

**Assessment Report
Land Surveying Minor
Montana State University
2015 – 2016 Academic Year**

Department: Civil Engineering

Department Head: Jerry Stephens

Assessment Coordinator: Doug Smith and Jerry Stephens

Date: Fall 2016, Reporting Period Academic Year 2015 – 2016

Program: Land Surveying Minor - offered in conjunction with
BS Civil Engineering (CE)
BS Civil Engineering, Bio-Resource (BREN) Option
BS Construction Engineering Technology (CET)
and open to all majors at MSU

Program Objectives:

The objective of the Civil Engineering Department's Minor in Land Surveying is to provide students with the education necessary to readily satisfy the academic requirements of the Montana Board of Professional Engineers and Professional Land Surveyors to sit for the Fundamentals of Surveying (FS) Exam. Currently, if a student desires to start on the path of becoming a Professional Land Surveyor, they must take a series of Montana Board of Professional Engineers and Professional Land Surveyors approved courses to become eligible to sit for this exam. As board members and class offerings change over time, it is difficult for students to be judged eligible by the Board to take the FS exam because of the need for a course-by-course assessment. The Montana Board of Professional Engineers and Professional Land Surveyors, the Montana Association of Registered Land Surveyors (MARLS), and the Department of Civil Engineering want to facilitate this approval process by tying it to a formal curriculum accepted by the Board as satisfying their requirements. This minor will facilitate the path to professional registration in Montana and other states, as students that successfully complete the associated coursework will have an institutionally established Surveying Minor recognized as satisfying the educational requirements to sit for the FS exam.

Program Structure:

The curricula requirements established by the Montana Board of Professional Engineers and Professional Land Surveyors to pursue licensing as a Professional Land Surveyor in the state of Montana were changed in calendar year 2015. The Board invited the Department's Surveying Program Coordinator and Department Head to meet with them to review these changes and discuss attendant modifications necessary in our Land Surveying Minor so that it would continue to satisfy the educational requirements to sit for the FS exam.

At that time, the Program of Study for the Land Surveying Minor, which was developed to meet the earlier requirements of a Board certified, FS eligible curricula, consisted of 29 credit hours of coursework as follows:

REQUIRED COURSES – 20 credits

SRVY 230 SURVEYING (formerly CE 201)**#	3 cr
SRVY 273 CONSTRUCTION SURVEYING AND EARTHWORK (formerly CET 202)**	3
OR ECIV 350 TRANSPORTATION ENGINEERING (formerly CE 350)#	
SRVY 355 ADVANCED SURVEYING COMPUTATIONS (formerly CE 363) ^^	3
SRVY 375 PHOTOGRAMMETRY (formerly CE 463) ^^	2
SRVY 361 LEGAL PRINCIPLES OF SURVEYING (formerly CE 361)^^	3
SRVY 362 U.S. PUBLIC LAND SURVEY SYSTEM (formerly CE 362)^^	3
SRVY 474 PROJECT DESIGN IN SURVEYING (formerly CE 464)^^	3

ELECTIVE COURSES from the following choices - 9 Credits

ECIV 456 HIGHWAY GEOMETRIC DESIGN (formerly CE 456)^^	3
AGEC 337 AGRICULTURAL LAW	3
DDSN 245 CIVIL DRAFTING	3
GPHY 357 GPS FUNDAMENTALS & APPS IN MAPPING (formerly LRES 357)	3
GPHY 426 REMOTE SENSING AND DIGITAL IMAGE PROCESSING (formerly LRES 426)	3
LRES 457 ADVANCED GPS MAPPING FOR GIS	3
GPHY 284 INTRODUCTION TO GIS SCIENCE AND CARTOGRAPHY	3
GPHY 384 ADVANCED GIS AND SPATIAL ANALYSIS	3
GPHY 484R APPLIED GIS AND SPATIAL ANALYSIS	3

** ALREADY IN CET CURRICULUM

ALREADY IN CE/BREN CURRICULUM

^^ PROFESSIONAL ELECTIVE IN CET, CE, or BREN

Following a very productive interchange with the Board, the following curriculum was arrived at by consensus:

Survey Techniques – 12 credits

SRVY 230 SURVEYING **#	3 cr
SRVY 273 CONSTRUCTION SURVEYING AND EARTHWORK **	3
OR ECIV 350 TRANSPORTATION ENGINEERING#^^	
SRVY 375 PHOTOGRAMMETRY ^^	3
ECIV 456 HIGHWAY GEOMETRIC DESIGN ^^	3
OR GPHY 426 REMOTE SENSING	

Principles and Practices of Land Surveying – 15 credits

SRVY 355 ADVANCED SURVEYING COMPUTATIONS ^^	3
SRVY 361 LEGAL PRINCIPLES OF SURVEYING^^	3
SRVY 362 U.S. PUBLIC LAND SURVEY SYSTEM^^	3
SRVY 474 PROJECT DESIGN IN SURVEYING^^	3
BGEN 361 PRINCIPLES OF BUSINESS LAW**	3
OR GPHY 357 GPS FUND/APP IN MAPPING	3
OR GPHY 384 ADV GIS AND SPATIAL ANALYSIS^^	
OR GPHY 484R APPLIED GIS & SPATIAL ANALYSIS	

Electives – 3 credits

GPHY 284 INTRODUCTION TO GIS SCIENCE AND CARTOGRAPHY	3
GPHY 384 ADVANCED GIS AND SPATIAL ANALYSIS^^	3
GPHY 484R APPLIED GIS AND SPATIAL ANALYSIS	3

Total – 30 credits

- ** ALREADY IN CET CURRICULUM
- # ALREADY IN CE or CE/BREN CURRICULUM
- ^^ PROFESSIONAL ELECTIVE IN CET, CE, or BREN

The total required credits in the Land Surveying Minor increased from 29 to 30 credits. Notably, the required photogrammetry class was changed from 2 to 3 credits. The number of elective credits was decreased from 9 credits to 3 credits, by making specific courses in the earlier list of electives (i.e., the route surveying and law classes) into required classes in the new curriculum. That being said, in both cases, substitution of specific remote sensing/GIS classes for these courses is allowed. These changes, and the manner in which the curriculum is organized into categories (i.e., Surveying Techniques, Principles and Practices of Land Surveying, and Electives), align the minor with the requirements of the licensing Board for a recipient to sit for the FS exam. These changes were submitted to, and subsequently approved by, the University review process.

Outcomes Assessment:

The above revised Land Surveying Minor was approved as a curriculum that meets the revised requirements of the Montana Board of Professional Engineers and Land Surveyors preparatory for the FS exam. With this action, the primary and direct objective of this Minor continued to be achieved, i.e., providing a formal curriculum available to MSU students that is recognized by the state licensing board as satisfying their academic requirements to permit pursuit of professional registration in land surveying (more specifically, to sit for the FS exam).

From a program perspective, it is further desirable to assess the level of demand for this minor, and the degree of success realized by students that pursue it. Therefore, the Department annually assesses the number of students that graduate with a Land Surveying Minor. Further and as possible, the progress of these students following graduation is monitored specifically with respect to their surveying related activities. Metrics/information that are tracked as available include:

- student satisfaction with the minor, at and after graduation,
- percent of students with the minor that are employed in surveying related jobs,
- surveying employer satisfaction with students that obtained the minor,
- percent of students with the minor that take the FS exam,
- FS exam performance compared to national experience,
- percent of students with the minor that earn surveying intern status, and
- percent of students with the minor that earn professional surveying registration.

With the exception of the number of students that graduate with a Surveying Minor, the above metrics/information on student performance post-graduation are not automatically collected or necessarily available in university or other databases. Collection of this information relies significantly on the Civil Engineering Department's ability to maintain contact with this specific cohort of students after they graduate, and on their subsequent willingness to respond to this contact. The Department has had limited success in these regards.

In academic year 2015-2016, one student graduated with the Land Surveying Minor. Since the minor was adopted in 2011, 16 students have completed the program (see Table 1).

Table 1. Land Surveying Minors Awarded at MSU

Academic Year	Surveying Minors Awarded ^b
2010-2011 ^a	4
2011-2012	1
2012-2013	0
2013-2014	4
2014-2015	6
2015-2016	1

^aMinor was approved in AY 2010 – 2011

^bTable entries have been updated relative to the 2013-2014 assessment report to reflect better information now available on number of minors awarded. Total number of minors awarded through 2013-2014 did not change, simply the specific years when they were awarded.

The graduate from 2015-2016 was not interviewed regarding the program. After a few years of steady increases in program graduates, the number of graduates dropped considerably in 2015 - 2016 compared to 2014 – 2015 (from six to just one). This drop is not attributed to any particular change in the program or in its promotion; rather, it is attributed to vagaries in the interests in the students in our program. Nonetheless, the number of graduates will be closely reviewed next year to see if this trend continues. Certainly, it is not related to the change in course requirements, as this change impacts students starting on the minor, not those about to graduate with it.

The employment status of all 16 graduates of the program to-date is unknown. Based on information available on the Montana Board of Professional Engineers and Professional Land Surveyors website, the 2015-2016 program graduate has not become a Land Surveyor Interns (in Montana) as of Fall 2016. Since its inception, four of the total of 16 program graduates have achieved the status of Land Surveyor Intern (in Montana). Note that even if status as a Land Surveyor Intern was not pursued, a focus in land surveying as recognized by a Land Surveying Minor could well support job activities and advancement in many civil/construction engineering employment situations.

In light of the on-the-job experience required prior to being considered for Professional Land Surveyor registration (four years), it is possible that some of the early program graduates are eligible for professional registration. However, in reviewing licensing information available on the State of Montana professional registration website, none of the program graduates to-date have become licensed Professional Land Surveyors.