

# MONTANA BOARD OF REGENTS

## LEVEL II REQUEST FORM

Item No.:	144-1901-R0709	Date of Meeting:	August 2009
Institution:	The University of Montana-Helena College of Technology		
Program Title:	Water Resources		

Level II proposals require approval by the Board of Regents.

**Level II action requested (check all that apply):** Level II proposals entail substantive additions to, alterations in, or termination of programs, structures, or administrative or academic entities typically characterized by the (a) addition, reassignment, or elimination of personnel, facilities, or courses of instruction; (b) rearrangement of budgets, cost centers, funding sources; and (c) changes which by implication could impact other campuses within the Montana University System and community colleges. Board policy 303.1 indicates the curricular proposals in this category:

- 1. Change names of degrees (e.g. from B.A. to B.F.A.)
- 2. Implement a new minor or certificate where there is no major or no option in a major;
- 3. Establish new degrees and add majors to existing degrees;
- 4. Expand/extend approved mission; and
- 5. Any other changes in governance and organization as described in Board of Regents' Policy 218, such as formation, elimination or consolidation of a college, division, school, department, institute, bureau, center, station, laboratory, or similar unit.

### **Specify Request:**

The University of Montana-Helena College of Technology requests to offer an Associate of Applied Science in Water Resources with options in Water Quantity and Water Quality.

## LEVEL II –A.A.S in Water Resources

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### Curriculum Proposals

#### 1. Overview

The University of Montana-Helena College of Technology is requesting approval by the Montana Board of Regents to offer an Associate of Applied Science in Water Resources with options in Water Quantity and Water Quality.

The Water Resources program being proposed by UM-Helena has been created in response to demand from local employers, students, and current employees in the field. The demand and interest brought forward by these individuals resulted in a 2 ½ year process of program development. The end result is a program that addresses the workforce development needs of our local state agencies, Department of Natural Resources and Conservation (DNRC) and Department of Environmental Quality (DEQ). The program will also produce employees who will be qualified to fill positions at private companies working in the water industry. With the vast amount of resources and expertise in the Helena area to draw from it was clear that the program could be created and delivered with a minimal financial investment. Based on input from industry and the need to reach out to students across our expansive state, this program will be primarily delivered on-line with the field internship having to be completed face to face.

#### 2. Need

a. *To what specific need is the institution responding in developing the proposed program?*

According to the Occupational Supply Demand System the national demand for technicians in this area is expected to grow 28% between the years of 2006-2016. This is one of the highest expected rates of growth on a national level during that time, and will expand the college's offerings of green jobs and green education.

Our local demand and need for this program has primarily been driven by our local state agencies, DNRC and DEQ. They have identified to us a specific need for technician level employees in their water quantity and water quality areas. The designed curriculum would prepare those students to perform jobs using a mix of scientific knowledge and technical skills. This curriculum was designed by our advisory board of industry individuals who will be the primary job market for these graduating students. The curriculum was designed to not only train degree seeking students, but also provide continuing education opportunities for incumbent workers.

The identified demand by our local agencies also requested that the entire curriculum be offered over a distance delivery format in order to reach potential students and incumbent workers around the state. UM-Helena intends to meet this request and is working to finalize details on how each of the courses will be delivered via distance education.

b. *How will students and any other affected constituencies be served by the proposed program?*

This degree will provide students and incumbent workers access to a sequence of courses that are designed to provide a strong scientific knowledge base and technical skills in the area of water resources. This offering of courses can be used to pursue a

degree option or used as training for incumbent workers looking to upgrade their knowledge base and further their career.

The skills developed can lead to positions in state government (DNRC and DEQ) or private companies in numerous career positions. In the area of water quantity it will prepare the student for a job such as Water Resource Specialist. In the water quantity option it will qualify students for additional jobs performing the following duties: analysis of issues pertaining to water use, gathering and analyzing technical water data, researching water use information, conducting field investigations to collect and evaluate water data, resolving disputes between water users, and other water resource management functions.

In the area of water quality it will train the student for jobs such as Water Protection Bureau-Compliance Inspector. In the water quality option it will qualify students for additional jobs performing the following duties: conduct compliance evaluations, inspections, investigation and sampling regarding actual and potential wastewater discharges, report and analyze decisions based on current water laws, regulations, and policies.

*c. What is the anticipated demand for the program? How was this determined?*

The anticipated demand for the program is between 10-15 students in the first year and growing gradually after that point. The anticipated enrollment is based on an identified interest by current students in the Associate of Science Environmental Science degree, inquiries through the Admissions office, and participation by incumbent workers in previous course offerings. UM-Helena has offered some of the fundamental courses associated with this degree in the 07-08 and 08-09 academic year with strong enrollment each time they were offered, averaging around 13 students per class. The courses we offered were Introduction to Water Resources, Introduction to GIS, and Groundwater Hydrology. These courses were filled with primarily non-degree seeking students and we believe this non-degree population will continue with the creation of a program.

### 3. Institutional and System Fit

*a. What is the connection between the proposed program and existing programs at the institution?*

The proposed program is most closely related to our current Associate of Science degree. Although there are some courses that are requirements for both degrees the student outcomes for each of the degrees are vastly different. The Water Resources offering is a focused program aimed at producing a student who is specifically trained at the technician level in the water resources field. The Associate of Science degree with Environmental Science option curriculum is a broad based offering of foundational courses in the area of Environmental Science.

*b. Will approval of the proposed program require changes to any existing programs at the institution? If so, please describe.*

The approval of this program will not require changes to any existing programs at UM-Helena.

c. Describe what differentiates this program from other, closely related programs at the institution (if appropriate).

See Item 3. (a)

d. *How does the proposed program serve to advance the strategic goals of the institution?*

The development and implementation of the Water Resources program is directed related to UM-Helena's strategic direction of Connecting with the Community and our action plan to work with business and industry to address workforce development needs. In the Helena area, state government is the largest employer and one of the most important industries to serve when addressing workforce needs. This program directly responds to a request by two large state agencies and shows UM-Helena's ability to address industry requests.

The creation of this program and our goal of delivering the entire curriculum through distance education also targets our strategic direction of Creating Access for students. Not only will this program and its method of delivery serve our students on campus, but it will make those course offerings available across the state and to current employees in the field.

e. *Describe the relationship between the proposed program and any similar programs within the Montana University System. In cases of substantial duplication, explain the need for the proposed program at an additional institution. Describe any efforts that were made to collaborate with these similar programs; and if no efforts were made, explain why. If articulation or transfer agreements have been developed for the substantially duplicated programs, please include the agreement(s) as part of the documentation.*

At the time UM-Helena began conversations about the development of a Water Resources program in the summer 2006 there were no active programs in the MUS that would be considered similar. The only program that had similar outcomes at that time was the Water Quality Technology:Environmental Health degree at MSU-Northern which was in moratorium. In the Fall of 2006 our Academic Dean informed the Provost at MSU-N of our intent to pursue the development of our Water Resources program. The academic officers from The University of Montana were informed of our intent in September of 2007.

During the development of our program MSU-N made the decision to have their Water Resources Program taken out of moratorium. We did have informal discussions with MSU-N about the possibility of collaboration between our programs before their program was reinstated, but no formal proposals for collaboration have been exchanged. The program curriculum was exchanged between campuses and we have had additional informal conversations about the similarities in our programs.

It is the belief of UM-Helena that although the programs at UM-Helena and MSU-N have similar titles and a few similar courses the overall curriculum is significantly different and the intended outcomes for students is significantly different. In the Water Quantity Option the overall focus of discipline is different than the MSU-N Water Quality degree. In comparing the UM-Helena Water Quality Option and the MSU-N

Quality degree the outcomes for the UM-Helena degree are designed to accommodate the requirements outlined by DEQ and their Water Compliance Officer job description.

UM-Helena believes this program differs significantly from all other programs in the MUS and that this will directly address a need and request from our local employers.

#### 4. Program Details

- a. *Provide a detailed description of the proposed curriculum. Where possible, present the information in the form intended to appear in the catalog or other publications. NOTE: In the case of two-year degree programs and certificates of applied science, the curriculum should include enough detail to determine if the characteristics set out in Regents' Policy 301.12 have been met.*

See attached curriculum

- b. *Describe the planned implementation of the proposed program, including estimates of numbers of students at each stage.*

UM-Helena will begin offering the Water Resources sequence of courses for both options in the Fall of 2009. We expect 10-15 students in the first year of the program and fill the remaining seats with incumbent workers from the state agencies in Helena and around the state. Our goal in the second year of the program is to enroll a minimum of 20 students in the program, and reach a goal of 30 students in the program by the start of the third year (Fall of 2011).

#### 5. Resources

- a. *Will additional faculty resources be required to implement this program? If yes, please describe the need and indicate the plan for meeting this need.*

It is the intent of UM-Helena to deliver this curriculum exclusively with adjunct instructors at this time. It is our belief that the vast amount of expertise in this area that resides in the Helena community will provide us with a rich pool of part-time instructors to deliver the curriculum. We believe the ability to use current employees in the field to deliver all technical courses in the program will be one of the strengths of the program.

- b. *Are other, additional resources required to ensure the success of the proposed program? If yes, please describe the need and indicate the plan for meeting this need.*

Any additional resources we may need for this program will be addressed by working in partnership with DNRC, DEQ, or local companies to provide access to equipment, internships, and expertise. Implementing this program at UM-Helena will require a minimal, or no financial investment of new resources. To solidify industry's desire for and commitment to this program, DNRC has provided \$10,000 to assist in course development.

#### 6. Assessment.

*How will the success of the program be measured?*

The program will be assessed using our institutional process for annual assessment of programs. This will include course evaluations, instructor evaluations, and submission of program goals. In addition to the annual assessment we will use indicators such as graduation rates, job placement, student satisfaction inventories, and enrollment by program/course.

7. Process Leading to Submission

*Describe the process of developing and approving the proposed program. Indicate, where appropriate, involvement by faculty, students, community members, potential employers, accrediting agencies, etc.*

In the summer of 2006 a former faculty member of UM-Helena proposed the development of a Water Resources program to address an identified need by DNRC to have trained technicians in their area of expertise. Through collaboration of UM-Helena and DNRC a Memorandum of Agreement was created and signed by official of both institutions which provided UM-Helena resources to develop the program and provided DNRC with the expectation that a Water Resources program would be developed.

The process of developing that program was informally handled by our former physical sciences instructor until December of 2008. At that time the faculty member was no longer employed at UM-Helena and the development of the program was passed to the Executive Director of Academic and Workforce Development. Using the documentation collected over the past two years, a formal advisory board was created with seven experts and potential employers in the area of water resources. The board included representatives from DNRC, DEQ and our local municipalities. This advisory board worked diligently through the next five months to formalize the curriculum, develop courses, and create a product that would meet their needs for training employees. The curriculum was submitted and approved at the departmental level on May 5, 2008, and received approval from the UM-Helena Academic Standards Curriculum Review Committee on June 2, 2009.

**WATER RESOURCES PROGRAM**  
**Water Quantity Option**

<b>Course Number</b>	<b>Course Title</b>	<b>Credits</b>
<b>First Semester</b>		
EVSC 120	Introduction to Water Resources	3
EVSC 130	Introduction to Environmental Science	3
BIOL 101	Biology	4
CAPP 131	Basic MS Office	3
M121	College Algebra (or higher)	3
	Total Credits	<u>16</u>
<b>Second Semester</b>		
EVSC 125	Maps and Aerial Photo Interpretation	3
EVSC 140	Introduction to Geographic Information Systems (GIS)	3
EVSC 145	Hydrologic Measurements	3
CHMY 121/122	Introduction to General Chemistry and Lab	4
WRIT 121	Introduction to Technical Writing	3
	Total Credits	<u>16</u>
GEN 288	Internship	<u>6</u>
<b>Third Semester</b>		
EVSC 210	Water Rights and Water Policy	3
EVSC 220	Surface Water Hydrology	3
EVSC 215	Ground Water Hydrology	3
EVSC 240	Applied Geographic Information Systems (GIS)	3
GEO 101/102	Introduction to Physical Geology and Laboratory	4
	Total Credits	<u>16</u>
<b>Fourth Semester</b>		
EVSC 225	Applied Quantitative Methods in Water Resources	4
EVSC 260	Soils, Weather, and Climate	3
EVSC 250	Technical Report Writing	3
EVSC 250	Field Methods and Reporting	4
COMM 201	Introduction to Public Relations	3
	Total Credits	<u>17</u>
Total		<u>71</u>

**WATER RESOURCES PROGRAM**  
**Water Quality Option**

<b>Course Number</b>	<b>Course Title</b>	<b>Credits</b>
<b>First Semester</b>		
EVSC 120	Introduction to Water Resources	3
EVSC 130	Introduction to Environmental Science	3
BIOL 101	Biology	4
CAPP 131	Basic MS Office	3
M 121	College Algebra (or higher)	3
	Total Credits	<u>16</u>
<b>Second Semester</b>		
EVSC 135	Maps and Aerial Photo Interpretation	3
EVSC 140	Introduction to Geographic Information Systems (GIS)	3
EVSC 150	Hydrologic Measurements	3
CHMY 121/122	General and Inorganic Chemistry and Lab	4
WRIT 121	Introduction to Technical Writing	3
	Total Credits	<u>16</u>
<b>Summer Semester</b>		
GEN 288	Internship	<u>6</u>
<b>Third Semester</b>		
EVSC 210	Water Quality	3
EVSC 220	Surface Water Hydrology	3
EVSC 215	Ground Water Hydrology	3
BIOL 220	Microbiology with Laboratory	4
EVSC 240	Environmental Policy and Laws	4
	Total Credits	<u>17</u>
<b>Fourth Semester</b>		
EVSC 250	Applied Quantitative Methods in Water Resources	4
EVSC 235	Environment and the Economy	3
WRIT	Technical Report Writing	3
COMM 201	Introduction to Public Relations	3
Electives		3
	Total Credits	<u>16</u>
Total		71

Course Prefix/Number: EVSC 120 Introduction to Water Resources



## **COURSE DESCRIPTION**

This course provides a basic introduction to the fundamental concepts, techniques and knowledge required to understand and manage water resources. Introduction to Water Resources is an introduction to use, conservation, and management of water resources. The course will provide an introduction to a variety of water resource topics including: water resource terminology, the principles of the hydrologic cycle, water balance techniques, hydrology, hydrogeology, basic computational techniques, historic water information, water law, and water rights overview. Through the use of professional sources, the students will develop a working knowledge of the hydrologic, water quality, legal, economic, political and social factors that determine water availability, hazards, use, demand, and allocation.

Course Prefix/Number: EVSC 130 Introduction to Environmental Science

## **COURSE DESCRIPTION**

This course is designed to introduce non-science students to important science-related issues in the world around us. The class will examine environmental issues and relate them to current problems in Montana and the United States. Class discussions will emphasize the basic scientific principles needed to evaluate scientific problems with examples based on areas of state and local concern.

Course Prefix/Number: BIOL101 Biology I with Lab

## **COURSE DESCRIPTION**

The first course in the biology sequence is an introduction to the basic concepts and principles of general biology with an emphasis on lab experiences, critical thinking, problem solving, and the scientific method. Areas of study include organic chemistry and biochemistry, cellular biology, cell growth, genetics and genetic engineering, reproduction, cell metabolism, ecology, evolution theory, and classification systems in biology.

Course Prefix/Number: CAPP 131 Basic MS Office

## **COURSE DESCRIPTION**

This course provides students with basic computer literacy concerning terminology, careers, and social issues related to computer, network, and information technology including ethics, crime, and copyright issues. Students will explore a computer operating system (Microsoft Windows XP) and Microsoft Office Suite 2007, including Microsoft Word and Excel, Internet, and solutions for real world problems. Through hands-on activities, participants will learn effective uses of a Windows-based computer as a tool to increase productivity and employability.

Course Prefix/Number: M121 College Algebra (or higher)

### **COURSE DESCRIPTION**

This is a study of equations and inequalities, including systems, functions and graphs, polynomial, rational, exponential and logarithmic functions and graphs, sequences and series and the binomial theorem.

Course Prefix/Number: EVSC 135 Maps and Aerial Photo Interpretation

### **COURSE DESCRIPTION**

The course will introduce basic principles, techniques, processes, and procedures for quantitative and qualitative interpretation of topographic maps and aerial photographs. The course will entail not only formal explanation of principles and concepts but also hands-on exercises that focus on various practical applications for effective interpretation of maps and air photos in order to make quality assessments of physical objects or locations of interest. Each student is required to conduct an individual research project, which will consist of problem solving using the analytical skills learned during the semester.

Course Prefix/Number: EVSC 140 Introduction to Geographic Information Systems (GIS)

### **COURSE DESCRIPTION**

This course teaches the basics of Geographic Information Systems (GIS) and the science and technology behind it. Students will be introduced to the fundamentals and methods of spatial data collection, processing, analysis, and cartography.

Course Prefix/Number: EVSC 150 Hydrologic Measurements

### **COURSE DESCRIPTION**

This course will introduce the concepts of flow, pressures, and measurement of water. This is a foundational course that will introduce the knowledge necessary to complete future courses in Surface Water, Groundwater, and Applied Methods.

Course Prefix/Number: CHEM 150/151 General and Inorganic Chemistry and Lab

### **COURSE DESCRIPTION**

**CHEM 150:** This course is designed to provide students with a working knowledge of the basic principles of chemistry and the physical world at a microscopic scale. Topics include the atomic model of matter, energy, chemical bonds and reactions, the states of matter, acids and bases, and an introduction to organic chemistry. The course integrates lecture and

homework assignments to provide students practical examples of applications and course material to “real world” situations.

**CHEM 151:** The lab component is designed to reinforce the material covered in CHEM 150 by providing students with a practical hands-on opportunity to execute and to observe supplemental exercises in a lab setting.

Course Prefix/Number: WRIT 121 Introduction to Technical Writing

### **COURSE DESCRIPTION**

The course provides experience in communication formats typical of technical careers and places emphasis on writing as the craft of the critical thinker, involving analysis of audience, context, and purpose, as well as the ability to locate, synthesize, analyze, organize, and present information effectively.

Course Prefix/Number: GEN 288 Internship

### **COURSE DESCRIPTION**

This course is designed for the student who takes the initiative to perform work outside of and in addition to the normal school curriculum. It is designed to be a highly rewarding workplace experience to give the student exposure to real workplace conditions, with the opportunity to enhance his/her resume and to aid in the student’s transition from school to work.

Course Prefix/Number: EVSC 212 Water Quality

### **COURSE DESCRIPTION**

The Water Quality course provides an understanding and an awareness of the basic principles of water quality including the following main themes: classification and assessment of ground water and surface water quality for naturally occurring, anthropogenic and biologic constituents; local, state, and federal regulations related to water quality; guidelines related to sampling and testing requirements for and the practical development of monitoring programs including design, sampling, analysis, interpretation and presentation of data; and water treatment processes for municipal water supply, surface water and ground water. The water quality course is designed to prepare interested students for future careers in applied water resource management.

Course Prefix/Number: EVSC 220 Surface Water Hydrology

### **COURSE DESCRIPTION**

Surface Water Hydrology explores the theory and observations of the physical processes of the hydrologic cycle with an emphasis on surface flows. This course involves an in-depth analysis of the hydrologic cycle and principles including: precipitation, evapotranspiration, stream flow and open channel hydraulics, rainfall interception, infiltration, and ground water hydrology. Water measurement and analysis tools will be introduced including discharge and stage monitoring and hydrograph analysis methods. These processes will be applied with the goal of evaluating simplified water budgets and understanding how different factors influence water flows, storage, and probabilities of extreme events including floods and droughts.

Course Prefix/Number: EVSC 215 Groundwater Hydrology

### **COURSE DESCRIPTION**

Ground Water Hydrology presents fundamental concepts and principles of the geology of ground water occurrence, aquifer types and their hydraulic properties, ground water flow, well drilling and design technology, aquifer testing analysis methods, and interpretation and assessment of aquifer testing results and pumping impacts.

Course Prefix/Number: BIOL 220 Microbiology with Laboratory

### **COURSE DESCRIPTION**

This course provides a general study of microscopic organisms and their forms, metabolism, reproduction, physiology, classification, relationship to each other, and their effects on humans.

Course Prefix/Number: EVSC 210 Water Rights and Water Policy

### **COURSE DESCRIPTION**

The Water Rights and Water Policy course is designed to introduce the laws, regulations and policies governing water quantity and water quality resources. The course will explore the many factors that influence and shape water quality laws and policies and the impact on a society's value, allocation, distribution, use, and preservation of water resources. Special emphasis will be given to the system of water courts and water judges by using real examples of adjudication and water transactions of a finite resource. This course will also introduce the historical context and evolution of water quality laws and regulations and explore the use of water quality permits and other regulatory methods for the protection of water quality.

Course Prefix/Number: EVSC 211 Environmental Policy and Laws

### **COURSE DESCRIPTION**

This course will study the federal and state policy and laws that apply to water quality. It will take a practical approach showing those policies and laws are applied and enforced in different circumstances.

Course Prefix/Number: EVSC 240 Geographic Information Systems (GIS)- Existing

### **COURSE DESCRIPTION**

Geographic Information Systems (GIS) are used for the creation, storage, representation, research, and analysis of spatial information in a digital environment. This course expands on the fundamentals and principles of GIS and cartography learned in the Introduction to Geographic Information Systems course. Students will learn the processes, procedures, and the critical thinking involved with performing geospatial analysis. The course will entail a hands-on lab that focuses on GIS concepts and techniques utilized for data design, analysis, and map creation. Each student is required to conduct his or her own individual research project, which will consist of model building and design for spatial analysis.

Course Prefix/Number: EVSC 250 Applied Quantitative Methods in Water Resources

### **COURSE DESCRIPTION**

Applied Quantitative Methods in Water Resources expands on the fundamentals of water resources and hydrology to gain more experience in problem solving and critical thinking. This course reviews and applies the skills required and the methods used for measuring and analyzing surface water and ground water data to make predictions or decisions in water resource applications. The course emphasizes practical applications of stream flow measurement with emphasis on discharge and stage monitoring methods for measuring and analyzing flow rate and discharge. Ground water flow and aquifer storage and sustainability analysis techniques including pumping test data analysis and borehole test data analysis. A review of field equipment required for measurement and computational tools utilized in the context of hydrologic problem solving will be discussed. An introduction to both analytic and numerical models as tools for problem solving will be introduced with an emphasis placed on spreadsheet use in problem solving.

Course Prefix/Number: EVSC 233 Environment and the Economy

### **COURSE DESCRIPTION**

This course will specifically address the environmental impact caused by economic development and projects. It will specifically look at the impact on water pollution, water sources, and reclamation of impacted water supplies. Current and historical examples will be used for demonstration purposes.

Course Prefix/Number: EVSC 235 Soils, Weather and Climate

### **COURSE DESCRIPTION**

This course will study the effect of soils, weather and climate on water distribution. A practical approach will be taken to apply this knowledge to existing examples of water distribution and the effect the environmental factors have on that process.

Course Prefix/Number: EVSC 260 Field Methods and Reporting

### **COURSE DESCRIPTION**

This Field Methods and Reporting course is designed to provide students with a working knowledge of the scientific principles and protocols used in water resource measurements and field methods. The course will emphasize equipment utilized in water resource measurements and experimental design for water resource studies. Measurement and sampling strategies and safety practices in the field will be discussed along with field trips to demonstrate application of field methods. Quality Assurance and Quality Control (QA/QC) procedures will be studied. The importance of record keeping, data logging, and data management to the legal aspects of environmental projects is emphasized.

Course Prefix/Number: WRIT Technical Report Writing

### **COURSE DESCRIPTION**

This course will specifically address advanced techniques in technical writing and how those skills should be applied when creating technical reports.

Course Prefix/Number: COMM 201 Introduction to Public Relations

### **COURSE DESCRIPTION**

This course introduces students to theory and to practice of public relations with practical application of public relations, writing, and delivery strategies. Additionally, students will study the media and produce a communications plan.