# Course Form (revised 8-2009)

## I. Summary of Proposed Changes

<table>
<thead>
<tr>
<th>Dept / Program</th>
<th>Applied Computing &amp; Electronics Technology</th>
<th>Prefix and Course #</th>
<th>EET 237</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Title</td>
<td>Programmable Logic Controllers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Title (max. 26 characters incl. spaces)</td>
<td>Intro to PLCs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summarize the change(s) proposed</td>
<td>New Course Addition</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## II. Endorsement/Approvals

Complete the form and obtain signatures before submitting to Faculty Senate Office

<table>
<thead>
<tr>
<th>Please type / print name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requestor:</td>
<td>Steven Stiff Assistant Professor</td>
<td>9/23/10</td>
</tr>
<tr>
<td>Phone/ email:</td>
<td>243.7913 <a href="mailto:steven.stiff@umontana.edu">steven.stiff@umontana.edu</a></td>
<td></td>
</tr>
<tr>
<td>Program Chair/Director:</td>
<td>Thomas Gallagher</td>
<td>9/23/10</td>
</tr>
<tr>
<td>Other affected programs</td>
<td>Steven Rice Electronics Technology</td>
<td>9/23/10</td>
</tr>
<tr>
<td></td>
<td>Dr. Brad Layton Energy Technology</td>
<td>9/23/10</td>
</tr>
<tr>
<td>Dean:</td>
<td>Dr. Barry Good</td>
<td>9/23/10</td>
</tr>
</tbody>
</table>

## III: To Add a New Course

Syllabus and assessment information is required (paste syllabus into section V or attach). Course should have internal coherence and clear focus.

**Common Course Numbering Review:** Does an equivalent course exist elsewhere in the MUS? Do the proposed abbreviation, number, title and credits align with existing course(s)? Please indicate equivalent course/campus ↓

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
<th>X</th>
</tr>
</thead>
</table>

Electronics courses are still under review with the state FLOCs.

**Exact entry** to appear in the next catalog (Specify course abbreviation, level, number, title, credits, repeatability (if applicable), frequency of offering, prerequisites, and a brief description.) ↓

U 237 Programmable Logic Controllers 3 cr. Offered Spring. Prereq. M 090. Introduces the concepts involving programmable logic controllers (PLCs). Provides an overview of PLC operation and hardware; number systems, codes, and Boolean logic. Covers aspects of PLC system programming and design, including control structures, data acquisition and manipulation, troubleshooting, and real-world applications.

**Justification:** How does the course fit with the existing curriculum? Why is it needed?

The course will become a requirement for students seeking the A.A.S. degree in Electronics Technology and a directed elective for students seeking the A.A.S. degree in Energy Technology. Additionally, our department is responding to a call from our local community to provide workforce training and education in the area of instrumentation, industrial automation, and control systems.

Are there curricular adjustments to accommodate teaching this course?

No

**Complete for UG courses.** (UG courses should be assigned a 400 number).

**Describe graduate increment (Reference guidelines: [http://www.umt.edu/facultysenate/Grad/UG.htm](http://www.umt.edu/facultysenate/Grad/UG.htm))**

Fees may be requested only for courses meeting specific conditions determined by the Board of Regents. Please indicate whether this course will be considered for a fee.

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
<th>X</th>
</tr>
</thead>
</table>

If YES, what is the proposed amount of the fee? $25

**Justification:**

Consumables include various electronic components including cables, connectors, jumpers, relays, lamps, sockets, etc., which need to be replaced at the end of semester, and as needed throughout the semester.
### IV. To Delete or Change an Existing Course – check X all that apply

<table>
<thead>
<tr>
<th>Deletion</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number Change</td>
<td></td>
</tr>
<tr>
<td>From:</td>
<td>Level U, UG, G</td>
</tr>
<tr>
<td>To:</td>
<td></td>
</tr>
<tr>
<td>Description Change</td>
<td>Repeatability</td>
</tr>
<tr>
<td>Change in Credits</td>
<td></td>
</tr>
<tr>
<td>From:</td>
<td>Cross Listing (primary program initiates form)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Is there a fee associated with the course?</td>
</tr>
<tr>
<td>1. Current course information at it appears in catalog (<a href="http://www.umt.edu/catalog">http://www.umt.edu/catalog</a>)</td>
<td>2. Full and exact entry (as proposed)</td>
</tr>
<tr>
<td>3. If cross-listed course: secondary program &amp; course number</td>
<td></td>
</tr>
<tr>
<td>4. Is this a course with MUS Common Course Numbering? If yes, then will this change eliminate the course's common course status? Please explain below.</td>
<td></td>
</tr>
<tr>
<td>5. Graduate increment if level of course is changed to UG. Reference guidelines at: <a href="http://www.umt.edu/facultysenate/Grad/UG.htm">http://www.umt.edu/facultysenate/Grad/UG.htm</a> (syllabus required in section V)</td>
<td>Have you reviewed the graduate increment guidelines? Please check (X) space provided.</td>
</tr>
<tr>
<td>6. Other programs affected by the change</td>
<td></td>
</tr>
<tr>
<td>7. Justification for proposed change</td>
<td></td>
</tr>
</tbody>
</table>

### V. Syllabus/Assessment Information

Required for new courses and course change from U to UG. Paste syllabus in field below or attach and send digital copy with form.

The University of Montana
Department of Applied Computing and Electronics
Course Syllabus

**Course:** EET 237 Programmable Logic Controllers  
**Term:** Spring 2011  
**Credits:** 3  
**Prereqs:** M090 (Introductory Algebra) or consent of instructor

**Faculty Contact:**  
Steven (Steve) L. Stiff  
Phone: (406) 243-7913  
E-mail: steven.stiff@umontana.edu  
Office Hours: AD09B

**Meeting:**  
Sec (CRN) xx (yyyy)  
Day, Time, and Location Lecture:  
Lab: Final Exam

**Course Description:**  
Introduces the concepts involving programmable logic controllers (PLCs). Provides an overview of PLC operation and hardware; number systems, codes, and Boolean logic. Covers aspects of PLC system programming and design, including control structures, data acquisition and manipulation, troubleshooting, and real-world applications.

**Course Overview:**  
Programmable control systems provide us the means to automatically control our environment from small control systems, such as maintaining the temperature in a home or office, to large control systems that perform industrial processes, such as manufacturing paper or generate electricity. The programmable logic controller (PLC) can be programmed and wired to provide these functions.
This course looks at the steps necessary to implement a PLC control system that include, but are not limited to:

- Defining control system operation in terms of control inputs and outputs.
- Identifying the hardware components necessary to perform the defined operation.
- Translating the system definition into PCL programming language (programming) that performs the defined operation.
- Performing off-line testing, troubleshooting, and validation of the control program (computer simulation).
- Performing limited on-line testing by loading the control program into the PLC to test, troubleshoot, and verify the control program with control inputs active and control outputs inactive.
- Performing on-line testing of all functions of the control program with control inputs active and control outputs active.
- Actual PLC operation.

This PLC course is designed to provide engineers and technicians a basic understanding in the design and implementation of PLC control systems. It is intended to be a broad approach; manufacturer-specific courses are best taught by the manufacturer or manufacturer's representatives.

Course Objectives:
Upon completion of the course a student will demonstrate the ability to:

1. Identify and define PLC control sequences.
2. Use basic logic circuits, program structures, and program instructions to program defined control sequences.
3. Use PCL ladder diagrams to program defined control sequences.
4. Discuss the need for, and processes of, off-line and on-line testing practices.
5. Analyze and implement real-world applications for PLCs.
6. Use critical-thinking skills and previous experience in developing solutions.

Required Materials:


Evaluation Procedures:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Projects, Written Assignments</td>
<td>60.0%</td>
</tr>
<tr>
<td>Exams</td>
<td>40.0%</td>
</tr>
<tr>
<td>100% - 90%</td>
<td>A</td>
</tr>
<tr>
<td>90% - 80%</td>
<td>B</td>
</tr>
<tr>
<td>80% - 72%</td>
<td>C</td>
</tr>
<tr>
<td>72% - 65%</td>
<td>D</td>
</tr>
</tbody>
</table>

Online Component:
Various components of the course will be delivered using the Blackboard Course Management Software at [http://courseware.umt.edu](http://courseware.umt.edu). It is the responsibility of the student to access and familiarize himself/herself with this software component. Blackboard training is available through UMOntline at [http://umonline.umt.edu](http://umonline.umt.edu).

Attendance:
- Lecture and laboratory attendance is considered when calculating semester grades (refer to Evaluation Procedures – Assessment). The bonus is calculated on a sliding scale.
- All students must attend the lecture and lab sections in which they are registered.
- Students more than 10 minutes late for lecture or lab will not be given credit for attendance.

Assignments, Laboratories, Quizzes, and Exams:
- Assignments are due on the assigned date, and at the assigned time.
- Laboratories are to be completed on the assigned date(s), and write-ups are due at the assigned time.
- Quizzes may be given during any lecture, and may or may not be previously announced.
- All quizzes and exams are to be taken on the assigned date, and at the assigned time.

Late or Missed Work:
- All late or missed work receives a score of 0. Late work may be accepted only in extraordinary circumstances, and is accepted at the instructor’s discretion.
- Makeup labs and exams are extremely difficult to schedule and conduct; these are rarely done.

Student Conduct:
- All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or disciplinary sanction by the University.
- Student conduct is governed by the Student Conduct Code. All students need to be familiar with the Student Conduct Code. It is available for review or can be downloaded at http://life.umt.edu/vpsa/student_conduct.php.

Students with Disabilities:
- Eligible students with disabilities will receive appropriate accommodations in this course when requested in a timely fashion. Please be prepared to provide me a copy of your Letter of Verification supplied by your Disability Services for Students (DSS) Coordinator for my records. Refer to http://life.umt.edu/dss for information regarding your rights.
- For students planning to request testing accommodations, you must supply me the completed Academic Support Center (ASC) scheduling form for my signature at least 3 days prior to the scheduled test date (the ASC requires the signed form at least two days prior to testing). ASC contact information is available at http://www.cte.umt.edu/academics/academicsupport/.

Policies for Dropping and Adding Courses, Changing Sections, Grading, and Credit Status:
- The University Policy for dropping courses or requesting grading/credit status changes can be found in the academic catalog or on the web at http://www.umt.edu/catalog/acad/acadpolicy/default.html. All students should be familiar with this policy.
- If you are having difficulty with the course for any reason and decide not to continue, please complete a drop or withdrawal form. A properly completed and approved drop or withdrawal form will prevent you from receiving a failing grade on your college transcript.
- Please note: if you are receiving financial aid, dropping or withdrawing from a course may affect your financial aid status.

Course Outline:

1. The Programmable Logic Controller (PLC)
   a. Overview
   b. Hardware
2. Computing and Programming
   a. Number Systems and Codes
b. Fundamentals of Logic

3. PLC Basics
   a. Programming
   b. Wiring Diagrams
   c. Ladder Logic

4. PLC Program Structures
   a. Timers
   b. Counters

5. PLC Instructions
   a. Control
   b. Data Manipulation
   c. Math
   d. Sequencer
   e. Shift Register

6. Putting It All Together
   a. Hardware Installation
   b. Program Troubleshooting
   c. Program Editing

7. Real-World Applications
   a. Process Control
   b. Data Acquisition
   c. Computer-Controlled Machines
   d. Computer-Controlled Processes

VI Department Summary (Required if several forms are submitted) In a separate document list course number, title, and proposed change for all proposals.

VII Copies and Electronic Submission. After approval, submit original, one copy, summary of proposals and electronic file to the Faculty Senate Office, UH 221, camie.foos@mso.umt.edu.