PROGRAM DESCRIPTION

1. Currently, the Department of General Engineering offers a Bachelor of Science Degree in General Engineering and Masters of Science in General Engineering. Within these degrees, students have the choice to choose from the following emphasis options: Civil Engineering; Control Systems Engineering; Mechanical Engineering; and Welding Engineering. Montana Tech of The University of Montana proposes to re-title the Control System option to Electrical Engineering option.

   A central goal of the General Engineering Degree is to provide a broad-based engineering education while the options allow students to focus on elective courses in a specific area. Students fulfill a well-recognized industry need for an engineer that can work in a multi-disciplinary engineering environment while maintaining expertise in a specific area. Examples include plant engineering (e.g., factories) and the minerals industry (e.g., mining and remediation).

   The Control Systems option within the General Engineering Degree is a well-established option that has produced many graduates over the last two decades. The option provides the student with a general engineering background with emphasis in instrumentation and control. Because many instrumentation and control fundamentals build upon a traditional electrical engineering foundation, the option's curriculum contains several electrical fundamental courses.

   There are three related reasons for the proposed change: 1) up-date to naming standards used by competing schools; 2) provide a degree name aligned with industry standards; and 3) provide more and better opportunities for graduates. A review of ABET-accredited General Engineering Degree programs in the United States shows that the majority of programs offer an Electrical Engineering option. The proposed name change will up-date Tech's program to naming standards used by competing General Engineering Degree programs in the United States thus benefiting students when competing for jobs. The name change will also better align with industry naming conventions.

2. The proposed name change was presented to the General Engineering industrial advisory board. The board consists of 19 representatives from industries that hire General Engineering graduates. The board unanimously supports the name change. The board stated that the name change would provide better degree-name recognition for the students, which will increase employability of the graduate. A letter of support from the chair of the advisory board is contained in Appendix A.

   Also, a student survey of current Control System option students at the junior, senior, and graduate levels was conducted. Of the 22 students that responded to the survey, 20 support the name change and 2 do not support the change. This results in 91% of the students support supporting the change.

3. Currently, two General Engineering faculty members with Ph.D. degrees in electrical engineering run the control system option. This includes advising and mentoring duties. Upon the name change, these two faculty members will continue to run the program.

4. The Electrical Engineering option fits well with the role and scope of Montana Tech of The University of Montana as an engineering discipline within the Department of General Engineering.

5. This change will have no effect on the administrative structure of the institution.

6. There are no programs offered in Montana that have an Electrical Engineering option within an ABET-accredited General Engineering Bachelor of Science Degree or Master of Science Degree. The regional colleges and universities with an ABET- accredited general engineering program that includes an option or concentration in electrical engineering include The Colorado School of Mines (CSM), Idaho State University, and Walla Walla College in Washington State. Of these programs, CSM offers one with the most similarity to the Montana Tech program. This includes a core curriculum focused on fundamental civil, mechanical and electrical engineering topics.

6. The General Engineering Bachelor of Science degree at Montana Tech of The University of Montana is accredited under the EAC of ABET. The degree is accredited and the options within the department meet the same core requirements as the general degree. ABET will have no concerns about the Electrical Engineering option since it will satisfy the same criteria as the General Engineering Bachelor of Science Degree. Montana Tech of The University of Montana does not plan to seek separate accreditation for the Electrical Engineering option. In the future, if needs change, approval from the Board of Regents and consultation with MSU-Bozeman would occur prior to seeking separate accreditation. ABET recently transitioned to a new set of accreditation standards called ABET 2000. These criteria are based on a program's objectives and its outcome assessment. The individual program sets its objectives and then through the use of outcome assessment feedback, it carefully readjusts its curriculum to meet the objectives. Prior to ABET 2000, there were strict regulations for each engineering discipline. An Electrical Engineering degree for instance, had certain rules pertaining to everything from numbers of faculty to the exact curriculum taught. A degree program such as the General Engineering degree at Montana Tech is accredited under the nontraditional engineering criteria. It also had certain restrictions but not as rigidly defined as an Electrical Engineering degree. The ABET 2000 criteria loosens the rules for accreditation. All programs must satisfy educational objectives, some of which are defined by ABET, while others are defined by the institution. The nontraditional programs now are only subject to the general criteria, while programs such as Electrical Engineering continue to have additional program criteria to meet. This is why a General Engineering degree at Montana Tech that has an Electrical Engineering option can be quite different from an Electrical Engineering degree offered at some other institution such as MSU-Bozeman. Both degrees must use an

outcome assessment feedback to satisfy objectives, but the more traditional degrees must also satisfy program criteria. Our objective is to educate a "general" engineer who has some expertise in the area of electrical engineering. This expertise will be neither as broad or deep as an accredited electrical engineering program. We will do this by requiring a series of electrical engineering type courses that are currently taught at Montana Tech.

7. Curriculum

B.S. in General Engineering – Electrical Engineering Option

Freshman Year	**F**	**S**
CHEM 1056+1136-General Chem.	4	
ENGL 1046-English Composition	3	
MATH 1520-Calculus I	3	
MIN 1010-Intro Engineering Problems	3	
*Approved Elective		3
CHEM 1066+1166-General Chem. II		4
MATH 1530-Calculus II		3
PHYS 1046-General Physics-Mech.		3
Humanities Elective	3	
***Computer Programming		3
	16	**16**
Sophomore Year		
ENGR 2050-Engr. Mechanic-Statics	3	
Humanities Elective 3		
MATH 2510-Calculus III	4	
PHYS 2076+2096-Gen Phys 4		
ECON 2606-Principles of Economics	3	
ENGR 2060-Engr. Mechanic-Dynamics		3
ENGR 2150-Engr. Graphics		3
MATH 2236-Differential Equations		3
PHYS 2086+2106-Gen Phys.	4	
ENGR 2530 + 2550 Electric Circuits		4
	17	**17**
Junior Year		
ENGR 3260-Fluid Mechanics	3	
ENGR 3350-Mechanics of Materials	3	
ENGR 3560-Circuits II	3	
PHYS 3036 Electronics	3	
ENGR 3540 Electric Machines	3	
**Math Elective	3	
ENGR 3340-Thermodynamics	3	
ENGR 3360- Mech. Materials Lab		1
ENGR 3280- Fluids Mech. Lab		1
ENGR 3570- Electronic Design		4
ENGR 3600- Signals and Systems		3
ENGR 3270- Digital Circuit Design		3
Social Science Elective		3
	18	**18**
Senior Year		
ENGR 3210- Technical Writing	3	
PHYS 4056- Electricity & Magnetism	3	
ENGR 4410- Control Theory	3	
ENGR 4450- I &C	3	
ENGR 4460- I &C Lab	1	
MEC 3630- Engr. Economy	3	
****Professional Electives	2	
Social Science Elective		3
ENGR 4420- Control System Lab		1
PHYS 4806- Intro. Microprocessors		3
ENGR 4040- Professional Engr.		1
ENGR 4940- Seminar		1
ENGR 4920 ENGR R&D		3
****Professional Electives		4
	18	**16**

Required credits for Electrical Engineering Option - 136

* Approved electives do not include Chemistry 101, 102, Physics 102 or 103, or Math 007, 105 or 106. Also, HPER credits are limited to 2 credits except for first aid. Co-op education is limited to 4 credits at 2 credits per semester.
** May choose from Math 4056 or Physics 4536.
*** Approved computer elective may choose: C-programming for Engineers or consent of advisor
**** Professional Electives – 3000 or higher, must include 3 credits from ENGR 5270, 5400, 5410, GEOP 4460, or consent of advisor.

FISCAL IMPACT AND BUDGET INFORMATION

Electrical Engineering Option in BS Program in General Engineering

	FY 2003 First Year FTE	Headcount	FY 2004 Second Year FTE	Headcount	FY 2005 Third Year FTE	Headcount
I. PLANNED STUDENT ENROLLMENT						
A. New Enrollment	15	15	15	15	15	15
B. Shifting Enrollment	50	50				
GRAND TOTAL PLANNED STUDENT ENROLLMENT	65	65	65	65	65	65

	First Year FTE	Cost	Second Year FTE	Cost	Third Year FTE	Cost
II. EXPENDITURES						
A. Personnel Cost						
1. Faculty						
2. Administrators						
3. Adjunct Faculty						
4. Graduate/Instruct Asst.						
5. Research Personnel						
6. Support Personnel						
7. Fringe Benefits						
8. Other(_____)						
Total Personnel FTE And Cost		$0		$0		$0
B. Operating Expenditures						
1. Travel						
2. Professional Services						
3. Other Services						
4. Communications						
5. Utilities						
6. Materials and Supplies						
7. Rentals						
8. Repairs & Maintenance						
9. Materials & Goods for Manufacturing & Resale						
10. Miscellaneous						
Total Operating Expenditure						
C. Capital Outlay						
1. Library Resources						
2. Equipment						
Total Capital Outlay						
D. Physical Facilities Construction or Major Renovation						
E. Indirect Costs (overhead)						
GRAND TOTAL EXPENDITURES		$0		$0		$0

III. REVENUES	FY 2003 First Year FTE	Cost	FY 2004 Second Year FTE	Cost	FY 2005 Third Year FTE	Cost
A. Source of Funds						
1. Appropriated Funds-Reallocation						
2. Appropriated Funds-New						
3. Federal Funds						
4. Other Grants						
5. Fees						
6. Other(_____)						
TOTAL SOURCE OF FUNDS		$0		$0		$0
B. Nature of funds						
1. Recurring						
2. Non-Recurring						
GRAND TOTAL REVENUES		$0		$0		$0

As this is a reorganization of currently offered course work the budget and fiscal implications are zero unless enrollment significantly exceed projections.

FACULTY AND STAFF REQUIREMENTS

1. The following faculty are responsible for the Electrical Engineering option:

   - Dan Trudnowski, Ph.D., Associate Professor of General Engineering
   - John Morrison, Ph.D., Assistant Professor of General Engineering

2. No new faculty are required to conduct the program over the next five years. The courses required are presently being taught and any projected increase in enrollment can easily be staffed at the present time.

3. There will be no additional needs or costs for support personnel.

CAPITAL OUTLAY, OPERATING EXPENDITURES, AND PHYSICAL FACILITIES

1. No new operating expenditures are anticipated since no new courses, facilities, or personnel are required to run the Electrical Engineering option. As previously stated, this option is replacing an existing option.

2. The current library system at Montana Tech of The University of Montana is adequate to support the Electrical Engineering option.

3. The present computer equipment available in the department will support the Electrical Engineering option. This equipment and software is currently purchased through the department operating budget and through student lab fees.

4. Current facilities are adequate for the Electrical Engineering option and include computer labs and required engineering laboratories and classrooms.

EVALUATION OF PROPOSED PROGRAM

1. Reviews

   This program was developed by the Department of General Engineering faculty and has been reviewed and approved by the Montana Tech Curriculum Review Committee on 11 April 2002, and by the Montana Tech faculty as a whole on 2 May 2002.

2. Consultants

   No outside consultants have been employed in the evaluation or preparation of this option.