New Undergraduate Course Approval Cover Form
Montana State University

This four-page form collects basic information about the proposed new course, provides information on the approval process, and includes all required approvals. Additional information (see INFO sheet) is also required as part of the New Course Packet.

Proposed New Course Information

Requested Rubric, Course Number, Core Designation (if needed): ETME 462

Course Title: Industrial Processing, Control, and Automation
Abbreviated Course Title (≤30 chars): Industrial Processing
First Semester to be Offered: Spring 2015
Submitted by: Keith Fisher, Mechanical and Ind. Engineering Dept.

Submitter's Contact Info: Phone, Email:
994-6288, kfisher@...

Instructor: Keith Fisher, Assoc. Professor
Department: Mechanical and Industrial Engineering
College: CoE

New Course Review Process

Instructor completes the New Course Packet, with Core information if a Core designation is requested.

Instructor checks for "equivalent" course in the MUS system and recommends a common or unique course number.

Department Head's signature indicates that course has been approved by the process used within the Department.

The Chair of the College Curriculum Committee signs to indicate College academic approval.

The College Dean signs to indicate that adequate resources are available to offer the course. Supporting information (Dean's Statement) is typically required.

The New Course Packet (as PDF) is uploaded to the Provost's Office server for distribution to other committees.

Course requests are sent to Curriculum and Program Committee (CPC). Core reviews are sent to appropriate Core subcommittee. Committees work in parallel when possible to speed approval process. Special topics courses (291,491) skip the CPC review (limited to two years.)

Provost's Office reviews the new course request. New courses are submitted to MUS for Common Course Number (CCN) review. Dean and Department informed upon approval.

Provost's Office forwards the new course request to Registrar's Office (for inclusion in Catalog and Schedule of Classes)

Note: This diagram illustrates the typical flow path, but at any review step there can be a request for additional information or modifications. Careful review in early steps is the best way to speed the overall process. * Special topics courses (x91) require fewer signatures, but cannot be offered more than two times without committee review.
INFORMATION NEEDED FOR COMMON COURSE NUMBERING

The process for identifying a common course number for a new course is as follows:

1. Course learning outcomes are prepared for the new course.
2. The person submitting the new course request looks at the CCN website to see if a course with similar outcomes already exists in the MUS system.
   
   www.mus.edu/Qttools/CCN/ccn_default.asp
   
   - If a course exists with at least 80% of the same outcomes, the course is considered "equivalent" to the proposed new course, and the new course should use the existing rubric and course number.
   - If no "equivalent" course is found, the person submitting the new course request should identify a unique course number that has not been used by any other course in the MUS system.
3. The requested rubric and course number are submitted as part of the new course packet.
4. The Provost’s Office submits the learning outcomes and the requested rubric and course number to the MUS to have a course number assigned to the course. (This will typically be the requested course number, but it could be changed.)
5. The assigned common course number is reported back to the person submitting the new course request.

Requested Rubric, Course Number, Core Designation (if needed):

<table>
<thead>
<tr>
<th>Course Title:</th>
<th>ETME 462</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbrev. Course Title</td>
<td>Industrial Processing, Control, and Automation</td>
</tr>
<tr>
<td>Credits:</td>
<td>Industrial Processing</td>
</tr>
<tr>
<td>Department Offering Course:</td>
<td>3</td>
</tr>
<tr>
<td>College:</td>
<td>Mechanical and Industrial Engineering</td>
</tr>
<tr>
<td>CoE</td>
<td></td>
</tr>
</tbody>
</table>

Is this course “equivalent” to a course in the MUS System?:   ☑️ No

Learning Outcomes for the Course:

1. Explain and knowledgeably discuss the features and functions of common industrial processes
2. Design, detail, and organize process flow plans and select sub-processes for an overall processing plan that will provide an efficient process
3. Identify critical process variables
4. Write the critical specifications that drive process goals
5. Design and select machinery (motors, drives, etc.) that is used to power common industrial processes
6. Design and select controls for industrial processes
7. Measure process variables.
INFORMATION REQUIRED BY THE REGISTRAR

The data needed to enter the new course into the MSU Catalog and Schedule of Classes is collected on this page. Once the new course has been approved, this page is automatically forwarded to the Registrar for data entry.

Assigned Rubric, Course Number, Core Designation (if needed):
ETME 462
Industrial Processing, Control, and Automation
Industrial Processing Control
Spring 2015
Mechanical and Industrial Engineering
CoE

Assigned Course Title (for Catalog):
ETME 462
Industrial Processing, Control, and Automation

First Semester to be Offered:
Spring 2015

Restricted Entry/Consent of Instructor Required:
Yes
Instructor’s GID (last 4 digits only):
8394

Department Offering Course:
Mechanical and Industrial Engineering
College:
CoE

Is the requested course number available? (x4155 to check):
Yes
No

Frequency of course offering:
Annually
Alternate Years, starting
Semester(s) offered (check all that apply):
Summer
Fall
Spring
Summer Options (check all that apply):
First 6 weeks
Second 6 weeks
12 weeks

Credits by mode of instruction:
Lecture:
2
Seminar:

Independent Study:

Lab/Studio:
1
Recitation/Discussion:

TOTAL CREDITS:
3

Primary Mode(s) of Delivery:
Face-to-face
Web-Enhanced (small on-line comp.)
On-Line Only
Blended (significant on-line portion)

Time and Location – Call the Registrar’s Office at x4155 to find a time and location for the course.

Assigned Day(s):
M W Th F Sa Su

Assigned Time(s):

Assigned Building:

Assigned Room:

Capacity (room capacity, or enrollment "cap"):

Co- and Pre-Requisites – Courses numbered 200 and above are normally expected to have prerequisites. When listing multiple prerequisites, please separate courses with “and” if both are required, or “or” if only one is required.

Prerequisite(s):
ETME 360 or EMEC 360, and EELE 250

Co-Requisite(s):

Course Description – Provide a course description of 40 words or less for the MSU Catalog.

The intent of this course is to equip engineering students with the basic understanding of industrial processes, knowledge of the fundamental machines, sensors, and controls used in automated processing, and an understanding of processing system design.
DEAN'S STATEMENT

The reviewing committees are being asked to take a closer look at the resources required for each proposed new course. In many cases new courses will replace existing courses and the new course request is effectively resource neutral, however that is not always the case. For example, a new elective course that would result in distributing an existing student population across a larger number of courses would represent a significant increase in expenditures for the new course, and no increase in total student credit hours. A funding mechanism for such a course would need to be identified. The Dean's Statement is the place to document how the costs of the proposed new course will be covered.

Growth in the Mechanical and Industrial Engineering Department has been extensive in the last few years. This growth has created an overwhelming need for new professional elective offerings and extra sections of required courses. Many of the current Mechanical Engineering Technology elective courses have had wait lists for the several years. The proposed course, ETME 462, follows the growing demand in industry for workers with skills in the area of automated manufacturing and processing. Instructional resources will be met within the current budgetary structure of the MET program. If the course significantly exceeds demand this may need to be revisited.
New Undergraduate Course Narrative  
Montana State University  
Updated August 23, 2012

Please provide the following information in narrative format. Substantive responses to all criteria are required. Although not required, a draft syllabus can also be helpful to the committee in understanding the details of the proposed course.

General Course Information
1. Requested Rubric, Course Number, and Core Designation (if any)

> ETME 462

2. Course Title

> Industrial Processing, Control, and Automation

3. Provide a general description of the course explaining the need for the course, its goals, and its overall structure. This is the most important part of the application and should offer a good sense of what students will experience by taking this class.

>The intent of this course is to equip engineering students with the basic understanding of industrial processes, knowledge of the fundamental machines, sensors, and controls used in automated processing, and an understanding of processing system design.

As manufacturing and processing become more and more automated, the need for mechanical engineers who have the ability to understand, design, and troubleshoot complex automated processing and manufacturing machinery and systems is growing.

Industrial Process Mechanical Engineers and Mechanical Engineering Technicians work with motors, controls, pumps, fans, heating and cooling equipment, valves and plumbing, conveyors, hydraulics, turbines, generators and other mechanical and rotating equipment in complex process systems. They prepare and design systems layouts, specify machinery, record data, make computations, analyze results, and write reports. They also understand maintenance procedures and application of preventative, predictive, proactive maintenance techniques in power and industrial plants and troubleshoot problems.

4. Based on what types of student work (e.g., tests, homework assignments, papers, performances, etc.) will grades be determined?

> Homework Assignments, Quizzes, Tests, Lab exercise assignments, Lab Project Report

5. Provide a course content outline containing all major topics plus a brief description of the material to be covered under each major topic heading.

> Industrial Processing, Control, and Automation  Course topics

1. Common Processing Industries
2. Elements of Processing
3. Detailing and Organizing Processes
4. What drives processing/processes
5. Process Variables
6. What powers processing/processes
7. Controlling Processing
8. Process measurements
9. Process automation
10. Process Reliability

Topic Details
1. Common Processing Industries overview – Food, paper, and chemical processing, mineral processing, petroleum refining, general manufacturing, energy plants, etc.

2. Elements of Processing
   (a) Material handling and material flow – Conveying, Sorting, Cleaning, Separation, Mixing
   (b) Air handling and control – Fans, blowers, ducts, vacuum
   (c) Liquid Handling and Control – Pumps, valves, and piping
   (d) Weighing and Measuring -
   (e) Heating, Distillation, and Cooking
   (f) Steam Generation
   (g) Cooling and Freezing
   (h) Assembly
   (i) Packaging and Scheduling
   (j) Cleanliness and material selection

3. Detailing and Organizing processes
   (a) Planning process flow
   (b) Mass and flow balances
   (c) Process Modeling and drawing
   (d) Process Design
   (e) Flexible Process Design
   (f) Productivity and Economics of processing

4. Process Drivers
   (a) Product/ process specifications and quality
   (b) Processing Energy and energy reduction
   (c) Processing Economics
   (d) Safety – process safety design and management, ergonomics, safety procedures

5. Processing Variables
   Identifying critical process variables

6. Powering Industrial Processes
   (a) Electrical motors and motor controls
1. DC motors
2. AC motors and 1φ, 3 φ power
3. Frequency and inverter drives
4. Motor starters
5. Stepper motors
6. Servo motors
(b) Electrical switches, relays, solenoids, and controllers
(c) Bearings
(d) Belt and Chain Drives
(e) Robots
(f) Power Monitoring, indicators, monitoring, and protection

7. Control of industrial processes
   (a) Open loop
   (b) Closed Loop Control
   (c) Statistical Control and standards
   (d) PLC control
   (e) Analog and PID control
   (f) Control Parameters

8. Process Measurement
   (a) Measurement of Variables
   (b) Sensors
   (c) Design of Experiments

9. Process Automation
   (a) Automation planning
   (b) Automation options
   (c) PLC control and programming
   (d) PID control

10. Process Reliability and Quality requirements in industrial manufacturing and processes
    (a) What does quality mean to industry?
    (b) Variability
    (c) Robustness
    (d) Improvement vs. design optimization
    (e) Multi-variable objectives and interactions
    (f) Statistical Control - impact on reliability
    (g) Six Sigma
    (h) Robust Design, Process Integration, Design Optimization, and Algorithms
    (i) Application of controls to achieve quality goals
    (j) Safety in Processing
6. List required texts or other required references.

> TBD

7. What are the estimated enrollment and student credit hour (SCH) production? 
   \[ \text{SCH} = (\text{enrollment} \times \text{credits}) \]

> [Enrollment Estimate – 30 students initially (limited by lab size and sections)] \times 3 \text{ credits} = 90 \text{ SCH}

8. Will there be an enrollment cap that restricts enrollment below the level of student demand? If so, what is the enrollment cap and why is it necessary?

> 30 students (limited by lab size and sections)

9. Will course be a "restricted enrollment" course? If so, why is restricted enrollment necessary?

> TBD. Restricted entry may be necessary as demand may exceed lab capacity.

10. Describe how the success of the course will be evaluated? ("End of semester student evaluations" is not the answer to this question. How will the instructor determine if the learning outcomes are being met, and how will the department determine if the course is fulfilling its intended purpose?)

> The success of the course in meeting the learning outcomes (listed below) will be determined first of all by evaluation of the students' actual learning of the material through the mechanisms listed in the answer to question #4.

Student success in designing and assembling processing systems in the lab, that really work, according to the goals of the course lab will be a strong indicator of success. Student feedback will be gathered at least 3 times during the course to gauge their perspective on whether they are learning.

An industrial advisory board for the course has already been started, (participants include persons from Imerys in Three forks, and REC Silicon in Silver Bow) with plans to be extended, to oversee the effectiveness of the course material itself.

Learning Outcomes: “At the conclusion of the course, students are able to:”

1. Explain and knowledgeably discuss the features and functions of common industrial processes
2. Design, detail, and organize process flow plans and select sub-processes for an overall processing plan that will provide an efficient process
3. Identify critical process variables
4. Write the critical specifications that drive process goals
5. Design and select machinery (motors, drives, etc.) that is used to power common industrial processes
6. Design and select controls for industrial processes
7. Measure process variables.
> Yes - tenured

Level of Offering

12. Has the course been offered previously under 250/291 or 450/401? If so, when? Under what number? What was the enrollment? What level of students took the course?

> No

13. Justify the level of course offering.

> Junior / Senior level: Builds upon the undergraduate fundamentals and is slightly specialized in its focus.

Relationship to other Courses, Curricula, and Departments

14. Does this course build on or interrelate with other courses in your curriculum or related curricula? If so, which ones?

> Builds upon instrumentation and electrical fundamentals ETME 360 or EMEC 360, and EELE 250; and design courses ETME 203 and EGEN 310. It will complement Fluid Power ETME 430 and HVAC ETME 422.

15. Do the topics in the proposed course duplicate or reiterate those in other courses in this or any other department? If so, how do the coverage and educational experience differ and how is this duplication or reiteration justified? Also, what liaison (which is expected in cases of apparent overlap) has been conducted with other departments? Report reactions, both favorable and unfavorable.

> There will likely be small amounts of duplication with courses in other departments (Electrical motor controls, PLC controls, PID controls, etc.), however its scope will go far beyond these aspects and its focus will be on applications for the mechanical engineer in processing. Liaisons have not been explored primarily because of the felt need to initially limit the size of the course and because of the desire to make this course specifically applied to the role of the Mechanical Engineer / Technician in processing and its control and automation.

16. What programs (departments, colleges) will be impacted by the SCH production of this course? That is, where do you think the SCH in the proposed course are likely to come from? If the expected SCH production of the proposed course is greater than 1000, and the SCH are expected to come from other colleges, what steps have been taken to make the other units aware of the potential loss of SCH? Report reactions, both favorable and unfavorable.

> Growth in the MIE department has created an overwhelming need for new professional elective offerings – many of the current MET electives have had wait lists and unmet requests for the last few years.
The course does have significant interdisciplinary content. The introduction that it will provide mechanical engineers to processes, electric motors and controls, and to control systems is a venture into the specialties of electrical and chemical/industrial engineers. The need for mechanical engineers to understand and be able to work with and interface with these systems is significant.

Students Served

The intent of the course is for majors (MET, ME, IE), however, it may be of interest to EE and ChemE students as indicated previously. The ability to accommodate other interested students will depend on demand and resource (personnel and space) availability.

Resources

The instructional resources are within the current projections of the MET program. Lab equipment is expected to be largely donated (some offers have been extended), but will need to be completed. Only very short local field trips will be expected of the students. No additional fees are planned.

Other Supporting Material

The laboratory portion of the course will be a key element of the learning experience. As students are being introduced to the concepts in lecture they will work to implement a scaled processing project in the lab that utilizes a large portion of the processing fundamentals and details. For example they could be asked to make an automated processing system for making cookies. They would identify the process goals and plan the process steps, choose means of accomplishing the process steps, construct the actual process steps with hardware, choose and size drivers and controls, identify process variables that need to be monitored and select and implement sensors,
integrate the process controls into an automation system, optimize the process for quality, reliability, and safety, and evaluate/report on the project (oh, and enjoy the product).
ETME 462 Industrial Processing Control and Automation  Spring 2015

LEC 01 –  LAB 02 –  LAB 03 –

Instructor: Keith Fisher
Office: Roberts Hall 210A
Phone: 994-6288
E-mail: kfisher@mc.montana.edu (do not expect e-mail to be answered evenings and weekends)
Office Hours: TBA. You are welcome to stop by my office any time. If I can’t see you when you come by, then we’ll arrange another time.

COURSE OBJECTIVE: This course is designed to equip engineering students with the basic understanding of industrial processes, knowledge of the fundamental machines, sensors, and controls used in automated processing, and an understanding of processing system design. As manufacturing and processing become more and more automated, the need for mechanical engineers who have the ability to understand, design, and troubleshoot complex automated processing and manufacturing machinery and systems is growing. Industrial Process Mechanical Engineers and Mechanical Engineering Technicians work with motors, controls, pumps, fans, heating and cooling equipment, valves and plumbing, conveyors, hydraulics, turbines, generators and other mechanical and rotating equipment in complex process systems. They prepare and design systems layouts, specify machinery, record data, make computations, analyze results, and write reports. They also understand maintenance procedures and application of preventative, predictive, proactive maintenance techniques in power and industrial plants and troubleshoot problems.

PREREQUISITE: EELE250, ETME 360 or EMEC 360; or permission.

TOOLS / SUPPLIES: Safety glasses absolutely required for Lab.

TEXTBOOKS: Required Text: TBA

COURSE TOPICS: The following topics will be covered this semester:

1. Common Processing Industries
2. Elements of Processing
3. Detailing and Organizing Processes
4. What drives processing/processes
5. Process Variables
6. What powers processing/processes
7. Controlling processes
8. Process Measurements
9. Process Automation
10. Process Reliability

The lab portion will complement the course subjects through the use of hands on learning.

Specific Learning Objectives:
"At the conclusion of the course, students are able to:"

- Explain and knowledgeably discuss the features and functions of common industrial processes
- Design, detail, and organize process flow plans and select sub-processes for an overall processing plan that will provide an efficient process
- Identify critical process variables
- Write the critical specifications that drive process goals
- Design and select machinery (motors, drives, etc.) that is used to power common industrial processes
- Design and select controls for industrial processes
- Measure process variables.
- Automate industrial processes.
- Plan for optimal quality and reliability in industrial processing.
STUDENT EVALUATION:

Student grades will be normally based upon the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
</tr>
<tr>
<td>C+</td>
<td>77-79</td>
</tr>
<tr>
<td>C</td>
<td>73-76</td>
</tr>
<tr>
<td>C-</td>
<td>70-72</td>
</tr>
<tr>
<td>D+</td>
<td>67-69</td>
</tr>
<tr>
<td>D</td>
<td>63-66</td>
</tr>
<tr>
<td>D-</td>
<td>60-62</td>
</tr>
<tr>
<td>F</td>
<td>Below 60</td>
</tr>
</tbody>
</table>

Alternatively, the instructor reserves the right to utilize an “Inspection Model” final course grade where the score distributions are evaluated at the end of the semester for natural breaks or cut-offs. Note that this is not a “curve” grading system. Your final grade will be based upon where you fall in the score distributions and my subjective evaluation of total class performance. Grading will be distributed as follows:

1. Work Product 40%
   - Homework & Quizzes (20%)
   - Lab Assignments (20%)
2. Preliminary Exams (20% each) 40%
3. Final Comprehensive Exam 20%

C- Policies:
Effective Fall 2005, a “C-” or better must be achieved for all courses (core courses and required courses), except free electives, in order to earn credit in that course toward graduation. See the following link ...

http://www.montana.edu/wwwcat/academic/acad6.html.

STUDENT CONDUCT:

Students are expected to conduct themselves in accordance with prescribed university regulations. A full review of the “Student Academic & Conduct Guidelines & Grievance Procedures” can be made at the offices of the Dean of Students or at: www.montana.edu/wwwfachb/policy/acguide.html.

I expect to be courteous and respectful of everyone else in the class; which includes the manner in which you directly speak and act, being on time, and avoiding disruptive behaviors, profanity, etc.

Cell Phones and other Personal Communication Devices: Finish your calls and text messaging before class time so that you can turn these devices off prior to the start of class and lab. The instructor reserves the right to collect cell phones used during class, or eject students who do not respect the rules. If cell phones are seen or heard during an exam, a zero will be given to the student on that exam.

Special Needs and Accommodations: If you require special accommodations or assistance, please speak to the instructor or contact MSU’s office of Disability, Re-entry, and Veteran Services at: http://www.montana.edu/wwwvres/disability/index.shtml

Lab and Homework Problem Assignments: The schedule will be detailed as the course progresses. Each student is expected to keep abreast of all assignments as they are given. Problems will be assigned from supporting materials as the course progresses. The requirement for formal lab reports will be specified at the beginning of the course. Content of the assignments will be reflected on the quizzes and examinations. Completed homework/lab assignments are due at the beginning of class/lab on the due date. Late assignments will be accepted up to 24 hours after the assigned time and date with a 25% - 50% reduction in credit. No assignments will be accepted after that point, except at the instructor’s discretion. Assignments must also conform to the following criteria:

- Each problem solution must begin with a problem statement
- Use only plain white paper or engineering paper
- Use only one side of the paper
- Answers and process must be communicated effectively and legibly
- Lab reports specified as full, or formal reports, must conform to the M&IE Writing Outcomes
**Attendance:** Role will not be taken at every class, but if you miss a class, it is your responsibility to get the notes, assignments, and announcements, or other material that you missed. Students are expected to be prepared for each class by reading the provided material before class.

**Lab Sessions:** The lab component of this course will focus on actual hands-on work with processing components and systems in a group setting, and on design projects. Therefore, **attendance** at all sessions is **mandatory** if you want a grade for that session, unless otherwise specified by the instructor. Also, everyone is to respect the value of each others time and **be on time**!

**Quizzes:** Quizzes will be given in class at random, unannounced, at the beginning of the class time.

<table>
<thead>
<tr>
<th>ETME 462 Industrial Processing ...</th>
<th>Assign Schedule: 9-12-13</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date</strong></td>
<td><strong>Discussion Topic</strong></td>
</tr>
<tr>
<td><strong>Reading Assignment</strong></td>
<td><strong>Homework Assignment</strong></td>
</tr>
<tr>
<td><strong>Due</strong></td>
<td><strong>Comments</strong></td>
</tr>
<tr>
<td><strong>Week 1 Lab</strong></td>
<td>No Lab – First Week</td>
</tr>
<tr>
<td><strong>Week 1</strong></td>
<td>I Course Introduction, Processing Industries, &amp; Elements of Processing</td>
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<tr>
<td><strong>Week 2 Lab</strong></td>
<td>Lab 1</td>
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<tr>
<td><strong>Week 2</strong></td>
<td>Elements of Processing</td>
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<tr>
<td><strong>Week 3 Lab</strong></td>
<td>Lab 2</td>
</tr>
<tr>
<td><strong>Week 3</strong></td>
<td>Detailing and Organizing Processes</td>
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<tr>
<td><strong>Week 4 Lab</strong></td>
<td>Lab 3</td>
</tr>
<tr>
<td><strong>Week 4</strong></td>
<td>What drives processing/processes</td>
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<td><strong>Week 5 Lab</strong></td>
<td>Lab. 4</td>
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<tr>
<td><strong>Week 5</strong></td>
<td>Test #1</td>
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<tr>
<td>Date</td>
<td>Discussion Topic</td>
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<tr>
<td>Week 5</td>
<td>What drives processing/processes</td>
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<td>Week 6</td>
<td>Lab. 5</td>
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<tr>
<td>Week 6</td>
<td>Process Variables</td>
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<td>Week 7</td>
<td>Lab. 6</td>
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<td>Week 7</td>
<td>Powering processing/processes</td>
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<tr>
<td>Week 8</td>
<td>Lab. 7</td>
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<tr>
<td>Week 8</td>
<td>Powering processing/processes</td>
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<tr>
<td>Week 9</td>
<td>Lab. 8</td>
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<td>Week 9</td>
<td>Controlling Processing</td>
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<tr>
<td>Week 10</td>
<td>Lab. 9</td>
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<tr>
<td>Week 10</td>
<td>Test #2</td>
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<tr>
<td>Date</td>
<td>Discussion Topic</td>
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<tr>
<td>Week 10</td>
<td>Controlling Processing</td>
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<td>Week 11</td>
<td>Lab. 10</td>
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<td>Week 11</td>
<td>Process measurements</td>
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<td>Week 12</td>
<td>Lab 11</td>
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<td>Week 12</td>
<td>Process automation</td>
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<td>Week 13</td>
<td>Lab 12</td>
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<td>Week 14</td>
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<td>Process Reliability</td>
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<td>Week 15</td>
<td>Lab 14</td>
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<tr>
<td>Week 15</td>
<td>Process Reliability</td>
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</tbody>
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**Final Exam** – Dec. 10th, 8:00-9:50 a.m. comprehensive
COURSE OBJECTIVE: This course is designed to equip engineering students with the basic understanding of industrial processes, knowledge of the fundamental machines, sensors, and controls used in automated processing, and an understanding of processing system design. As manufacturing and processing become more and more automated, the need for mechanical engineers who have the ability to understand, design, and troubleshoot complex automated processing and manufacturing machinery and systems is growing. Industrial Process Mechanical Engineers and Mechanical Engineering Technicians work with motors, controls, pumps, fans, heating and cooling equipment, valves and plumbing, conveyors, hydraulics, turbines, generators and other mechanical and rotating equipment in complex process systems. They prepare and design systems layouts, specify machinery, record data, make computations, analyze results, and write reports. They also understand maintenance procedures and application of preventative, predictive, proactive maintenance techniques in power and industrial plants and troubleshoot problems.

PREREQUISITE: EELE250, ETME 360 or EMEC 360; or permission.

TOOLS / SUPPLIES: Safety glasses absolutely required for Lab.

TEXTBOOKS: Required Text: TBA

COURSE TOPICS: The following topics will be covered this semester:

1. Common Processing Industries
2. Elements of Processing
3. Detailing and Organizing Processes
4. What drives processing/processes
5. Process Variables
6. What powers processing/processes
7. Controlling processes
8. Process Measurements
9. Process Automation
10. Process Reliability

The lab portion will complement the course subjects through the use of hands on learning.

Specific Learning Objectives:
“At the conclusion of the course, students are able to:”

- Explain and knowledgeably discuss the features and functions of common industrial processes
- Design, detail, and organize process flow plans and select sub-processes for an overall processing plan that will provide an efficient process
- Identify critical process variables
- Write the critical specifications that drive process goals
- Design and select machinery (motors, drives, etc.) that is used to power common industrial processes
- Design and select controls for industrial processes
- Measure process variables.
- Automate industrial processes.
- Plan for optimal quality and reliability in industrial processing.
STUDENT EVALUATION:

Student grades will be normally based upon the following scale:

- A  93-100
- A-  90-92
- B+  87-89
- B   83-86
- B-  80-82
- C+  77-79
- C   73-76
- C-  70-72
- D+  67-69
- D   63-66
- D-  60-62
- E   Below 60

Alternatively, the instructor reserves the right to utilize an “Inspection Model” final course grade where the score distributions are evaluated at the end of the semester for natural breaks or cut-offs. Note that this is not a “curve” grading system. Your final grade will be based upon where you fall in the score distributions and my subjective evaluation of total class performance. Grading will be distributed as follows:

1. Work Product 40%
   - Homework & Quizzes (20%)
   - Lab Assignments (20%)
2. Preliminary Exams (20% each) 40%
3. Final Comprehensive Exam 20%

C- Policies:
Effective Fall 2005, a “C-” or better must be achieved for all courses (core courses and required courses), except free electives, in order to earn credit in that course toward graduation. See the following link ... http://www.montana.edu/wwwcat/acad/academic/acad6.html.

STUDENT CONDUCT:

Students are expected to conduct themselves in accordance with prescribed university regulations. A full review of the “Student Academic & Conduct Guidelines & Grievance Procedures” can be made at the offices of the Dean of Students or at: www.montana.edu/wwwfachb/policy/academic.html.

I expect to be courteous and respectful of everyone else in the class; which includes the manner in which you directly speak and act, being on time, and avoiding disruptive behaviors, profanity, etc.

Cell Phones and other Personal Communication Devices: Finish your calls and text messaging before class time so that you can turn these devices off prior to the start of class and lab. The instructor reserves the right to collect cell phones used during class, or eject students who do not respect the rules. If cell phones are seen or heard during an exam, a zero will be given to the student on that exam.

Special Needs and Accommodations: If you require special accommodations or assistance, please speak to the instructor or contact MSU’s office of Disability, Re-entry, and Veteran Services at: http://www.montana.edu/wwwvrec/disability/index.shtml

Lab and Homework Problem Assignments: The schedule will be detailed as the course progresses. Each student is expected to keep abreast of all assignments as they are given. Problems will be assigned from supporting materials as the course progresses. The requirement for formal lab reports will be specified at the beginning of the course. Content of the assignments will be reflected on the quizzes and examinations. Completed homework/lab assignments are due at the beginning of class/lab on the due date. Late assignments will be accepted up to 24 hours after the assigned time and date with a 25% - 50% reduction in credit. No assignments will be accepted after that point, except at the instructor’s discretion. Assignments must also conform to the following criteria:

- Each problem solution must begin with a problem statement
- Use only plain white paper or engineering paper
- Use only one side of the paper
- Answers and process must be communicated effectively and legibly
- Lab reports specified as full, or formal reports, must conform to the M&IE Writing Outcomes
Attendance: Role will not be taken at every class, but if you miss a class, it is your responsibility to get the notes, assignments, and announcements, or other material that you missed. Students are expected to be prepared for each class by reading the provided material before class.

Lab Sessions: The lab component of this course will focus on actual hands-on work with processing components and systems in a group setting, and on design projects. Therefore, attendance at all sessions is mandatory if you want a grade for that session, unless otherwise specified by the instructor. Also, everyone is to respect the value of each others time and be on time!

Quizzes: Quizzes will be given in class at random, unannounced, at the beginning of the class time.

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<th>Date</th>
<th>Discussion Topic</th>
<th>Reading Assignment</th>
<th>Homework Assignment</th>
<th>Due</th>
<th>Comments</th>
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Assign Schedule: 9-12-13
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### ETME 462 Industrial Processing ... Assign Schedule: 9-12-13

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Final Exam – Dec. 10th, 8:00-9:50 a.m. comprehensive