AIR POLL. CONT
Course Long Name: Transport Processes in Atmospheric Pollution Control
Credit Hours: 4.0
Course Description: Formation and transport of gaseous and solid pollutants through the atmosphere, dispersion theory using Gaussian models, particle motion in external force field, buoyancy and natural convection, and aerosol mechanics, including terminal settling velocity and particle formation from nucleation, condensation and agglomeration. Control of atmospheric pollutants through application of transport phenomena, including use of electrostatic precipitation, impactors, scrubbers, filtration and inertial separation.

Course Prerequisites: M E 546 OR CH E 642

Semester Course Info

Course ID: ME 7310
Course Prefix: ME
Course Number: 7310
Course Short Name: TRANSPORT AIR POLL CNTRL
Course Long Name: Transport Processes in Atmospheric Pollution Control
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: EVERY OTHER YEAR
Typical Terms Offered: Spring

Course Description: Formation and transport of gaseous and solid pollutants through the atmosphere, dispersion theory using Gaussian models, particle motion in external force field, buoyancy and natural convection, and aerosol mechanics, including terminal settling velocity and particle formation from nucleation, condensation and agglomeration. Control of atmospheric pollutants through application of transport phenomena, including use of electrostatic precipitation, impactors, scrubbers, filtration and inertial separation.

Additional Resources:
Outcome Goals:
1. Ability to account for the effect of chemical equilibrium and dissociation on reaction thermodynamics and combustion kinetics.
2. Understand how engineering principles are used to control air pollution.
3. Understand numerical models and principles pertinent to air pollution control.
4. Develop skills to impact the changing field of air pollution engineering.
5. Understand mechanics of air pollution transport.

Prerequisites

Prerequisite Text: M E 5460 OR CHE 6400
Prerequisites:
1. CHE 6400 - TRANSPORT PHENOMENA (Not Required) (EXPEDITED - COMPLETED)
2. ME 5460 - POTENTIAL FLOW THEORY (Not Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 7310

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### General Info

**Alias Course:** ME 633  
**Semester Course:** ME 7330

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<td>Designee Name</td>
<td>Merry Cibula</td>
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<td>10/29/2009 by Frank Kraft (kraftf)</td>
<td>Last Modification: 06/07/2010 by Anita James (james)</td>
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### Alias Course Info

- **Course ID:** M E 633
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 03: A-F, CR, WP, WF, FN, FS, AU, I
- **Course Short Name:** NUM HEAT TRANS
- **Course Long Name:** Numerical Heat Transfer and Fluid Flow
- **Credit Hours:** 4.0
- **Course Description:** Numerical solution techniques in heat and mass transfer, fluid flow, and related processes. Includes governing conservation equations, discretization methods, heat conduction, convection, diffusion, and calculation of flow field.
- **Course Prerequisites:** M E 513 & 546 & 547

### Semester Course Info

- **Course ID:** ME 7330
- **Course Prefix:** ME
- **Course Number:** 7330
- **Course Short Name:** NUM HEAT TRANS
- **Course Long Name:** Numerical Heat Transfer and Fluid Flow
- **Department/School:** ME (Mechanical Engineering)  
  **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** EVERY OTHER YEAR
- **Typical Terms Offered:** Spring
- **Course Description:** Numerical solution techniques in heat transfer and fluid flow and related processes. Includes governing conservation equations, discretization methods, analysis of heat conduction, convection, diffusion, and flow field.

### Additional Resources

**Outcome Goals:**

1. Ability to use discretization methods for numerical solution.
2. Ability to numerically solve multidimensional problems by explicit and implicit methods.
3. Ability to solve convection and diffusion problems for a known flow field.
4. Ability to solve the non-linear flow field using implicit algorithms.
5. Ability to use special approaches such as upwind method, pressure correction and under-relaxation to aid convergence to a solution.
6. Ability to formulate governing equations for modeling heat transfer and fluid flow.

### Prerequisites

**Prerequisite Text:** ME 5130 and ME 5460

- **Prerequisites:**
  1. ME 5130 - CONDUCTION CONVEC & RAD (Required) (EXPEDITED - COMPLETED)
  2. ME 5460 - POTENTIAL FLOW TH (Required) (EXPEDITED - COMPLETED)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Alias Course: M E 545  |  Semester Course: ME 7450

General Info

Document Description: Alias Course: M E 545  |  Semester Course: ME 7450
Document ID: 102272
Document Version: 1.0
Document Type: EXPEDITED
Document Status: COMPLETED - UCC
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 10/29/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 545
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ADV NUMERICAL METH
Course Long Name: Advanced Numerical Methods
Credit Hours: 4.0
Course Description: Numerical methods for solution of ordinary and partial differential equations, stability considerations and error estimates, application to variety of engineering problems, numerical method of lines and integration procedures for stiff ODE systems.
Course Prerequisites: (MATH 544 OR E E 778) & (MATH 544 ORCH E 500)

Semester Course Info

Course ID: ME 7450
Course Prefix: ME
Course Number: 7450
Course Short Name: TOPICS NUMERICAL METH
Course Long Name: Advanced Topics in Numerical Methods
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Fall
Course Description: Application of numerical methods for solving ordinary and partial differential equations and eigenvalue problems. Emphasis on problems in thermal and mechanical systems. Finite difference and finite element methods.
Additional Resources:
Outcome Goals:
1. Ability to solve ordinary differential equation by Runge-Kutta and multipoint methods.
2. Ability to solve eigenvalue problems using power method and inverse power method.
3. Ability to determine the stability and convergence of solution methods for a variety of mechanical systems.
4. Ability to solve partial differential equations by finite difference and finite element methods.

Prerequisites

Prerequisite Text: ME 6970 OR CHE 6100 OR MATH 5600
Prerequisites:
1. ME 6970 - ENGR ANAL AND NUM METH (Not Required) (COMPOSITE - COMPLETED)
2. MATH 5600 - Intro NUMERICAL ANALYSIS (Not Required) (COMPOSITE - REVIEW)
3. CHE 6100 - AP CHEM ENGR CALCUL (Not Required) (EXPEDITED - COMPLETED)
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course ID: ME 7450
Course Components:

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Course Topics:
Course Topic Notes:
Alias Course: M E 751 | Semester Course: ME 7510

General Info

Document Description: Alias Course: M E 751 | Semester Course: ME 7510
Document ID: 102274
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/29/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 751
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ADVANCED CAD
Course Long Name: Advanced Computer-Aided Design
Credit Hours: 4.0
Course Description: Application of advanced CAD techniques to mechanical design problems. Interactive computer programming, mechanical tolerancing. Solid modeling and finite element applications. Pre- and post-processing of FEM data. Automated mesh generation techniques. Cubic splines, B-splines, and sculptured surfaces.

Course Prerequisites:

Prerequisite Text: ME 6570 OR CE 5200
Prerequisites:
1. ME 6570 - INTRO FINITE ELEMENT METHODS (Not Required) (COMPOSITE - COMPLETED)
2. CE 5200 - FIN EL METH-ENGR (Not Required) (SEMESTER - REVIEW)
No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 7510
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Course Topics:

Course Topic Notes:
Alias Course: ME 760 | Semester Course: ME 7600

**General Info**

**Document Description:** Alias Course: ME 760 | Semester Course: ME 7600

**Document ID:** 102275

**Document Version:** 1.0

**Document Status:** COMPLETED - UCC

**Document Type:** EXPEDITED

**Contact Name:** Frank Kraft

**Contact Oak ID:** kraftf

**Designee Name:** Merry Cibula

**Designee Oak ID:** cibula

**Creation Info:** 10/29/2009 by Frank Kraft (kraftf)

**Last Modification:** 06/07/2010 by Anita James (james)

**Alias Course Info**

- **Course ID:** M E 760
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 03: A-F, CR, WP, WF, FN, FS, AU, I
- **Course Short Name:** ADV CAD/CAM/CAE
- **Course Long Name:** Advanced CAD/CAM/CAE of Dies and Molds
- **Credit Hours:** 4.0
- **Course Description:** Formulation of the design basis for dies and molds; analysis of material flow through dies; development of criteria for design optimization, heat transfer, and die stress analysis. Theoretical basis for describing 3-D die geometry of complex dies for computer-aided manufacture. Applications in extrusion, forging die casting, and injection molding dies. Development and use of computer software in CAD/CAM/CAE of dies.
- **Course Prerequisites:** M E 551 & 557

**Semester Course Info**

- **Course ID:** ME 7600
- **Course Prefix:** ME
- **Course Number:** 7600
- **Course Short Name:** ADV CAD/CAM/CAE
- **Course Long Name:** Advanced CAD/CAM/CAE of Dies and Molds
- **Department/School:** ME (Mechanical Engineering)
  - **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 3.0 hours
- **Grade Eligibility:** 01: A-F, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 3 hours
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Fall
- **Course Description:** Formulation of the design basis for dies and molds; analysis of material flow through dies; development of criteria for design optimization, heat transfer, and die stress analysis. Theoretical basis for describing 3-D die geometry of complex dies for computer-aided manufacture. Applications in extrusion, forging die casting, and injection molding dies. Development and use of computer software in CAD/CAM/CAE of dies.
- **Course Topics:**
  - **Outcome Goals:**
    1. Ability to develop optimization criteria for manufacturing dies and molds.
    2. Understand basic principles and uses of dies and molds.
    3. Ability to apply and use the proper analysis tools, including but not limited to finite element and finite volume based software, to simulate die and mold behavior.

**Prerequisites**

**Prerequisite Text:** ME 6570

**Prerequisites:**

1. ME 6570 - INTRO FINITE ELEMENT METHODS (Required) (COMPOSITE - COMPLETED)

**No Credit - Sequence:** No credit for this course if taken after the following:

**No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):

**No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Alias Course: M E 762 | Semester Course: ME 7620

General Info

Document Description: Alias Course: M E 762 | Semester Course: ME 7620
Document ID: 102386
Document Type: EXPEDITED
Contact Name: Frank Kraft
Contact Oak ID: kraftf
Designee Name: Merry Cibula
Designee Oak ID: cibula
Creation Info: 11/02/2009 by Frank Kraft (kraftf)
Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 762
GenEd Code: N/A
Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I
Course Short Name: ADV TOPICS IN NN
Course Long Name: Advanced Topics in Non-Newtonian Fluid Dynamics
Credit Hours: 5.0
Course Description: Includes constitutive modeling including power law fluids, Maxwell fluids, and models of differential and integral type. Formulation schemes for non-Newtonian fluid dynamics using finite element analysis and its applications.
Course Prerequisites: ME 557 OR 633 OR C E 520

Semester Course Info

Course ID: ME 7620
Course Prefix: ME
Course Number: 7620
Course Short Name: NON-NEWTONIAN FLUIDS
Course Long Name: Topics in Non-Newtonian Fluid Dynamics
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Spring
Course Description: Includes constitutive modeling including power law fluids, Maxwell fluids, and models of differential and integral type. Formulation schemes for non-Newtonian fluid dynamics using finite element analysis and its applications.
Additional Resources:
Outcome Goals:
1. Ability to use constitutive models for power law fluids, Maxwell fluids.
2. Ability to use numerical solutions using finite element analysis.
3. Ability to formulate governing equations for Non-Newtonian fluids.

Prerequisites

Prerequisite Text: ME 7140
Prerequisites:
1. ME 7140 - VISCOUS FLOW AND CONVECTION (Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course Topics:
Course Topic Notes:
Alias Course: M E 776 | Semester Course: ME 7760

General Info

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Alias Course Info

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<td>Course Short Name: TOPICS MAT PROCESSING</td>
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<td>Course Long Name: Special Topics in Materials Processing</td>
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<td>Course Description: Advanced topics in selected areas of materials processing technology. Processing by deformation, solidification, and deposition are possible areas of study.</td>
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<td>Course Prerequisites: M E 563 &amp; CH E 620</td>
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Semester Course Info

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<td>Department/School: ME (Mechanical Engineering)</td>
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<td>Course Description: Advanced topics in selected areas of materials processing technology. Processing by deformation, solidification, powder metallurgy, machining, deposition, and non-traditional methods are possible areas of study.</td>
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<td>Additional Resources:</td>
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<td>Outcome Goals:</td>
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<tr>
<td>1. Understand process, structure, property relationships in manufacturing.</td>
</tr>
<tr>
<td>2. Ability to specify and fully design manufacturing processes.</td>
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<td>3. Ability to apply advanced analytical techniques to evaluate manufacturing processes.</td>
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Prerequisites

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Course Content

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### General Info

**Document Description:** Alias Course: M E 780 | Semester Course: ME 7800

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<td>Last Modification:</td>
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### Alias Course Info

- **Course ID:** M E 780
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 03: A-F, CR, WP, WF, FN, FS, AU, I
- **Course Short Name:** DOCTORAL COLLOQUIUM
- **Course Long Name:** DOCTORAL COLLOQUIUM
- **Credit Hours:** 1.0
- **Course Description:** Course description not available.

### Semester Course Info

- **Course ID:** ME 7800
- **Course Prefix:** ME
- **Course Number:** 7800
- **Course Short Name:** DOCTORAL COLLOQUIUM
- **Course Long Name:** Doctoral Colloquium
- **Department/School:** ME (Mechanical Engineering)
  - **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** FIXED | 1.0 hours
- **Grade Eligibility:** 03: A-F, CR, WP, WF, FN, FS, AU, I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 1 hours
- **Typical Offer Frequency:** YEARLY
- **Typical Terms Offered:** Fall, Spring
- **Course Description:** Presentation and discussion of research topics.
- **Additional Resources:**
- **Outcome Goals:**
  1. Develop understanding of a variety of research topics in engineering.

### Prerequisites

**Prerequisite Text:**

**Prerequisites:**

- **No Credit - Sequence:** No credit for this course if taken after the following:
- **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
- **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

### Course Content

**Course ID:** ME 7800

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**Course Topics:**

**Course Topic Notes:**
Alias Course: M E 784 | Semester Course: ME 7840

General Info

Document Description: Alias Course: M E 784 | Semester Course: ME 7840

Document ID: 102243

Document Type: EXPEDITED

Contact Name: Frank Kraft

Designee Name: Merry Cibula

Creation Info: 10/28/2009 by Frank Kraft (kraftf)

Document Version: 1.0

Document Status: COMPLETED - UCC

Contact Oak ID: kraftf

Designee Oak ID: cibula

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 784

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: FRACTURE & FATIGUE

Course Long Name: Fracture and Fatigue of Engineering Materials

Credit Hours: 4.0

Course Description: Analysis of crack-tip stress field, energy concepts and crack growth criteria, conservation integrals, crack life prediction, mechanisms of fatigue damage, and high-cycle and low-cycle fatigue damage.

Course Prerequisites: C E 523 OR 528

Semester Course Info

Course ID: ME 7840

Course Prefix: ME

Course Number: 7840

Course Short Name: FRACTURE AND FATIGUE

Course Long Name: Fracture and Fatigue of Engineering Materials

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours

Typical Offer Frequency: YEARLY

Typical Terms Offered: Spring

Course Description: Analysis of crack-tip stress field, energy concepts and crack growth criteria, conservation integrals, crack life prediction, mechanisms of fatigue damage, and high- and low-cycle fatigue damage.

Additional Resources:

Outcome Goals:

1. Ability to define fracture and fatigue damage.
2. Ability to use techniques and methods to estimate the damage and the life of machine components subject to fracture and fatigue failure.
3. Ability to apply methods and techniques to avoid-suppress that damage.
4. Understand the sources of damage caused by fatigue and fracture of engineering materials.

Prerequisites

Prerequisite Text: ME 5630 or ME 6630 or CE 6230

Prerequisites:

1. CE 6230 - CONTINUUM MECHANICS (Not Required) (SEMESTER - REVIEW)
2. ME 6630 - ADV MECH MATERIALS (Not Required) (EXPEDITED - COMPLETED)
3. ME 5630 - MECH MATERIALS (Not Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

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Course ID: ME 7840

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Course Topics:

Course Topic Notes:
Document Description: Alias Course: M E 785  | Semester Course: ME 7850

Document ID: 102238

Document Version: 1.0

Document Status: COMPLETED - UCC

Contact Name: Frank Kraft

Contact Oak ID: kraftf

Designee Name: Merry Cibula

Designee Oak ID: cibula

Creation Info: 10/28/2009 by Frank Kraft (kraftf)

Last Modification: 06/07/2010 by Anita James (james)

Alias Course Info

Course ID: M E 785

GenEd Code: N/A

Grade Eligibility Code: 01: A-F,WP,WF,FN,FS,AU,I

Course Short Name: PLASTICITY

Course Long Name: Plasticity: Theory and Application

Credit Hours: 4.0

Course Description: Theory of plasticity, stress-strain relations for perfectly plastic and strain hardening materials, yield criteria and constitutive equations of plastic bodies, boundary value problems of plasticity, the slip-line theory and applications.

Course Prerequisites: CE 523 & 529 & M E 597

Semester Course Info

Course ID: ME 7850

Course Prefix: ME

Course Number: 7850

Course Short Name: PLASTICITY

Course Long Name: Plasticity Theory and Application

Department/School: ME (Mechanical Engineering)

College: ENT (Engineering and Technology, Russ College of)

Credit Hours: FIXED | 3.0 hours

Grade Eligibility: 01: A-F,WP,WF,FN,FS,AU,I

Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours

Typical Offer Frequency: YEARLY

Typical Terms Offered: Spring

Course Description: Theory of plasticity, stress-strain relations for perfectly plastic and strain hardening materials, solving some elementary boundary value problems of plasticity.

Additional Resources:

Outcome Goals:

1. Understand theory of plasticity, stress-strain relations for perfectly plastic and strain hardening materials, yield criteria and constitutive equations of plastic bodies, solving some elementary boundary value problems of plasticity.
2. Ability to illustrate the use of those field equations and their analytical solutions through some simple examples.
3. To prepare a student for a future application of numerical methods to solve the field equations in more complex problems.

Prerequisites

Prerequisite Text: ME 6970 AND (ME 5630 OR ME 6630 OR CE 6230)

Prerequisites:

1. CE 6230 - CONTINUUM MECHANICS (Not Required) (SEMESTER - REVIEW)
2. ME 6970 - ENGR ANAL AND NUM METH (Required) (COMPOSITE - COMPLETED)
3. ME 6630 - ADV MECH MATERIALS (Required) (EXPEDITED - COMPLETED)
4. ME 5630 - MECH MATERIALS (Not Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:

No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):

No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 7850

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Course Topics:
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<td>Designee Name</td>
<td>Merry Cibula</td>
<td></td>
</tr>
<tr>
<td>Creation Info</td>
<td>10/29/2009 by Frank Kraft (kraftf)</td>
<td>Last Modification: 06/07/2010 by Anita James (james)</td>
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## Alias Course Info

<table>
<thead>
<tr>
<th>Course ID</th>
<th>M E 790</th>
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<tbody>
<tr>
<td>GenEd Code</td>
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<tr>
<td>Grade Eligibility Code</td>
<td>04: A-F, CR, PR, WP, WF, FN, FS, AU, I</td>
</tr>
<tr>
<td>Course Short Name</td>
<td>SPECIAL TOPICS IN ME</td>
</tr>
<tr>
<td>Course Long Name</td>
<td>Special Topics in Mechanical Engineering</td>
</tr>
<tr>
<td>Credit Hours</td>
<td>0.0</td>
</tr>
<tr>
<td>Course Prerequisites</td>
<td>PERMISSION REQUIRED</td>
</tr>
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</table>

## Semester Course Info

<table>
<thead>
<tr>
<th>Course ID</th>
<th>ME 7900</th>
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<tbody>
<tr>
<td>Course Prefix</td>
<td>ME</td>
</tr>
<tr>
<td>Course Number</td>
<td>7900</td>
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<tr>
<td>Course Short Name</td>
<td>SPECIAL TOPICS IN ME</td>
</tr>
<tr>
<td>Course Long Name</td>
<td>Special Topics in Mechanical Engineering</td>
</tr>
<tr>
<td>Department/School</td>
<td>ME (Mechanical Engineering)</td>
</tr>
<tr>
<td>College</td>
<td>ENT (Engineering and Technology, Russ College of)</td>
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<tr>
<td>Course Type</td>
<td>Special Topics</td>
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<td>Credit Hours</td>
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<td>Grade Eligibility</td>
<td>04: A-F, CR, PR, WP, WF, FN, FS, AU, I</td>
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<td>Repeat/Retake</td>
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<tr>
<td>Typical Offer Frequency</td>
<td>INFREQUENT</td>
</tr>
<tr>
<td>Typical Terms Offered</td>
<td>Fall, Spring, Full Summer</td>
</tr>
<tr>
<td>Course Description</td>
<td>Advanced topics in selected areas in mechanical engineering.</td>
</tr>
<tr>
<td>Additional Resources</td>
<td></td>
</tr>
<tr>
<td>Outcome Goals</td>
<td>1. Develop expertise in a variety of special topics in mechanical engineering.</td>
</tr>
</tbody>
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## Prerequisites

<table>
<thead>
<tr>
<th>Prerequisite Text</th>
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<td>Prerequisites:</td>
<td>No Credit - Sequence: No credit for this course if taken after the following:</td>
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<td>No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):</td>
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<td>No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):</td>
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## Course Content

<table>
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<tr>
<th>Course ID</th>
<th>ME 7900</th>
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<tbody>
<tr>
<td>Course Components</td>
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<tr>
<td>Type</td>
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<tr>
<td>Primary</td>
<td>Lecture</td>
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<table>
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<tr>
<th>Course Topics</th>
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<tbody>
<tr>
<td>Course Topic Notes</td>
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Alias Course: M E 791  |  Semester Course: ME 7930

General Info

- **Document Description:** Alias Course: M E 791  |  Semester Course: ME 7930
- **Document ID:** 102278
- **Document Type:** EXPEDITED
- **Contact Name:** Frank Kraft
- **Designee Name:** Merry Cibula
- **Creation Info:** 10/29/2009 by Frank Kraft (kraftf)

Alias Course Info

- **Course ID:** M E 791
- **GenEd Code:** N/A
- **Grade Eligibility Code:** 04: A-F,CR,PR,WP,WF,FN,FS,AU,I
- **Course Short Name:** SPECIAL INVESTIGATIONS
- **Course Long Name:** Special Investigations
- **Credit Hours:** 0.0
- **Course Description:** Advanced topics in mechanical engineering with an emphasis on individual study.

Semester Course Info

- **Course ID:** ME 7930
- **Course Prefix:** ME
- **Course Number:** 7930
- **Course Short Name:** SPECIAL INVESTIGATIONS
- **Course Long Name:** Special Investigations
- **Department/School:** ME (Mechanical Engineering)
- **College:** ENT (Engineering and Technology, Russ College of)
- **Credit Hours:** VARIABLE | 1.0 - 4.0 hours
- **Grade Eligibility:** 04: A-F,CR,PR,WP,WF,FN,FS,AU,I
- **Repeat/Retake:** REPEATABLE | Max Repeat Hours: 999 hours
- **Typical Offer Frequency:** INFREQUENT
- **Typical Terms Offered:** Fall, Spring, Full Summer
- **Course Description:** Advanced topics in mechanical engineering with an emphasis on individual study.

Additional Resources:

1. Ability to investigate advanced topics in mechanical engineering.

Prerequisites

- **Prerequisite Text:** PERMISSION REQUIRED
- **Prerequisites:**
  - **No Credit - Sequence:** No credit for this course if taken after the following:
  - **No Credit - Duplicate:** No credit for both this course and the following (always deduct credit for first course taken):
  - **No Credit - Limit:** No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

- **Course ID:** ME 7930

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<th>Number of Sections/Year</th>
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<th>Might Be Offered Online</th>
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<tr>
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Course Topics:

Course Topic Notes:
Alias Course: ME 797  |  Semester Course: ME 7970

General Info

Document Description: Alias Course: M E 797  | Semester Course: ME 7970
Document ID: 102279
Document Type: EXPEDITED
Contact Name: Frank Kraft
Designee Name: Merry Cibula
Creation Info: 10/29/2009 by Frank Kraft (kraftf)

Alias Course Info

Course ID: M E 797
GenEd Code: N/A
Grade Eligibility Code: 03: A-F,CR,WP,WF,FS,AU,I
Course Short Name: ADV ENGINEERING ANALYSIS
Course Long Name: Advanced Engineering Analysis
Credit Hours: 4.0
Course Description: Unified approach for obtaining solutions to a variety of engineering problems, with emphasis on mechanical engineering topics such as transport processes, nonlinear vibrations, and dynamics. Focus on advanced/approximate methods.

Course Prerequisites:

- M E 497 & CH E 642

Semester Course Info

Course ID: ME 7970
Course Prefix: ME
Course Number: 7970
Course Short Name: ADV ENGINEERING ANALYSIS
Course Long Name: Advanced Engineering Analysis
Department/School: ME (Mechanical Engineering)
College: ENT (Engineering and Technology, Russ College of)
Credit Hours: FIXED | 3.0 hours
Grade Eligibility: 01: A-F,WP,WF,FS,AU,I
Repeat/Retake: REPEATABLE | Max Repeat Hours: 3 hours
Typical Offer Frequency: INFREQUENT
Typical Terms Offered: Spring
Course Description: Analytical approaches for obtaining solutions to a variety of engineering and physics problems, with emphasis on mechanical engineering topics such as transport processes, nonlinear vibrations, and dynamics. Focus on advanced/approximate methods.

Additional Resources:

Outcome Goals:

1. Learning advanced generic analytical methods frequently applied in various engineering/physics disciplines, with emphasis on mechanical engineering topics such as transport processes, nonlinear vibrations and dynamics.

Prerequisites

Prerequisite Text: ME 6970 OR CHE 6100
Prerequisites:

1. ME 6970 - ENGR ANAL AND NUM METH (Not Required) (COMPOSITE - COMPLETED)
2. CHE 6100 - AP CHEM ENGR CALCUL (Not Required) (EXPEDITED - COMPLETED)

No Credit - Sequence: No credit for this course if taken after the following:
No Credit - Duplicate: No credit for both this course and the following (always deduct credit for first course taken):
No Credit - Limit: No credit for this course if the following is taken (keeps credit for the following course, as defined by department):

Course Content

Course ID: ME 7970
Course Components:

<table>
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<th>Type</th>
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<th>Number of Sections/Year</th>
<th>Default Section Size</th>
<th>Might Be Offered Online</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Primary</td>
<td>Lecture</td>
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Course Topics:

Course Topic Notes: