

CURRICULUM PROPOSALS

1. **Overview:** The Department of Mathematical Sciences at Montana Tech would like to convert the existing Statistics Option in the Mathematical Sciences Program into a separate program (i.e., degree) called the Statistics Program. The current Statistics Option was approved in 2000 and has been the most popular option in the Mathematical Sciences program and our graduates have been very successful in obtaining jobs and in their pursuit of advanced degrees. The Department of Mathematical Sciences also offers a Minor in Statistics.

Rationale:

The faculty in the Department of Mathematical Sciences at Montana Tech feels that changing the Statistics Option to a major would;

- be helpful in recruiting students to Montana Tech by having a Statistics program separate from the math program. With the current popularity of the AP Statistics Exam it is likely that some high school students will be looking for programs in statistics when choosing a college;
- enhance the career opportunities of students earning the current statistics option. Many employers prefer to hire graduates having a degree in statistics over students having degrees in mathematics. The current status of the non-teaching job market for students earning undergraduate degrees in mathematics is primarily for students having statistics/data analysis skills. The job as a statistician is currently one of the top rated jobs (#3) in the science and engineering fields according to CareerCast.com;
- increase our graduates' chances of being accepted into the top-rated graduate programs in statistics. The overwhelming majority (> 90%) of our graduates attending graduate programs pursue advanced degrees in statistics;
- be the first official undergraduate Statistics Program at a Montana University System school.

Cost: The proposed relabeling of the Statistics Option in the Mathematical Sciences Program will not require any new faculty or the creation of a new department head, and thus has no anticipated cost to the university. The Department of Mathematical Sciences currently has three Ph.D. statisticians teaching the department's statistics courses. The Statistics Program faculty will continue to serve as members of the Department of Mathematical Sciences.

The curriculum for a degree in Statistics will be the same as it currently is under the Statistics Option in the Mathematical Sciences Program, so new classes are being proposed with the Statistics Program proposal.

2. **Need:** The need for well trained statisticians in industry and government was recognized by the Department of Mathematical Sciences in the late 1990's, and henceforth, the department added the Statistics Option to the program in 2000. Over the last 10 years approximately half of the graduates in Mathematical Sciences have graduated with the Statistics Option. Our graduates have been highly successful in finding jobs which have been primarily in Montana, Nevada, Colorado, California, Washington, and Oregon; our graduates have also been very successful in some of the top-rated graduate programs in Statistics including Texas A&M, UC Davis, Oregon State University, Purdue University, Montana State University, and the University of Idaho.
 - a. The job market for bachelor's graduates in the Mathematical Sciences is primarily in the area of statistics and data analysis. There are very few non-teaching jobs for students earning only a bachelor's degree in mathematics.

b. Students will be better prepared for jobs in the 21st Century and well suited for graduate programs in Statistics. Students earning a Statistics degree will have a better chance of being employed in Montana than those with only a degree in Mathematical Sciences. In fact, several of our graduates with the Statistics Option have found employment in Montana over the past decade.

c. The demand in industry and government for trained statisticians is not currently being met by the current supply of statisticians. Statistics jobs are available in all regions of the country for a graduate having a B.S. in Statistics.

3. Institutional Fit:

- a. The proposed program has been offered for the last ten years as an option in Mathematical Sciences.
 - b. No changes to existing programs will be required with changing the Statistics Option within Mathematical Sciences to a separate degree program in Statistics.
 - c. There are no programs at Montana Tech similar in nature to the proposed program in Statistics.
 - d. The Statistics program fits well with advancing the reputation of Montana Tech, scholarly activity and research by the Montana Tech faculty, and providing educational access and opportunities to students attending Montana Tech.
 - e. Montana State University-Bozeman and The University of Montana both have Statistics Options within their Mathematical Sciences programs. In the last 10 years several of our Statistics Option graduates have pursued advanced degrees from the MSU-Bozeman graduate program in Statistics.
4. **Program Details:** The curriculum for the proposed Statistics program currently exists and has been in place for the last 10 years as the Statistics Option within Mathematical Sciences. The curriculum worksheet for the Statistics Program is listed below.

Montana Tech of the University of Montana
Bachelor of Science in MATHEMATICAL SCIENCES
Statistics Option

Fall Semester				Spring Semester					
				Credits					Credits
FRESHMAN YEAR									
M	171	Calculus I	3	COMM	1216	Principles of Speaking	OR		
WRIT	101	College Writing I	3	COMM	1226	Public Speaking			3
STAT	216	Intro. to Statistics	3	M	172	Calculus II			3
M	194	Freshman Seminar in Mathematical Sciences	1	*		Science Elective			4
*		Science Elective		**		General Elective			3
			3				3		
**		General Elective		**		General Elective			2
			2				2		
Total Credits			15	Total Credits			15		
SOPHOMORE YEAR									
M	242	Methods of Proof	3	M	274	Intro. To Diff. Equations			3
M	273	Multivariable Calculus	4	M	331	Statistics for Scientists & Engineers			3
M	333	Linear Algebra	3	CS	2136	Matlab for Engineers and Scientists	OR		
**		General Elective		CS	2146	C Programming for Engineers and Sci			3
			3	M	323	Methods of Proof II			3
**		General Elective		**		General Elective			3
			2				3		
Total Credits			15	Total Credits			15		
JUNIOR YEAR									
STAT	421	Probability Theory	3	M	410	Numerical Compt. for Engineering & Sci			3
M	435	Advanced Calculus I	3	M	435	Advanced Calculus II			3
M	xxxx	3000/4000 Elective		STAT	422	Mathematical Statistics			3
			3	**		General Elective			3
**		General Elective					3		
			3	**		General Elective			3
**		General Elective					3		
			3	Total Credits			15		
Total Credits			15						
SENIOR YEAR									
STAT	441	Experimental Design	3	STAT	435	Statistical Computing & EDA			3
M	xxxx	3000/4000 Elective		STAT	432	Regression & Model Building			3
			3	**		General Elective			3
M	4xxx	Math Elective					3		
			3	**		General Elective			3
Total Credits			3						

**	General Elective				3
		3	**	General Elective	
**	General Elective				2
		3		Total Credits	14
M	494	Senior Seminar in Mathematical Sciences			1
		Total Credits	16		

Minimum credits for B.S. degree in Mathematical Sciences - Statistics Option = 120

* Science Electives must include at least one semester of laboratory science, either (1) BIOL 1026,1116, 1236, or 2016; (2) CHMY 141 with lab 142; (3) GEO 101 with lab GEOE 104 or GEO 209; or (4) PHYS 1046 and PHYS 2076 with lab 2096.

** Electives must be chosen so that the Gen. Ed. Requirements in the Communication Core, Humanities Core, Physical and Life Sciences Core, and Social Sciences Cores are met.

The sequences M 405-406, STAT 421-422, and the courses STAT 432 & STAT 435 are offered on alternate year basis.

M 330 does not count as an approved M 3000/4000 elective.

M 329 only counts as an approved M 3000/4000 elective for those students seeking Secondary Education Certificate.

Last Updated 4/14/2009

All courses in the above Statistics curriculum currently exist and no new courses are planned for in the near future.

5. **Resources:** No new resources will be needed to implement the Statistics program. There are currently three Ph.D. statisticians within the Department of Mathematical Sciences teaching statistics courses and overseeing the Statistics Option. A department of Statistics is not currently planned for or needed. The faculty in the Statistics program will remain members of the Department of Mathematical Sciences.
6. **Assessment:** The success of the Statistics program will be measured by the graduation rate and the acceptance rate for graduate programs in Statistics as is currently being used to measure the success of the Statistics Option.
7. **Process Leading to the Submission:** During the 2006-7 academic year several Mathematical Sciences students asked the Department Head of Mathematical Sciences at Montana Tech why Montana Tech did not have a B.S. degree in Statistics. This initiated a discussion among the faculty who are responsible for the Statistics Option at Montana Tech which led to a department-wide discussion. The Department of Mathematical Sciences faculty were well aware of the success of the students earning the Statistics Option, the demand for statisticians in industry and government, the widespread use of the AP Statistics course by incoming students and decided in a unanimous vote (Fall 2009) to pursue a Statistics Program. The Dean of the College of Letters and Sciences was consulted and he voiced his strong support for this proposal. The proposal to create a Statistics Program was approved by both the Curriculum Review Committee and the Montana Tech faculty in the fall of 2009.