Faculty Senate Minutes

4/30/2019

10:00-11:00 am

Pintler Room SUB

Attendees: Charie Faught, Stella Capoccia, Atish Mitra, Miriam Young, John Ray, Kishor Shrestha, Peter Lucon, Vickie Petritz, Matt Donnelly, Ulana Holtz, Katherine Zodrow, Mary North Abbott, Dan Autenrieth, Chad Okrusch, Phillip Curtiss, Courtney Young, David Gurchiek, Doug Abbott, Glen Southergill.

Started with quorum @ 10:02am. No meeting minutes from last time yet.

Action Items

I. CRC Recommendations: Motion to approve all Computer science CRC items together, and seconded. **Motion Passed.**

Discussion by Chair about signatures for future CRC items. Senator: We should explore possibility of electronic signatures. Chair will check whether DocuSign can be used.

II. Discussion about Meeting times for next semester:

Chair reported that some senator (not present) suggested meeting every 2 weeks, alternating between 60 mins and 90 mins. Senator: earlier it used to be 2 hours each once a month, later changed to the present format of 2 meetings of 60 mins each. Senator: suggested starting at 7:30am till 9:00am. Senator: Proposed that meetings are scheduled only during 8-5 timings, to avoid daycare problems. Senator: suggested the people will children should accommodate. Senator: Asked about reasoning to changing from present format, as the present format seems to work well. Senator: Motion to keep same times (60 mins every 2 weeks) and keep scheduling techniques as from last year to accommodate maximum no of senators. Motion seconded. **Motion Passed.** Vice-Chair: Suggested to keep Tuesday / Thursday schedule for Fall 2019. Chad Okrush: As his department does not exist any more, does he still attend as senator? Chair: yes, as per by-laws. Vice-Chair: At present there is no adjunct representative in the senate. We have an open position for an adjunct on the senate, so suggestions are welcome. Vice-chair: Suggested doing scheduling the first week of Fall2019. Senator: as faculty contracts start 15th Aug, suggested having the first meeting before classes starts. Senator: suggested the first meetings be on the Friday before classes start.

Discussion Items

III. Committee List:

Senator: Appreciated work done on committee on committees, suggested do more study and discussion on it next session. Senator: Suggested we go thru the list and get rid of any defunct committees. Chad Okrusch: Volunteered to make a chart with details of membership and mandate. Courtney Young: Volunteered to get the existing chart from Scott Risser and work with Chad Okrusch.

IV. Faculty Satisfaction Survey:

Vice-chair: encouraged everyone to submit by deadline. Senator: important that a high fraction of faculty participates, to make the survey meaningful. More email reminders useful.

V. Planned meeting with new Chancellor:

Vice-chair: A meeting of senate officers with incoming Chancellor is planned.

Informational Items

VI. Northwest Commission on Colleges and Universities Revisions to Accreditation Standards Comments

Chair sent out the letter (drafted by John Ray) yesterday.

Motion to adjourn. Adjourned 10:30am

MontanaTech *Curriculum Change Request Form Dated 2 Feb 2017*

Protocol: The department requesting curriculum change holds a discussion at the departmental level, and if agreed upon by the department head, discuss with the Dean for approval. Forward the completed form along with supporting information to the CRC chair after approval from the department head, dean, and graduate council if necessary. Final changes are then made by the registrar after faculty senate approval. Guidance: https://www.umt.edu/provost/faculty/curriculum/default.php.

Date 03/12/2019
Dept. General Science **College** CLSPS
Program: B.S. Degree

Description of Request/Summary: Place in moratorium per Program Prioritization

Current Course Program Information: N/A

Proposed Change (Attach syllabus or curriculum for new course or curriculum changes.)

Course # Name	Credits	Pre-req.
XXXXXXXX		

This should include what will appear in the catalog, exactly.

List of supporting documentation attached:

1. **Example: syllabus**
2. **Example: Curriculum worksheet**

Assessment Leading to Request
XXXXXXXX.

Anticipated Impacts to "Other" Programs
XXXXXXXX.

Impact on Library: XXXXXXXXXX has consulted with XXXX (XX/XX/XX) at the Montana Tech library to ensure needed materials and media are available. (Or No consultation is required since changes are only in the course number, course name, or course pre-requisites.)

Date to take effect: 04/01/19

LEVEL of Request
Please indicate the type of request(s) by selecting *all that apply*:
Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ☐ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification of 29 credits or less

- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- X Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

APPROVALS

Department Head Approval Amy Kvernvik Date 3/12/19

Dean Approval [signature] Date 4/11/19

VCAAR Approval (see above) Douglas M. Abbott Date 4/17/19

Chancellor Approval (see above) Donald M. Blackketter Date 4/17/19

Graduate Council Approval _____ Date _____

CRC Approval _____ Date _____

Faculty Senate Approval _____ Date _____

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/16/19
Dept. HC- Health Programs
Program: AAS Radiologic Technology

College – Highlands Health Programs
CRC Representative: Tamara Harp

Description of Request: Add M140 College Math for Healthcare as an alternative for Radiologic Technology Program's math requirement/program prerequisites.

Current Course or Program Information: Current requirement is M121 College Algebra. M121 will remain an option for students.

Proposed Change

Course # Name	Credits	Pre-req.
M140 College Math for Healthcare	3	M95 or placement into M121
New course require course objectives listed in this area.		

List of supporting documentation attached:

Program Curriculum Worksheet
M140 Spring 2019 Syllabus
M140 Learning Outcomes & Catalog Posting

Assessment Leading to Request

Many healthcare programs in the state are offering this course as an alternative to College Algebra, allowing for more transferability between schools or programs. The material covered in College Math for Healthcare is applicable to the mathematic applications expected of students throughout the radiology program, and in their careers in healthcare.

Anticipated Impacts to "Other" Programs

Will allow for more transferability between other healthcare programs utilizing this course, such as our MA program. Many students that apply to the radiology program are not accepted, this would allow them to have a math applicable to other health departments they may want to explore. The math department will see more students enrolled in this course rather than college algebra.

Impact on Library: Tamara Harp has consulted with Scott Juskiewicz on 04/16/19 at the Montana Tech library to ensure needed materials and media are available. (Or No consultation is required since changes are only in the course number, course name, or course pre-requisites.)

Date to take effect: **05/28/2019**

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval _____ Date 4/16/19

Dean Approval _____ Date 4/16/19

Graduate Council Approval _____ Date _____

CRC Approval _____ Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ☒ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
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- ☐ Establishing a B.A.S./A.A./A.S. area of study
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- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

Radiologic Technology Program

Associate of Applied Science Degree

First Semester – Fall

Program Prerequisites

*BIOH	201	Human Anatomy & Physiology I	3 credits
*BIOH	202	Human Anatomy & Physiology I Lab	1 credit
*AHXR	104	Intro to Radiologic Sciences	3 credits
		OR	
*CHMY	121	Intro to General Chemistry	
*WRIT	101	College Writing I	3 credits
*M	121	College Algebra	3 credits
		OR	
***M**	**140**	**College Math for Healthcare**	
*AHXR	100	Intro to Diagnostic Imaging	3 credits
		Total:	16 credits

Second Semester – Spring

Entrance into program if accepted

BIOH	211	Human Anatomy & Physiology II	3 credits
BIOH	212	Human Anatomy & Physiology II Lab	1 credit
AHXR	101	Patient Care in Radiology	3 credits
AHXR	140	Radiographic Methods	3 credits
AHXR	121	Radiographic Imaging I	4 credits
AHXR	195	Radiographic Clinical I	4 credits
		Total:	18 credits

Third Semester – Summer

AHXR	195b	Radiographic Clinical II	10 credits

Fourth Semester – Fall

AHXR	225	Radiobiology/Radiation Protection	2 credits
AHXR	221	Radiographic Imaging II	3 credits
AHXR	295	Radiographic Clinical III	8 credits
PSYX	100	Intro to Psychology	3 credits
		Total:	16 credits

Fifth Semester – Spring

AHMS	175	Medical Law & Ethics	2 credits
AHXR	222	Radiographic Imaging III	2 credits
AHXR	270	Radiographic Registry Review	2 credits
AHXR	295b	Radiographic Clinical IV	6 credits
		Total:	12 credits

Minimum credits for an A.A.S. degree in Radiologic Technology = 72 credits

*Prerequisite courses may only be repeated once

Highlands College
OF MONTANA TECH

25 Basin Creek Road – Butte, MT – 59701

M 140 – College Mathematics for Health Care
Spring 2019

Instructor	Dr. Hilary Risser hrisser@mtech.edu 406-496-4581
Office hours	MW 10:00AM -11:00AM (North campus) TR 2:15PM – 2:45PM (Highlands)
Required text and materials	Mathematics for Health Sciences: A Comprehensive Approach (1st edition) by Joel R. Helms Math in Society: A Survey of Mathematics for the Liberal Arts Major version 2.5 by David Lippman http://www.opentextbookstore.com/mathinsociety/2.5/Probability.pdf Scientific or graphing calculator
Learning Outcomes	1. Apply knowledge of decimals, fractions, and percents to solve algebraic linear equations in the healthcare field. 2. Understand rational equations and use knowledge of rational equations to solve problems involving ratios and proportions (including but not limited to volume, mass, weight and temperature) . 3. Be able to use the fundamental units of the metric system (SI), household units, and the apothecary system in making measurements and doing calculations related to allied health applications. 4. Interpret the meaning of range, standard deviation, and the coefficient of variation in applied situations. 5. Use and apply the basic probability concepts: probability models (Venn diagrams, two-way tables), sample spaces with equally likely outcomes (counting), probability distributions. 6. Use and apply the rudiments of statistics: measures of center and spread, the normal distribution. 7. Understand and interpret exponential and logarithmic functions and graphs. 8. Apply knowledge of logarithmic functions to solve problems in the healthcare. 9. Apply mathematical and statistical reasoning to a variety of applied or theoretical healthcare problems.
Important dates:	Last day to drop without class appearing on transcript: January 28th Last day to withdraw with an automatic "W": March 26th Final Exam: May 1st 3PM

Class Policies:

Academic Dishonesty: Academic Dishonesty as defined in the student handbook will not be tolerated. Any violations of the policy will result in all involved parties receiving a 0 on the assignment in question. All violations will also be reported to the provost.

Attendance: Attendance is required and will be taken daily. You are expected to be on-time and remain the entire class time. You should sign in on the sign in sheet every day. If you didn't sign in, you weren't there. Responsibility for work missed because of illness or school business is placed upon the student. Attendance will be considered for students with a grade of D+.

Evaluation and Measurement:

Homework: These problems are listed on the syllabus. The problems on quizzes and tests will be similar to these problems. Questions concerning these problems will be answered during class. However, these problems will not be collected or graded.

Exam: There will be three exams, including a final exam. The exams during the semester will be announced approximately one week in advance. Makeup exams will be available for one calendar week after the missed exam. If the missed exam is not made up by that time, you will receive a zero. Documentation must be provided to receive a makeup exam. Scientific calculators will be allowed on all exams. The final exam will be comprehensive.

Quizzes: There will be weekly quizzes on the material. The quizzes will not be announced in advance. I will drop the lowest four to five quizzes. Makeup quizzes are not available.

Grade distribution:

3 exams @ 20% each	= 60%
10 quizzes @ 4% each	= 40%

Structure of the Course:

Before class: Before each class meeting, you should attempt the homework listed on the syllabus and check the odd numbered problems in the back of the book. You should mark questions that are not correct. If you have a small number of homework questions that you need help with, you can bring those to class for help. If you have a lot of questions that you need help with, you should bring those questions by my office for individual help. Generally, the homework problems should take between 1 and 2 hours to complete. Remember that the homework is designed to give you practice. I will not collect or grade the work.

Beginning of class: At the beginning of class, I will go over about 3-4 questions on the assigned homework problems from the book.

Lecture: I will introduce a topic via a short lecture and a small number of worked examples. I usually use even numbered problems from the homework in my lectures.

Independent/Group Work: After the short lecture, I will ask you to work independently or in small groups on even numbered homework problems. I will walk around and help you as you work through these problems. We will primarily be working books out of the text. Please make sure that you have access to those problems every day.

Quizzes: Be sure that you have your calculator in class each day. You will be able to use it on your quizzes. Quizzes will be given at the end of a class period. Once you finish your quiz, you may leave.

Topics Covered:

Objective	**Homework**
Solve linear equations	2.1 (17-42) 2.3 (61-65)
Write a linear equation for a situation	2.1 (43, 44)
Solve mixture problems	2.2 (1-15)
Evaluate formulas for a given value	2.4 (21-28, 35-38)
Solve problems using ratio and proportions	2.5 (19-40)
Solve percent problems	2.6 (25-36)
Simplify exponential expressions	2.7 (1-34)
Convert between scientific and standard notation	2.8 (1-40, 59-62)
Simplify expressions given in scientific notation	2.8 (41-58)
Simplify units using dimensional analysis	3.1 (1-20)
Convert units within the metric system	3.2 (1-41)
Convert between metric and nonmetric systems	3.3 (1-26)
Convert between apothecary and household systems	3.4 (1-17)
Convert between Celsius and Fahrenheit	3.5 (1-16)
Exam 1	
Solve single dilution problems	4.1 (1-31)
Determine final concentrations	4.2 (1-5, 10-12)
Solve dilution problems of two solutions	4.3 (1-18)
Solve problems using percent volume	4.4 (5-13)
Read and interpret drug orders	5.1 (1-9)
Read and interpret drug labels	5.1 (10-16)
Calculate drug orders	5.2 (1-23)
Calculate volume of drug to satisfy an order	5.3 (10-19)
Identify volume of drug in a syringe	5.3 (1-9)
Calculate the volume that is required when medicine is provided in powdered form	5.4 (1-7)
Perform intravenous calculations	5.5 (1-22)
Perform titration calculations	5.6 (1-11)
Calculate drug dosages based on body weight	5.7 (1-7)
Determine if a physician's order is appropriate	5.7 (8-22)
Calculate drug dosages based on BSA	5.8 (1-10)
Calculate drug dosages based on BSA using the West Nomogram chart	5.8 (11-20)

Exam 2	
Plot ordered pairs on the coordinate plane	6.1 (2)
Determine the slope of a line given a graph or two points	6.2 (1-7, 8-15)
Graph a linear equation using slope and y-intercept	6.3 (1-16)
Read and interpret linear and nonlinear graphs	6.5 (1-9)
Determine if a graph represents a function	7.1 (1-6)
Graph inequalities	7.1 (14-25)
Graph exponential functions	7.2 (1-12)
Solve applications involving exponential functions	7.3 (5-12)
Expand and condense logarithmic expressions	7.4 (17-29)
Determine the pH of a solution	7.5 (1-6)
Create a frequency table	9.2 (1-7)
Construct graphs from tables	9.4 (1-10)
Calculate the mean, median, and mode of a data set	10.1 (1-9)
Compute the standard deviation of a data set	10.2 (1-6)
Compute percentages that fall within a range of data values for normally distributed data	10.3 (2-6)
Calculate percentiles	10.5 (1-6)
Compute basic probabilities	12 (1-10)
Find probability for and/or events	12 (17-22, 27-30,33, 34)
Compute conditional probabilities	12 (41-48)
Compute probabilities using permutations and combinations	12 (49-57)
Final Exam	

M 140 3 credits

College Math for Healthcare

Highlands College of Montana Tech

Learning Outcomes:

1. Apply knowledge of decimals, fractions, and percent's to solve algebraic linear equations in the healthcare field.
2. Understand rational equations and use knowledge of rational equations to solve problems involving ratios and proportions (including but not limited to volume, mass, weight and temperature).
3. Be able to use the fundamental units of the metric system (SI), household units, and the apothecary system in making measurements and doing calculations related to allied health applications.
4. Interpret the meaning of range, standard deviation, and the coefficient of variation in applied situations.
5. Use and apply the basic probability concepts: probability models (Venn diagrams, two-way tables), sample spaces with equally likely outcomes (counting), probability distributions.
6. Use and apply the rudiments of statistics: measures of center and spread, the normal distribution.
7. Understand and interpret exponential and logarithmic functions and graphs.
8. Apply knowledge of logarithmic functions to solve problems in the healthcare.
9. Apply mathematical and statistical reasoning to a variety of applied or theoretical healthcare problems.

General Ed. Designators	M – Mathematics
Integrated Lab	No
Online	No
Cultural Heritage of American Indians	No

From the Catalog:

This course is designed to provide students with a solid mathematical foundation necessary to succeed in a health care profession. This course will review algebra systems of measurement, ratio and proportions, basic probability and statistics concepts, and ionic solutions and pH calculations. This course will apply mathematical reasoning and problem solving as it applies to the health care field and is a suitable prerequisite for STAT 216. Pre-requisite M 095 or placement into M 121.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Computer Science, Data Science
College SME
CRC Representative Jeff Braun

Description of Request: Cross-list CSCI 446 as 446/546. Change description to reflect that.

Current Course or Program Information:

Description: An introduction to the basic concepts of Artificial Intelligence. Topics to be covered include the history of AI, the problems treated in AI, solution techniques, state spaces, search algorithms and heuristics, expert systems, natural language processing, and robotics.

Prerequisite(s): CSCI 332. Course generally offered 1st semester.

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 446 Artificial Intelligence	**3**	**CSCI 332**
An introduction to the basic concepts of Artificial Intelligence. Topics to be covered include the history of AI, the problems treated in AI, solution techniques, state spaces, search algorithms and heuristics, expert systems, natural language processing, and robotics. Students may not take this course for both 400 and 500 level credit.		
CSCI 546 Artificial Intelligence	**3**	**CSCI 332 or consent of instructor**
An introduction to the basic concepts of Artificial Intelligence. Topics to be covered include the history of AI, the problems treated in AI, solution techniques, state spaces, search algorithms and heuristics, expert systems, natural language processing, and robotics. Students may not take this course for both 400 and 500 level credit.		

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the prerequisites.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele VanDyke Date 4/9/19

Dean Approval [signature] Date 4-10-19

Graduate Council Approval [signature] Date 4-11-19

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

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- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
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- ☐ Other:

CSCI 446

Artificial Intelligence

3 Cr. (Hrs.:3 Lec.)

An introduction to the basic concepts of Artificial Intelligence. Topics to be covered include the history of AI, the problems treated in AI, solution techniques, state spaces, search algorithms and heuristics, expert systems, natural language processing, and robotics. Students may not take this course for both 400 and 500 level credit. Prerequisite: CSCI 332 **(1st)**

Course generally offered fall (1st) semester.

Expectations:

E1. Students should have a thorough understanding of space and time complexity of data structures and algorithms. (CSCI 332)

E2. Students should have a thorough understanding of recursion and recursive problem solving techniques, and list structures and the algorithms associated with them. (CSCI 232)

E3. Students should have a thorough understanding of graphs, trees, and the algorithms associated with them. (CSCI 332)

E4. Students should have a working knowledge of logic and logical methods, including propositional and predicate calculus. (CSCI 246)

Course Outcomes:

R1. Students know the historical background of the field of Artificial Intelligence. (CAC-h)

R2. Students are aware of the relevant ethical considerations in the field of Artificial Intelligence. (CAC-e, g)

R3. Students understand and define the concept of a state space for a problem. (CAC-a, j)

R4. Students can describe and implement brute-force search techniques, such as breadth-first, depth-first, and iterative deepening. (CAC-a, b, c, j)

R5. Students can describe and implement heuristic search techniques such as greedy and A*. (CAC-a, b, c, j)

R6. Students can describe and implement adversarial search techniques such as minimax and alpha-beta pruning. (CAC-a, b, c, j)

R7. Students can describe and implement constraint satisfaction techniques such as backtracking and local search methods. (CAC-a,b, c, j)

R8. Students understand the use of logic (propositional and predicate calculus) as means of representing knowledge in a computer system. (CAC-a, b, c, j)

R9. Students can perform theorem proving using resolution in a logical knowledge-based system. (CAC-a, b, c, j)

R10. Students understand the concept of probabilistic reasoning and can determine when to use this concept. (CAC-a, b, c, j)

R11. Students are able to apply Bayes theorem to determine conditional probabilities and can use Bayesian networks to model and reason about problems. (CAC-a, b, c, j)

R12. Students understand and can work with Markov models and reinforcement learning. (CAC-h)

CSCI 546

Artificial Intelligence

3 Cr. (Hrs.:3 Lec.)

An introduction to the basic concepts of Artificial Intelligence. Topics to be covered include the history of AI, the problems treated in AI, solution techniques, state spaces, search algorithms and heuristics, expert systems, natural language processing, and robotics. Students may not take this course for both 400 and 500 level credit. Prerequisite: CSCI 332 or consent of instructor **(1st)**

Course generally offered fall (1st) semester.

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R11. Students are able to apply Bayes theorem to determine conditional probabilities and can use Bayesian networks to model and reason about problems. (CAC-a, b, c, j)

R12. Students understand and can work with Markov models and reinforcement learning. (CAC-h)

R13. Students will implement a real-world project using techniques presented over the semester.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science **College** SME
Program Data Science **CRC Representative** Jeff Braun

Description of Request: Change description and prerequisites of CSCI 447/547.

Current Course or Program Information:

Description: Introduction to the framework of learning from examples, various learning algorithms such as neural networks, and generic learning principles such as inductive bias, Occam's Razor, and data mining. Reviews some statistical learning techniques, but focus is on non-statistical techniques.

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 447 Machine Learning	**3**	**CSCI 332**

Introduction to the framework of learning from examples. Topics include various learning algorithms such as neural networks, Bayesian networks, and genetic algorithms, and generic learning principles such as bias/variance, MDL principle, and ethical considerations. Review statistical learning techniques, yet focuses on non-statistical techniques. Students may not take this course for both 400 and 500 level credit.

CSCI 547 Machine Learning	**3**	**CSCI 332 or consent of instructor**

Introduction to the framework of learning from examples. Topics include various learning algorithms such as neural networks, Bayesian networks, and genetic algorithms, and generic learning principles such as bias/variance, MDL principle, and ethical considerations. Review statistical learning techniques, yet focuses on non-statistical techniques. Students may not take this course for both 400 and 500 level credit.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the prerequisites and description.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele VanDyke Date 4/9/19

Dean Approval [signature] Date 4-10-19

Graduate Council Approval [signature] Date 4-11-19

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 447

Machine Learning

3 Cr. (Hrs.:3 Lec.)

Introduction to the framework of learning from examples. Topics include various learning algorithms such as neural networks, Bayesian networks, and genetic algorithms, and generic learning principles such as bias/variance, MDL principle, and ethical considerations. Review statistical learning techniques, yet focuses on non-statistical techniques. Students may not take this course for both 400 and 500 level credit. Prerequisite CSCI 332. **(2nd)**

Course generally offered spring (2nd) semester.

E1. Students should have a thorough understanding of space and time complexity of data structures and algorithms. (CSCI 332)

E2. Students should have a thorough understanding of recursion and recursive problem solving techniques, and list structures and the algorithms associated with them. (CSCI 232)

E3. Students should have a thorough understanding of graphs, trees, and the algorithms associated with them. (CSCI 332)

E4. Students should have a working knowledge of logic and logical methods, including propositional and predicate calculus. (CSCI 246)

Course Outcomes:

R1. Be comfortable with machine learning fundamentals including probability, linear algebra, data analysis, the overall machine learning process and general dimensions of machine learning problems

R2. Have reviewed the statistical techniques of regression, clustering and the nearest neighbor approach.

R3. Understand and be able to implement machine learning algorithms such as neural networks, Bayesian networks and genetic algorithms.

R4. Be able to discuss tradeoffs between different machine learning algorithms, hyperparameter selection heuristics, and bias/variance.

R5. Understand performance metrics and what measures to use to compare results from different models.

R6. Be able to identify and implement ensemble learning techniques.

R7. Be able to develop workable representations for the various approaches, and identify situations in which data manipulation must be used prior to learning.

R8. Understand ethical considerations and assumptions behind the development of a learned model.

CSCI 547

Machine Learning

3 Cr. (Hrs.:3 Lec.)

Introduction to the framework of learning from examples. Topics include various learning algorithms such as neural networks, Bayesian networks, and genetic algorithms, and generic learning principles such as bias/variance, MDL principle, and ethical considerations. Review statistical learning techniques, yet focuses on non-statistical techniques. Students may not take this course for both 400 and 500 level credit. Prerequisite CSCI 332 or consent of instructor. **(2nd)**

Course generally offered spring (2nd) semester.

E1. Students should have a thorough understanding of space and time complexity of data structures and algorithms. (CSCI 332)

E2. Students should have a thorough understanding of recursion and recursive problem solving techniques, and list structures and the algorithms associated with them. (CSCI 232)

E3. Students should have a thorough understanding of graphs, trees, and the algorithms associated with them. (CSCI 332)

E4. Students should have a working knowledge of logic and logical methods, including propositional and predicate calculus. (CSCI 246)

Course Outcomes:

R1. Be comfortable with machine learning fundamentals including probability, linear algebra, data analysis, the overall machine learning process and general dimensions of machine learning problems

R2. Have reviewed the statistical techniques of regression, clustering and the nearest neighbor approach.

R3. Understand and be able to implement machine learning algorithms such as neural networks, Bayesian networks and genetic algorithms.

R4. Be able to discuss tradeoffs between different machine learning algorithms, hyperparameter selection heuristics, and bias/variance.

R5. Understand performance metrics and what measures to use to compare results from different models.

R6. Be able to identify and implement ensemble learning techniques.

R7. Be able to develop workable representations for the various approaches, and identify situations in which data manipulation must be used prior to learning.

R8. Understand ethical considerations and assumptions behind the development of a learned model.

R9. Demonstrate the ability to implement one or more learning techniques using a real-life dataset.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/09/2019
Dept. Computer Science
Program Computational Science
College SME
CRC Representative Jeff Braun

Description of Request: Change description and prerequisite on CSCI 477/577.

Current Course or Program Information:

CSCI 477: Covers various computational modeling and simulation principles and techniques applicable to various domains of engineering and science. Students will implement and apply these methods, including model verification and validation, for basic examples. Students will then complete a project within their discipline to design a representative model, implement the model, complete a verification and validation of the model, and update the model to reflect corrections, improvements and enhancements. Specific topics include matrix languages, ODE solving, PDE solving, finite difference approximation, finite element methods, and visualize data generated from computer simulations.

Prerequisite(s): CSCI 112 ,CSCI 117 , or CSCI 135

CSCI 577: Covers various computational modeling and simulation principles and techniques applicable to various domains of engineering and science. Students will implement and apply these methods, including model verification and validation, for basic examples. Students will then complete a project within their discipline to design a representative model, implement the model, complete a verification and validation of the model, and update the model to reflect corrections, improvements and enhancements. Specific topics include matrix languages, ODE solving, PDE solving, finite difference approximation, finite element methods, and visualize data generated from computer simulations.

Prerequisite(s): CSCI 112 , CSCI 117 , or CSCI 135

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 477 Computer Modeling and Simulation	**3**	**(CSCI 112 or CSCI 117 or CSCI 135) and M 273 and STAT 332 or Consent of Instructor**

Covers various computational modeling and simulation principles and techniques applicable to various domains of engineering and science. The course will rely on the python programming language and use frameworks such as PySim to explore topics in discrete event simulation; such as Apache Mesa to explore agent-based modeling; and SciPy to explore topics in continuous time simulation. Students will implement and apply these methods, including model verification and validation, to basic examples. Other topics include matrix languages, ODE solving, PDE solving, finite difference approximation, finite element methods, and visualize data generated from computer simulations. Students may not take this course for both 400 and 500 level credit.

CSCI 577 Computer Modeling and Simulation	**3**	**(CSCI 112 or CSCI 117 or CSCI 135) and M 273 and STAT 332 or Consent of Instructor**

Covers various computational modeling and simulation principles and techniques applicable to various domains of engineering and science. The course will rely on the python programming language and use frameworks such as PySim to explore topics in discrete event simulation; such as Apache Mesa to explore agent-based modeling; and SciPy to explore topics in continuous time simulation. Students will implement and apply these methods, including model verification and validation, to basic examples, eventually completing a project within their discipline to design a representative model, implement the model, complete a verification and validation of the model, and update the model to reflect corrections, improvements and enhancements. Other topics include matrix languages, ODE solving, PDE solving, finite difference approximation, finite element methods, and visualize data generated from computer simulations. Students may not take this course for both 400 and 500 level credit.

List of supporting documentation attached:

1. Course Description and Outcomes

Assessment Leading to Request

Part of a department effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs
None

Impact on Library: No consultation is required since changes are only in the course description and prerequisite.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele VanDyke Date 4/9/19

Dean Approval [signature] Date 4-10-19

Graduate Council Approval [signature] Date 4-11-19

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 477

Computer Modeling and Simulation

3 Cr. (Hrs.: 3 Lec.)

Covers various computational modeling and simulation principles and techniques applicable to various domains of engineering and science. The course will rely on the python programming language and use frameworks such as PySim to explore topics in discrete event simulation; such as Apache Mesa to explore agent-based modeling; and SciPy to explore topics in continuous time simulation. Students will implement and apply these methods, including model verification and validation, to basic examples. Other topics include matrix languages, ODE solving, PDE solving, finite difference approximation, finite element methods, and visualize data generated from computer simulations. Students may not take this course for both 400 and 500 level credit.

Prerequisite: (CSCI 112 or CSCI 117 or CSCI 135) and
M 273 and STAT 332 or Consent of Instructor (1st)

Expectations:

E1. The student should be able to program in a high-level programming language and/or create programs within a software packages – such as MATLAB, R, etc.
E2. The student should have a foundation in calculus and statics.
E3. Student should have explored mathematical models within their discipline.

Course Outcomes:

R1. Be familiar with the importance of modeling for science and engineering.
R2. Be able to identify different types of models and simulation.
R3. Be able to create a computer simulation of a set of observations based on the system's physical characteristics.
R4. Be able to solve both ordinary and partial differential equations with computers.
R5. Know how to verify and validate a computational model using data.
R6. Know how to construct a computer visualization of the model results.
R7. Understand the quality of the model and sources of errors.

CSCI 577

Computer Modeling and Simulation

3 Cr. (Hrs.: 3 Lec.)

Covers various computational modeling and simulation principles and techniques applicable to various domains of engineering and science. The course will rely on the python programming language and use frameworks such as PySim to explore topics in discrete event simulation; such as Apache Mesa to explore agent-based modeling; and SciPy to explore topics in continuous time simulation. Students will implement and apply these methods, including model verification and validation, to basic examples, eventually completing a project within their discipline to design a representative model, implement the model, complete a verification and validation of the model, and update the model to reflect corrections, improvements and enhancements. Other topics include matrix languages, ODE solving, PDE solving, finite difference approximation, finite element methods, and visualize data generated from computer simulations. Students may not take this course for both 400 and 500 level credit.
Prerequisite: (CSCI 112 or CSCI 117 or CSCI 135) and
M 273 and STAT 332 or Consent of Instructor (1st)

Expectations:

E1. The student should be able to program in a high-level programming language and/or create programs within a software packages – such as MATLAB, R, etc.
E2. The student should have a foundation in calculus and statics.
E3. Student should have explored mathematical models within their discipline.

Course Outcomes:

R1. Be familiar with the importance of modeling for science and engineering.
R2. Be able to identify different types of models and simulation.
R3. Be able to create a computer simulation of a set of observations based on the system's physical characteristics.
R4. Be able to solve both ordinary and partial differential equations with computers.
R5. Know how to verify and validate a computational model using data.
R6. Know how to construct a computer visualization of the model results.
R7. Understand the quality of the model and sources of errors.
R8. Have made use of one of the simulation frameworks discussed throughout the course to create a term modeling project within their discipline and present a working computational model at the end of the term.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/09/2019
Dept. Computer Science
College SME
Program Computational Science
CRC Representative Jeff Braun

Description of Request: Change description and prerequisite on CSCI 479/579.

Current Course or Program Information:

CSCI 479: Provides an overview of computer hardware, software, and numerical methods that are useful for scientific computing on workstations and high performance computing (HPC) systems. Topics include HPC architectures, parallel programming, software tools and packages, algorithm design, characteristics of commonly used numerical methods, mapping of solution methods to modern multi-processor systems, and performance analysis.

Prerequisite(s): CSCI 232 and (M 426 or CSCI 477)

CSCI 579: Provides an overview of computer hardware, software, and numerical methods that are useful for scientific computing on workstations and high performance computing (HPC) systems. Topics include HPC architectures, parallel programming, software tools and packages, algorithm design, characteristics of commonly used numerical methods, mapping of solution methods to modern multi-processor systems, and performance analysis.

Prerequisite(s): CSCI 232 and (M 426 or CSCI 477)

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 479 Scientific Computing	**3**	**CSCI 332 and (M 426 or CSCI 477)**

Provides an overview of multi-core, multi-processor, heterogeneous computer architectures and their runtime systems. Students will implement applied computational models and simulations using an array of high-performance computing systems to explore notions of scalability, extensibility, heterogeneity, and performance in these environments. Software engineering issues of specification, maintainability, validation and verification, and versioning will be explored. Lastly, data modeling will be central to mapping large scale problem sets to differing hardware platforms. Topics include high-performance architectures, heterogeneous computing, parallel programming, software tools and packages (Python4, SciPy), algorithm design, characteristics of commonly used numerical methods, mapping of solution methods to modern multi-processor systems, and performance. Students may not take this course for both 400 and 500 level credit. (2^{nd})

CSCI 579 Scientific Computing	**3**	**CSCI 332 and (M 426 or CSCI 477 or CSCI 577)**

Provides an overview of multi-core, multi-processor, heterogeneous computer architectures and their runtime systems. Students will implement applied computational models and simulations using an array of high-performance computing systems to explore notions of scalability, extensibility, heterogeneity, and performance in these environments. Software engineering issues of specification, maintainability, validation and verification, and versioning will be explored. Lastly, data modeling will be central to mapping large scale problem sets to differing hardware platforms. Topics include high-performance architectures, heterogeneous computing, parallel programming, software tools and packages (Python4, SciPy), algorithm design, characteristics of commonly used numerical methods, mapping of solution methods to modern multi-processor systems, and performance. Students may not take this course for both 400 and 500 level credit. (2^{nd})

List of supporting documentation attached:

1. Course Description and Outcomes

Assessment Leading to Request

Part of a department effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs

None

Impact on Library: No consultation is required since changes are only in the course description and prerequisite.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele VanDyke Date 4/9/19

Dean Approval [signature] Date 4-10-19

Graduate Council Approval [signature] Date 4-11-19

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 479

Scientific Computing

3 Cr. (Hrs.: 3 Lec.)

Provides an overview of multi-core, multi-processor, heterogeneous computer architectures and their runtime systems. Students will implement applied computational models and simulations using an array of high-performance computing systems to explore notions of scalability, extensibility, heterogeneity, and performance in these environments. Software engineering issues of specification, maintainability, validation and verification, and versioning will be explored. Lastly, data modeling will be central to mapping large scale problem sets to differing hardware platforms. Topics include high-performance architectures, heterogeneous computing, parallel programming, software tools and packages (Python4, SciPy), algorithm design, characteristics of commonly used numerical methods, mapping of solution methods to modern multi-processor systems, and performance. Students may not take this course for both 400 and 500 level credit.
Prerequisite: CSCI 332 and (M 426 or CSCI 477) (2nd)

Expectations:

E1. Know how to work in a UNIX/Linux environment to manipulate files, use and integrate existing software packages and libraries, and can compile/execute custom programs.
E2. Understand the basics of the algorithmic analysis – asymptotic Big-O complexity. (CSCI 332)
E3. Student should understand how the formal steps to create a mathematical or computation model. (M 426 or CSCI 477)

Course Outcomes:

R1. Be familiar with basic computer architecture principles, including the SIMD & MIMD execution models, data cache, shared & distributed memory, multi-core processors, and graphical processing units (GPUs).
R2. Be able to set up a virtual machine and install multiple operating systems on it.
R3. Understand basic concepts of parallel programming, including local vs. shared data, data dependencies, race conditions, multi-threaded programming with OpenMP, multi-process programming with MPI, and GPU computing.
R4. Know how to develop, analyze (Big-O complexity), and code both serial and parallel algorithms to solve scientific problems.
R5. Know how to test and debug both serial and parallel programs.
R6. Know how to submit programs for execution on a multi-user HPC system through a job queuing system.
R7. Understand how to measure, interpret, and report the performance of their code, including the speedup on a multiprocessor system.

R8. Understand basic compiler optimization options and know how to use them to evaluate and improve code performance.
R9. Learn about cloud computing options and Map/Reduce computational paradigm.

CSCI 579

Scientific Computing

3 Cr. (Hrs.: 3 Lec.)

Provides an overview of multi-core, multi-processor, heterogeneous computer architectures and their runtime systems. Students will implement applied computational models and simulations using an array of high-performance computing systems to explore notions of scalability, extensibility, heterogeneity, and performance in these environments. Software engineering issues of specification, maintainability, validation and verification, and versioning will be explored. Lastly, data modeling will be central to mapping large scale problem sets to differing hardware platforms. Topics include high-performance architectures, heterogeneous computing, parallel programming, software tools and packages (Python4, SciPy), algorithm design, characteristics of commonly used numerical methods, mapping of solution methods to modern multi-processor systems, and performance. Students may not take this course for both 400 and 500 level credit.
Prerequisite: CSCI 332 and (M 426 or CSCI 477) (2nd)

Expectations:

E1. Know how to work in a UNIX/Linux environment to manipulate files, use and integrate existing software packages and libraries, and can compile/execute custom programs.
E2. Understand the basics of the algorithmic analysis – asymptotic Big-O complexity. (CSCI 332)
E3. Student should understand how the formal steps to create a mathematical or computation model. (M 426 or CSCI 477)

Course Outcomes:

R1. Be familiar with basic computer architecture principles, including the SIMD & MIMD execution models, data cache, shared & distributed memory, multi-core processors, and graphical processing units (GPUs).
R2. Be able to set up a virtual machine and install multiple operating systems on it.
R3. Understand basic concepts of parallel programming, including local vs. shared data, data dependencies, race conditions, multi-threaded programming with OpenMP, multi-process programming with MPI, and GPU computing.
R4. Know how to develop, analyze (Big-O complexity), and code both serial and parallel algorithms to solve scientific problems.
R5. Know how to test and debug both serial and parallel programs.
R6. Know how to submit programs for execution on a multi-user HPC system through a job queuing system.
R7. Understand how to measure, interpret, and report the performance of their code, including the speedup on a multiprocessor system.

R8. Understand basic compiler optimization options and know how to use them to evaluate and improve code performance.

R9. Learn about cloud computing options and Map/Reduce computational paradigm.

R10. Design and implement a non-trivial serial and parallel program and analyze the algorithmic performance and identify performance barriers such as data contention, bottleneck, and dependency and discuss strategies for solving these performance barriers.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/09/2019
Dept. Computer Science
Program Computational Science

College SME
CRC Representative Jeff Braun

Description of Request: Change description on CSCI 599.

Current Course or Program Information: An individual research or design project in computational science. The project will be interdisciplinary in nature combining computing within a domain specific scientific discipline.

Prerequisite(s): M 526 or CSCI 577

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 599 Computational Science Project	**3**	**M526 or CSCI 577**

An individual research or design project in computational science. The project will be interdisciplinary in nature combining computing within a domain specific scientific discipline. Student will select a faculty member within their discipline and within the Department of Computer Science to act as project advisors. Course offered on demand.

List of supporting documentation attached:

1. Course Description and Outcomes

Assessment Leading to Request

Part of a department effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs

None

Impact on Library: No consultation is required since changes are only in the course description.)

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele VanDyke Date 4/9/19

Dean Approval [signature] Date 4-10-19

Graduate Council Approval [signature] Date 4-11-19

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 599

Computational Science Project

3 Cr. (Hrs.: 3 Lec.)

An individual research or design project in computational science. The project will be interdisciplinary in nature combining computing within a domain specific scientific discipline. Student will select a faculty member within their discipline and within the Department of Computer Science to act as project advisors.
Prerequisite: M 526, Mathematical Modeling or CSCI 577, Computer Modeling and Simulation (On Dem.)

Course Outcomes:

R1. Maintain a project journal – either electronic or in a notebook – that documents the activities involved in the design, development, and presentation of the project. This information should be a running log of work performed, challenges encountered, changes to the project as a result, and remedies performed.

R2. Develop a detailed project proposal that must include:
   a. A thesis statement related to their scientific domain
   b. Goals and Objectives for the project upon completion
   c. A description of how the results of this project will further their work within their scientific domain
   d. A high-level set of tasks required to complete the project
   e. A high-level timeline showing work effort and task completion for the project

R3. Be able to develop a coded solution that implements their project with an emphasis on:
   a. Validation and unit testing
   b. Modularity and portability
   c. Parallelization
   d. Documentation that incorporates specific use cases for their project results

R4. Provide a final presentation of project to project advisors, highlighting the anticipated goals and objectives of the project

R5. Provide a final report submitted to the project advisors detailing the experience of developing this project – mostly from the maintained journal.

Montana Tech
THE UNIVERSITY OF MONTANA

Curriculum Change Request Form

Date: April 16, 2019
Dept.: Bus. Tech/Acct. Tech **College: Highlands**
Program: All Options **CRC Representative: L. Granger**

Description of Request: Additions and Deletions being done in the business technology and accounting technology optionsl.

Current Course Program Information: We currently have four options in the above-mentioned departments and all options will be affected by our changes.

Proposed Change(s)

Course #	Name	Credits	Pre-req.	Reason for Change
M105	Consumer Math	3	None	This course will replace M095.
MT220	Empl. Strategies	2	None	Delete as coursework embedded in other courses.
BUS265	Bus. Applications	3	None	Delete as coursework embedded in M105.
COMM111	Public Speaking	3	None	Place "or" and add COMM230, Pres. Tech. Info.
WRIT 101	College Writing	3	None	Place "or" and add WRIT 121, Intro to Tech. Wr.

Other: The latter two regarding the placement of "or" was due to time conflicts, low-enrollment, and the need to accommodate dual credit students who do not have option to take COMM230 or WRIT 121.

List of supporting documentation attached:

Assessment Leading to Request

Highlands College Leadership Team met with writing director and math department head to discuss changes to those areas and other changes brought about by embedded coursework.

Anticipated Impacts to "Other" Programs: None.

Impact on Library: No consultation is required since changes are only in the course number, course name, course prerequisites, rewording, etc.

Date to Take Effect: Fall 2019

Montana Tech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval _____ Date 4-15-19

Dean Approval _____ Date 4-15-19

Graduate Council Approval _____ Date _____

CRC Approval _____ Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ☒ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/16/2019
Dept. **Business and Information Technology** **College** CLSPS
Program Bachelor of Science **CRC Representative David Hood**

Description of Request: The Department of Business and Information Technology respectively requests approval of changes to the program of study under its Bachelor of Applied Science (BAS) program. It is believed these changes will better serve both the student and any prospective employer by allowing students to complete additional course work in their specific program of study.

Current Course or Program Information: Currently, students may select from the following three programs of study (called tracks) under the BAS program:

- Accounting
- Construction Management
- Management

Traditionally, the program of study has been broken down as follows (a total of 120 credits):

- Block transfer – AAS degree (54 credits)
- General education requirements (30 credits)
- General business core (similar for all tracks) (24 credits)
- Coursework related to a specific track (12 credits)

Currently, students complete a total of 36 credits related to the general business core (24 credits) and in their coursework related to their specific track (12 credits).
The question has arisen as to whether the coursework related to a specific track (currently 12 credits) can be expanded to better serve students and prospective employers.

Proposed Change

Course # Name	Credits	Pre-req.

This proposal requests a change in the composition of the 36 credits related to the general business core and the specific track. It is believed that the student, and prospective employer, would be better served if the student were allowed to take more credits related to their specific track, which would require a corresponding reduction in the general business core due to the limit on total credit hours.
This proposal would incorporate a decrease in nine credits in the general business core (a shift from 24 credits to 15 credits) and an increase in the coursework related to a specific track from 12 credits to 21 credit. This will be accomplished by removing the requirements of BMGT 325 Management and Organization, BMIS 311 Business Information Systems or ACTG 321 Accounting Information Systems, and BMKT 325 Marketing from the general business core.
It is believed this change would allow students to complete additional track related coursework which appears to fit under the concept of an applied science degree.

List of supporting documentation attached:
This request includes a list of the current requirements for each track as listed in the current catalog and a proposed list of required coursework for each track.

Assessment Leading to Request
The current requirements for the BAS degree have not changed for 10 years. Various issues have been identified with the current requirements. For example, students completing the accounting requirements under the BAS program are required to take fewer accounting courses than students studying accounting under the BS program. Additionally, students studying under the construction management track of the BAS program are currently taking four courses specifically related to their program of study. This proposal would allow both the accounting and construction management students under the BAS program to complete three additional courses specific to their program of study.
This proposal has been thoroughly discussed by the department faculty members. Additionally, this proposal has been discussed with members of our Industrial Advisory Board (IAB) as well as potential employers. All parties support the proposal for similar reasons.

Anticipated Impacts to "Other" Programs
There are no anticipated impacts to other programs.

Impact on Library:. It is believed there will be no incremental impact on library resources. Scott Juskiewicz was briefed on this proposal.
Date to take effect: The change will be incorporated in the 2019-20 Catalog.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval _____ Date 4/16/2019

Dean Approval _____ Date 4/24/19

Graduate Council Approval _____ Date _____

CRC Approval _____ Date 04/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

Establish a new course for the catalog (please contact the Registrar of MUS CCN information)

Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing

- [X] Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- [ ] New degree certification program of 29 credits or less
- [ ] Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

Placing a postsecondary educational program into moratorium

- [ ] Withdrawing a postsecondary educational program from moratorium
- [ ] Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- [ ] Establishing a B.A.S./A.A./A.S. area of study
- [ ] Offering an existing postsecondary educational program via distance or online delivery
- [ ] Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

Re-titling an existing postsecondary educational program

- [ ] Terminating an existing postsecondary educational program
- [ ] Consolidating existing postsecondary educational programs
- [ ] Establishing a new minor where there is a major or an option in a major
- [ ] Revising a postsecondary educational program
- [ ] Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- [ ] Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- [ ] Establishing a new postsecondary educational program
- [ ] Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- [ ] Forming, eliminating or consolidating an academic, administrative, or research unit
- [ ] Re-titling an academic, administrative, or research unit
- [ ] Other:

Department of Business and Information Technology
Proposed Changes to the BAS Degree
April 2019

	Existing Requirements			Proposed Requirements		
Block Transfer (AAS degree):	**54 credits**			**54 credits**		
General Education:	**30 credits**			**30 credits**		
Communication:	WRIT 101 College Writing WRIT 222 Advanced Business Writing			WRIT 101 College Writing WRIT 222 Advanced Business Writing		
Humanities:	BGEN 363 Business Ethics Humanities Elective			BGEN 363 Business Ethics Humanities Elective		
Math (pick 2 of 3):	M 141 Math for Bus and SS I M 141 Math for Bus and SS II STAT 216 Introduction to Statistics			M 141 Math for Bus and SS I M 141 Math for Bus and SS II STAT 216 Introduction to Statistics		
Physical Science	Elective Elective with a lab			Elective Elective with a lab		
Social Sciences:	ECNS 203 Principles of Micro and Macro Elective			ECNS 203 Principles of Micro and Macro Elective		
Business Core:	**24 credits**			**15 credits**		
	ACTG 201 Principles of Financial Acct ACTG 202 Principles of Managerial Acct BGEN 235 Business Law I BMGT 335 Management and Organization BMKT 325 Marketing BFIN 322 Business Finance ACTG 321 AIS/BMIS 311 MIS BMGT 426 Strategic Management			ACTG 201 Principles of Financial Acct ACTG 202 Principles of Managerial Acct BGEN 235 Business Law I BFIN 322 Business Finance BMGT 426 Strategic Management		
Track Requirements:	**Accounting**	**Construction Management**	**Management**	**Accounting**	**Construction Management**	**Management**
	12 Credits			**21 Credits**		
Required:	ACTG 301 ACTG 302 ACTG 410	BMGT 329	BMGT 329	ACTG 301 ACTG 302 ACTG 321 ACTG 401 ACTG 410 ACTG 411	BMGT 329 **or** BMGT 362	BMGT 311 BMGT 329 BMGT 335 BMKT 325
Electives	**Pick 1**	**Pick 3**	**Pick 3**	**Pick 1**	**Pick 6**	**Pick 3**
	ACTG 401 ACTG 402 ACTG 411 ACTG 412 ACTG 420 ACTG 436	ECIV 208 ECIV 304 EGEN 325 ECIV 307 ECIV 391	ACTG 410 ACTG 420 BGEN 236 BMGT 322 BMGT 353 BMGT 362 BFIN 455	ACTG 402 ACTG 412 ACTG 415 ACTG 436 ACTG 498	ECIV 208 ECIV 304 EGEN 325 ECIV 307 ECIV 391 ECIV 405 BMGT 311 BMGT 322 BMGT 335 BMIS 320 HCI 410 BMGT 498 OSH 224 OSH 324 BMKT 325	ACTG 410 BGEN 236 BGEN 360 BMGT 322 BMGT 353 BMGT 362 BMGT 448 BMKT 337 BMKT 342 HCI 410 BMIS 320 BMIS 415 BMGT 498

Department of Business and Information Technology
Requirements for the Bachelor of Applied Science Degree
2019 - 20

Block Transfer (AAS degree): 54 Credits

General Education: 30 Credits

Communication:	WRIT 101 College Writing WRIT 222 Advanced Business Writing
Humanities:	BGEN 363 Business Ethics Humanities Elective
Math (pick 2 of 3):	M 141 Math for Bus and SS I M 141 Math for Bus and SS II STAT 216 Introduction to Statistics
Physical Science	Elective Elective with a lab
Social Sciences:	ECNS 203 Principles of Micro and Macro Elective

Business Core: 15 Credits

ACTG 201 Principles of Financial Acct
ACTG 202 Principles of Managerial Acct
BGEN 235 Business Law I
BFIN 322 Business Finance
BMGT 426 Strategic Management

Track Requirements: 21 Credits

	Accounting	**Construction Management**	**Management**
Required:	ACTG 301 Intermed Acct I ACTG 302 Intermed Acct II ACTG 321 Acct Information Sys ACTG 401 Individual Income Tax ACTG 410 Cost/Man Acct ACTG 411 Auditing I	BMGT 329 Human Res Mgmt **or** BMGT 362 Labor Relations	BMGT 311 Mgmt Infor Systems BMGT 329 Human Res Mgmt or BMGT 335 Management & Org BMKT 325 Marketing
Electives	**Pick 1** ACTG 303 Intermed Acct III ACTG 402 Advanced Income Tax ACTG 412 Auditing II ACTG 415 Gov't and not for Profit ACTG 436 Advanced Acct ACTG 498 Internship	**Pick 6** ECIV 208 Constructions Contracts ECIV 304 Const Means & Methods EGEN 325 Eng Econ Analy ECIV 307 Construct Est & Bid ECIV 391 Temporary Structures ECIV 405 Cons Proj Plan & Sched BMGT 322 Operations Mgmt BMGT 335 Mgmt and Organization BMKT 325 Marketing HCI 410 Proj Mgmt and Sys Anal BMGT 498 Internship OSH 224 Safety & Health Occ & Pro OSH 324 Construct Safety BMIS 311 Mgmt Info Systems BMIS 320 Business Modeling	**Pick 3** ACTG 410 Cost/Man Acct BGEN 236 Business Law II BGEN 360 Internatinal Bus BMGT 322 Operations Mgmt BMGT 353 Organizational Behav BMGT 362 Labor Relations BMGT 448 Entrepreneurship BMKT 337 Consumer Behavior BMKT 342 Marketing Research HCI 410 Proj Mgmt and Sys Anal BMIS 320 Business Modeling BMIS 415 Mgmt of Info Tech BMGT 498 Internship

Executive Summary

Below is a listing of the CRC requests in this packet. None of these courses are service courses, and the changes should not affect other programs. I wanted to add this header, though, so you can make the decision to print them out or not – there are a lot of pages.

Class/Program	Change
CSCI 347	Description, pre-req, timing
CSCI 440	New course
CSCI 460	pre-req, co-req
CSCI 470	description
CSCI 486	pre-req, timing
CSCI 494	name, description (eliminate ESOF 494)
CSCI 499	desription, W, credit, pre-req
ESOF 322	description
ESOF 326	co-req, increase credits
ESOF 328	description
ESOF 411	pre-req
ESOF 427	description, pre-req
ESOF 486	name, description, credit, pre-req
ESOF 487	description, co-req, credit

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Data Science
College SME
CRC Representative Jeff Braun

Description of Request: Change description, prerequisites and timing for CSCI 347.

Current Course or Program Information:

Description: Provides a grounding in data mining techniques and prepares students to design, use, and evaluate these techniques in a variety of application domains and for the purpose of decision support. Topics include decision trees, rule based systems, statistical approaches, neural networks, and instance-based approaches.

Prerequisite(s): (CSCI 110 or CSCI 135 or CSCI 117) and (CAPP 158 or CSCI 340) Course generally offered 1st semester.

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 347 Data Mining	**3**	**(CSCI 114 or CSCI 117 or CSCI 135) and (M 141 or 151) and (CSCI 340 or BMIS 375)**

Provides a grounding in data mining techniques and prepares students to design, use, and evaluate these techniques in a variety of application domains and for the purpose of decision support. Topics include decision trees, rule based systems, statistical approaches, and instance-based approaches.

Course generally offered 2nd semester.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the description and prerequisites.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Hyne Date 4/5/19

Dean Approval [signature] Date 4-5-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
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- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 347

Data Mining

3 Cr. (Hrs.:3 Lec.)

Provides a grounding in data mining techniques and prepares students to design, use, and evaluate these techniques in a variety of application domains and for the purpose of decision support. Topics include decision trees, rule based systems, statistical approaches, and instance based approaches. Prerequisites: (CSCI 114, CSCI 117, or CSCI 135), and (M 141 or M 151 or higher), and (CSCI 340 or BMIS 375). **(2nd)**

Course generally offered spring (2nd) semester.

Expectations:

E1. Students have basic computer skills and familiarization with common microcomputer applications, including web browsing, email, text editing, spreadsheets, and file manipulation.

E2. Students have had College Algebra (M121) or the equivalent.

Course Outcomes:

R1. Students can identify key characteristics of data mining and/or decision support projects, and can use these characteristics to choose appropriate data mining techniques.

R2. Students understand and can apply data preprocessing techniques appropriately.

R3. Students understand the underlying theory, biases, strengths, and weaknesses of different data mining techniques.

R4. Students understand and are able to apply measures of success to algorithm output, and can measure performance differences between algorithms.

R5. Students are able to use data mining algorithms including decision trees, rule based systems, statistical approaches, instance based approaches, linear techniques, and clustering, to both example data sets and real life data sets.

R6. Students have a firm grasp of supervised and unsupervised approaches to data mining and when to use each type.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science **College** SME
Program Computer Science and Software Engineering **CRC Representative** Jeff Braun

Description of Request: Create a new course, CSCI 440, Database Systems and Architectures, to replace the existing CSCI 340, Database Design.

Current Course or Program Information: N/A

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 440 Database Systems and Architectures	**3**	**BMIS 375 or CSCI 340**

The traditional relational database system is explored more deeply, along with alternative database systems including document-oriented, graph-oriented, and object-oriented systems. Database architectures are also explored including scalability, reliability, distributed databases, in-memory databases, database replication and fault tolerance. Design considerations such as relational algebras, functional dependencies and normal forms, and query execution are also considered. Lastly, integration of databases into software is explored and the benefits of creating a database API is developed.

Prerequisite: BMIS 375 or CSCI 340 (2nd)

3CR. (Hrs.: 3 Lec.)

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request

Our department Industry and Advisory Board has been asking us to provide our graduates with a better background in database. With CSCI 340, we taught it as a combined major and service course, so were not able to increase the complexity of the content. We are now requiring student take BMIS 375 (Data Analytics) instead, and will no longer need to offer CSCI 340, so we want to offer the more technical version instead.

Anticipated Impacts to "Other" Programs

BMIS 375 is a new class, and this will add to its enrollment – students who used to take CSCI 340 should take BMIS 375 instead.

Impact on Library: Michele Van Dyne has consulted with Scott Juskiewicz (04/16/19) at the Montana Tech library to ensure needed materials and media are available.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 440

Database Systems and Architectures

3 Cr. (Hrs.: 3 Lec.)

Advanced concepts in traditional relational database systems are explored, along with alternative database systems including document-oriented, graph-oriented, and object-oriented systems. Database architectures such as distributed, in-memory and replicated are covered, with their contributions to scalability, reliability and fault tolerance. Design considerations such as relational algebras, functional dependencies, normal forms, and query execution are also explored. Lastly, integration of databases into software and the benefits of creating a database API is developed.
Prerequisite: BMIS 375 or CSCI 340 (2nd)

Expectations:

E1. The student should be able to program fluently in a high-level programming language. (CSCI 332)
E2. The student should have a firm understanding of a relational database management system (BMIS 375 or CSCI 340)
E3. The student should understand how to work with data and the data lifecycle (BMIS 375)

Course Outcomes:

R1. Understand functional dependencies and transform a database schema into various normal forms and produce the data definition language (DDL) in the target database system.
R2. Understand how to use relational algebras to characterize database schema, simplify the schema, understand how queries against these schemata are execute by the database system.
R3. Explore, design, and implement non-relational database systems, such as document, graph and object-oriented.
R4. Be introduced to different database architectures related to performance and data integrity requirements.
R5. Develop a database application programming interface (API) using DDL statements that provide a layer of abstraction between the application and the database system.
R6. Explore how to profile and measure database system and architecture performance.
R7. Integrate one or more database systems into an application by creating a database API.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Computer Science, Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Change prerequisite and co-requisite of CSCI 460.

Current Course or Program Information:

Description: I/O management, memory management, processor management, device management and performance measurement/evaluation are examined. Other operating systems, theoretical and current, are discussed.

Prerequisite(s): CSCI 255 and CSCI 332 Course generally offered 2nd semester.

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 460 Operating Systems	**3**	**CSCI 332** **Co-requisite: CSCI 361**

I/O management, memory management, processor management, device management and performance measurement/evaluation are examined. Other operating systems, theoretical and current, are discussed.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the name and description.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

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- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
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- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
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- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 460

Operating Systems

3 Cr. (Hrs.:3 Lec.)

I/O management, memory management, processor management, device management, and performance measurement/evaluation are examined. Other operating systems, theoretical and current, are discussed. Prerequisite: CSCI 332, Co-requisite: CSCI 361 **(2nd)**

Course generally offered spring (2nd) semester.

Expectations:

E1. The student should understand commonly used data structures such as queues, stacks, and trees. (CSCI 332)

E2. The student should have a high-level understanding of how a processor works. (CSCI 361)

E3. The student should be able to quickly learn to write programs in the C programming language. (CSCI 332)

Course Outcomes:

R1. Students understand how the operating system depends on and interacts with the hardware (privilege levels, interrupts, memory protection, etc) and that it acts as an extended machine and a resource manage. (CAC-h; EAC-i)

R2. Students understand the major trends in the history and development of operating systems. (CAC-h; EAC-i)

R3. Students know how operating systems create, schedule, and manage processes. (CAC-i; EAC-k)

R4. Students know how operating systems provide mechanisms for sharing resources between processes and inter process communication: race conditions, critical sections, mutual exclusion, semaphores, monitors, message passing. (CAC-i, CAC-j; EAC-k)

R5. Students know how operating systems manage input and output devices. (CAC-i, EAC-k)

R6. Students know how operating systems manage memory, with an emphasis on virtual memory and paging. (CAC-i; EAC-k)

R7. Students know how operating systems manage file systems. (CAC-i; EAC-k)

R8. Students have written computer programs that make use of the services offered by an operating system and made minor changes to an actual operating system. (CAC-a, c, i; EAC-a, k, SEC-1)

R9. Students have researched a current topic in operating systems, written a paper based on their research, and presented the paper to the rest of the class. (CAC-f, i; EAC-g, k)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Computer Science and Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Change description for CSCI 470.

Current Course or Program Information:

Description: This course is designed to give the student an understanding of the plumbing that makes the web work. It covers basic and some advanced technologies currently being used in web based systems and provides an overview of the technical issues surrounding the web. Students successfully completing this course will learn to employ web technologies to build high-value web applications.

Prerequisite(s): CSCI 466. Course generally offered 2nd semester.

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 470 Web Science	**3**	**CSCI 466**

This course examines the structure of the world wide web from a software architecture point of view and how best to engineer software applications using web technologies. The structure is also examined as the world's largest distributed data repository of information and how to apply descriptive logic in a semantic graph framework to make inferences from this information and build ontologies. Finally, topics in cryptology are examined for how to construct secure protocols and hashes used to reduce the vulnerabilities of threat vectors in web applications. (2nd)

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the description and pre-requisites.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 470

Web Science

3 Cr. (Hrs.: 3 Lec.)

This course examines the structure of the world wide web from a software architecture point of view and how best to engineer software applications using web technologies. The structure is also examined as the world's largest distributed data repository of information and how to apply descriptive logic in a semantic graph framework to make inferences from this information and build ontologies. Finally, topics in cryptology are examined for how to construct secure protocols and hashes used to reduce the vulnerabilities of threat vectors in web applications.
Prerequisite: CSCI 466 (2nd)

Expectations:

E1. The student should be able to program fluently in a high-level programming language. (CSCI 332)
E2. The student should have a firm understanding of network protocols, TCP/IP, and the network stack. (CSCI 466)
E3. The student should be able to write network-driven software in a client-server architecture using a high-level programming language. (CSCI466)

Course Outcomes:

R1. Understand and be able to use the basic resources, data formats, and protocols used in the Internet.
R2. Be able to build robust and load balanced client-server applications that makes use of web components and protocols.
R3. Understand and be able to use public/private key cryptography in an application.
R4. Understand how to manage state in a state-less protocol environment and make use of these principles in a modern web application.
R5. Explore the use of different media types with web-based applications and become familiar with MIME descriptors and file formats for the major media and data types.
R6. Explore the creation of Single-Page Web Applications; first authoring these by using low-level tools and later using a front-end application framework.
R7. Explore the creation of web-services; first authoring these by using low-level tools and later using a middle-ware application framework.
R8. Explore the creation of a data-store for managing application state through data models; first authoring these by using low-level tools and later using back-end application framework.
R9. Have designed and implemented a web application using a full-stack application development framework.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Computer Science
College SME
CRC Representative Jeff Braun

Description of Request: Change prerequisites and timing of CSCI 486.

Current Course or Program Information:

Description: Individual or small group pursuit of a project preferably an advanced topic in computing. Prerequisite: Senior standing, Consent of Instructor and department head.

Course generally offered both semesters.

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 486 Senior Project	**1-6 (Variable)**	**Senior standing and consent of department**

Individual or small group pursuit of a project preferably an advanced topic in computing.

Course offered on demand.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the prerequisites and timing.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Hyne Date 4/5/19

Dean Approval [signature] Date 4-5-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 486

Senior Project

Variable Cr. (Hrs.:0 Lab)

Individual or small group pursuit of a project preferably an advanced topic in computing. Prerequisite: Senior standing. Consent of department **(On demand)**

Senior Design Project Learning Agreement. Course generally offered on demand.

Expectations:

E1. The student should be able to program fluently in several languages. (CSCI 135, CSCI 136, CSCI 255, CSCI 232, CSCI 332, CSCI 305)

E2. The student should understand advanced programming concepts and constructs. (CSCI 232, CSCI 332, CSCI 46, CSCI 305, CSCI 340, CSCI 361, CSCI 460)

E3. The student should understand the software development life cycle and the need for using appropriate software development techniques. (ESOF 322, ESOF 326)

E4. The student should have the ability to work independent of supervision, and manage time and deadlines appropriately. (Senior Standing)

Course Outcomes:

R1. The student will demonstrate the ability to apply knowledge of computing and mathematics acquired in their previous coursework to the solutions of research problem or a client project. (CAC-a)

R2. The student will demonstrate the ability to analyze a problem and identify the appropriate computing requirements appropriate to its solutions. (CAC-b)

R3. The student will demonstrate the ability to design, implement and evaluate computer-based systems, processes, components, or programs to meet desired needs. (CAC-c)

R4. The student will recognize the need for, and demonstrate the ability to, engage in continuing professional development. (CAC-h)

R5. The student will demonstrate the ability to use current techniques, skills, and tools necessary for computing practice, as appropriate to the problem or project. (CAC-i)

R6. The student will demonstrate the ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems

in a way that demonstrates comprehension of the tradeoffs involved in design choices. (CAC-j)

R7. The student will demonstrate the ability to apply design and development principles in the construction of software of varying complexity. (CAC-k)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Computer Science, Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Change name and description of CSCI 494.

Current Course or Program Information:

Description: Investigations in the Computer Science and Software Engineering fields. Students will report on their internship experience, present their senior design projects, and/or present their undergraduate research. Faculty and guest speakers will discuss current issues in computer science and software engineering, Students will take an exam covering their computer-related course work. Students will demonstrate their ability to apply a computer-related code of ethics (ACM, IEEE, or SE). This is a required seminar for computer science and software engineering seniors. Prerequisite: Senior standing or Consent of Instructor.

Course generally offered 2nd semester.

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 494 Senior Seminar	**1**	**Senior standing or consent of instructor**

Investigations in the Computer Science and Software Engineering fields. Students will report on their internship experience, present their senior design projects, and/or present their undergraduate research. Faculty and guest speakers will discuss current issues in computer science and software engineering, Students will take an exam covering their computer-related course work. This is a required seminar for computer science and software engineering seniors. Prerequisite: Senior standing or Consent of Instructor.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request

Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs

None.

Impact on Library: No consultation is required since changes are only in the name and description.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Hyne Date 4/5/19

Dean Approval [signature] Date 4-5-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 494

Senior Seminar

1 Cr. (Hrs.:1 Lec.)

Investigations in the Computer Science and Software Engineering fields. Students will report on their internship experience, present their senior design projects, and/or present their undergraduate research. Faculty and guest speakers will discuss current issues in computer science and software engineering. Students will take an exam covering their computer-related coursework. This is a required seminar for computer science and software engineering seniors. Prerequisite: Senior standing or Consent of Instructor. **(2nd)**

Course generally offered spring (2nd) semester.

Course Outcomes:

R1. Students made one 35 to 40 minute technical presentation on a topic related to their internship, senior design project, undergraduate research project, or area of personal interest. (CAC-f; EAC-g)

R2. Students attended seminars by faculty members concerning the need for professional development, historical perspectives, and societal issues relating to computer technology. (CAC-h; EAC-i, j)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science **College** SME
Program Computer Science and Software Engineering **CRC Representative** Jeff Braun

Description of Request: Change description and prerequisites for CSCI 499, and change to writing intensive.

Current Course or Program Information:

Description: *1-4 credits*

Proposed Change

Course # Name	Credits	Pre-req.
CSCI 499W Capstone: Data Science Project	**4**	**Senior Standing**

An individual research or design project in data science. Student will select a faculty member within their discipline and within the Department of Computer Science to act as project advisor.

Prerequisite: Senior Standing (On Dem.)

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the description and pre-requisites.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

CSCI 499W

Capstone: Data Science Project

4 Cr. (Hrs.:0 Lab)

No description available. **(On Dem.)**

Course offered on demand.

An individual research or design project in data science. Student will select a faculty member within their discipline and within the Department of Computer Science to act as project advisor.

Prerequisite: Senior Standing (On Dem.)

Course Outcomes:

R1. Maintain a project journal – either electronic or in a notebook – that documents the activities involved in the design, development, and presentation of the project. This information should be a running log of work performed, challenges encountered, changes to the project as a result, and remedies performed.
R2. Develop a detailed project proposal which will be subject to review and revision. This proposal must include:
    a. A thesis statement related to their scientific domain
    b. Goals and Objectives for the project upon completion
    c. A description of how the results of this project will work within their domain
    d. A high-level set of tasks required to complete the project
    e. A high-level timeline showing work effort and task completion for the project
R3. Be able to develop a coded solution that implements their project which includes:
    a. Data analysis and partitioning of the chosen data set
    b. Documentation on algorithms attempted and chosen, including choice (and justification) of hyper-parameters
    c. Results on training, validation and test sets
    d. Documentation that explains the results
R4. Provide a final presentation of project to project advisors, highlighting the anticipated goals and objectives of the project
R5. Provide a final report submitted to the project advisors detailing the experience of developing this project – mostly from the maintained journal.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/03/2019
Dept. Computer Science
Program Computer Science and Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Change description and prerequisite for ESOF 322.

Current Course or Program Information:

Description: Studies the process of engineering software applications and systems. Concentrates on the techniques and processes needed to engineer simple program assignments. Material on all aspects of software engineering, including professional ethics, is presented. In addition to individual homework assignments students will do in class assignments in pairs, triads, and quads on single and multiple module software products.

Corequisite(s): CSCI 232 and Junior Standing. Course generally offered 1st semester.

Proposed Change

Course # Name	Credits	Pre-req.
ESOF 322 Software Engineering	**3**	**CSCI 232 and Junior standing**

Studies the process of engineering software applications and systems. Topics include process models, metrics, requirements engineering, design, testing, quality assurance, configuration management and software inspections. Students gain experience in these areas by working on a software project.

List of supporting documentation attached:

1. Course description and outcomes.

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the course description and prerequisites. No material changes to the course content has been made.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

ESOF 322

Software Engineering

3 Cr. (Hrs.:3 Lec.)

Studies the process of engineering software applications and systems. Topics include process models, metrics, requirements engineering, design, testing, quality assurance, configuration management and software inspections. Students gain experience in these areas by working on a software project. Prerequisites: CSCI 332 & Junior standing. **(1st)**

Course generally offered fall (1st) semester.

Expectations:

E1. Students have a basic understanding of object-oriented programming and can create multi-class programs in C++. (CSCI 232)

E2. Students know basic error-handling, and debugging techniques. (CSCI 135, 136, 232)

Course Outcomes:

At the conclusion of this course those students who receive at least a grade of C- will:

R1. Understand what it means to "engineer" software. (CAC-a, b,c, i; EAC- a, c, e, k, 1)

R2. Understand standard life-cycle process models such as the Waterfall, Incremental, Spiral and Agile models. Know the properties of these models, and given a development environment and project goals can select an appropriate development process model.(CAC-h,i, k; EAC-a, c, e,i, k)

R3. Understand security and social issues and responsibilities and be able to analyze the local and global impact of computing on individuals, organizations, and society. (CAC-g,h; EAC-h,i)

R4. Understand quality issues such as usability, reliability, availability, maintainability, portability, and performance,and how these must be considered throughout the life cycle. (CAC-a, h,i, k; EAC-a, c, e, i, k, 1)

R5. When given the description of a small program, be able to write a consistent and complete set of concise and verifiable requirements for that program that conforms to a small program standard. (CAC-b, c, f, k; EAC-a, c, e, g, k, 1)

R6. When a given set of requirements for a small program that conforms to the requirements satisfying R5, be able to write a design for that program that conforms to a design standard. (CAC-c, f, k; EAC-a, c, e, g, k, 1)

R7. When given the requirements and design for a small module, be able to specify test conditions and test files/scenarios and scripts that provide a complete functional test of the program. For C++ programs students can obtain and explain the test coverage measures for these tests.(CAC-a, c, f, k; EAC-a, c, e, g, k,)

R8. When given the requirements and design for a small module be able to write a random test file generator. (CAC-a,c,i, k; EAC-a, c, e, g, k, 1, 2)

R9. Appreciate the need for and can adhere to a coding standard. (CAC-c, k; EAC-a,c,e, 1)

R10. When given the requirements and design, be able to write low-defect (by inspection) correctness arguments for the design algorithm that conform to a module development standard. (CAC-f, k; EAC-a, c, e, g, k, 1)

R11. When given code that conforms to a source file standard and is documented by proceeding sections of its standard, construct an argument that the code correctly implements the algorithm statements. (CAC-f, k; EAC-a, c, e, g, k, 1)

R12. Understand the importance of software inspections throughout the life cycle, and will have performed several such reviews and inspections according to the documented procedures for such reviews and inspections. (CAC-c, k; EAC-a, c, k, 1)

R13. Understand the difference between ethics and morals and the purpose of ethical codes. Students are familiar with the joint ACM/IEEE Software Engineering Code of Ethics and can use it to analyze the impact of computing and engineering solutions on individuals, organizations, and society. (CAC e, g, EAC-f, h)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Computer Science and Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Remove corequisite for ESOF 326, increase credits to 3, change prerequisite.

Current Course or Program Information:

Description: Continues to study the process of developing software applications and systems. Software requirements, design and testing are addressed. Students gain experience in these areas by working on software maintenance projects that involve significant changes to a previously developed product and further development on a previously started project.

Prerequisite(s): ESOF 322 and CSCI 340; co-requisite of CSCI 332 Course generally offered 2nd semester.

Proposed Change

Course # Name	Credits	Pre-req.
ESOF 326 Software Maintenance	**3**	**ESOF 322 and (CSCI 340 or BMIS 375)**

Continues to study the process of developing software applications and systems. Software requirements, design and testing are addressed. Students gain experience in these areas by working on software maintenance projects that involve significant changes to a previously developed product and further development on a previously started project.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness. This course meets three times a week, and we put it at two credits to accommodate a years ago change in the credits for public speaking courses.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the course co-requisites.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Hyne Date 4/5/19

Dean Approval [signature] Date 4-5-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

ESOF 326

Software Maintenance

3 Cr. (Hrs.:3 Lec.)

Continues to study the process of developing software applications and systems. Software requirements, design and testing are addressed. Students gain experience in these areas by working on software maintenance projects that involve significant changes to a previously developed product and further development on a previously started project. CSCI 340, ESOF 322 **(2nd)**

Course generally offered spring (2nd) semester.

Expectations:

E1. Students entering this course should have a firm knowledge of multiple programming languages (from CSCI 136 and CSCI 232), algorithm design and analysis (from CSCI 232), databases (from CSCI 340) and software engineering (ESOF 322).

E2. Students entering this course should be able to construct source files in C++ and Java that conform to the small module standards for such files. (ESOF 322).

E3. Students entering this course should be able to write and execute any of the following standard software development documents (from ESOF 322).

Course Outcomes:

At the conclusion of this course those students who receive at least a grade of C- will have:

R1. Demonstrated the ability to work effectively in a team setting on a multi-programmer, multi-month, software project. (CAC-a, b, c, d, f, i, k; EAC-a, c, e, g, k, 1, 3)

R2. Taken an existing project and either bring it to the next stage of completion or made major enhancements. (CAC-a, b, c, d, f, h, i, k; EAC-a, c, e, g, i, k, 1, 3)

R3. Appreciate the importance of early and continuous involvement of all system stakeholders during the development cycle. (CAC-b, d, f, g; EAC-g)

R4. Be able to create and follow a software test plan, report failures, correct faults, and resubmit test case results. (CAC-a, d, f, i, k; EAC-a, e, k, 1, 2, 3)

R5. Understand the importance of software metrics and know the standard measurements such as person hours and lines of code. (CAC-d; EAC-a, c, k, 4)

R6. Can describe his or her experience with the personal, technical, managerial and people aspects of a class maintenance project. (CAC-f; EAC-g, 4)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Change description for ESOF 328.

Current Course or Program Information:

Description: Concentrates on the development of requirements for software applications and systems. Topics include elicitation, analysis, documentation, and modeling software requirements. The Z specification language is one of the techniques used for modeling requirements.

Corequisite(s): ESOF 326 & CSCI 332. Course generally offered 2nd semester.

Proposed Change

Course # Name	Credits	Pre-req.
ESOF 328 Requirements and Specifications	**3**	**ESOF 326 and CSCI 332**

Concentrates on the development of requirements for software applications and systems. Topics include elicitation, analysis, documentation, and modeling software requirements. A formal specification language is one of the techniques used for modeling requirements.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the description.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Hyne Date 4/5/19

Dean Approval [signature] Date 4-5-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

ESOF 328

Requirements & Specifications

3 Cr. (Hrs.:3 Lec.)

Concentrates on the development of requirements for software applications and systems. Topics include elicitation, analysis, documentation, and modeling software requirements. A formal specification language is one of the techniques used for modeling requirements. Co-requisite: ESOF 326 & CSCI 332 **(2nd)**

Course generally offered spring (2nd) semester.

Expectations:

E1. The student has a basic grasp of traditional software engineering processes, such as requirements gathering, software design, implementation, and testing. (ESOF 322)

E2. The student has been introduced to quantitative aspects of the software engineering process, including software metrics and formal methods. (ESOF 322)

E3. Students are able to use propositional and predicate logic to specify and reason about program requirements (CSCI 246)

E4. Students can use mathematical structures such as sets, relations, functions and sequences to reason about problems. (CSCI 246)

Course Outcomes:

R1. Students can enumerate the various types and purposes of requirements (EAC-k)

R2. Students can identify the properties of well-written requirements and can identify the faulty aspects of inadequate requirements. (EAC-k)

R3. Students have conceptual understanding of and practical experience with the steps of requirements production, including requirements elicitation, requirements validation, and requirements management. (EAC-e, g, 1)

R4. Students have hands-on experience with the processes of formal software system specifications. (EAC-a, k, 1, 2)

R5. Students know the connection between defective requirements and software project failure. (EAC-k)

R6. Students have developed software requirements for a small system, or a portion of a large system. (EAC-g, k, 1)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Change prerequisites for ESOF 411.

Current Course or Program Information:

Description: Using industry standards, a text and other materials, this course will focus on understanding software verification and validation (V&V) concepts, processes, techniques and tool. In addition students will practice several V&V techniques in class exercises and lab assignments.

Proposed Change

Course # Name	Credits	Pre-req.
ESOF 411 Software Verification and Validation	**3**	**ESOF 322**

Using industry standards, a text and other materials, this course will focus on understanding software verification and validation (V&V) concepts, processes, techniques and tool. In addition students will practice several V&V techniques in class exercises and lab assignments. (2nd)

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness..

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the prerequisites.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Hyne Date 4/5/19

Dean Approval [signature] Date 4-5-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

ESOF 411

Software Verification and Validation

3 Cr. (Hrs.:3 Lec.)

Using industry standards, a text and other materials, this course will focus on understanding software verification and validation (V&V) concepts, processes, techniques and tools. In addition students will practice several V&V techniques in class exercises and lab assignments.
Prerequisites: ESOF 322 **(2nd)**

Course generally offered spring (2nd) semester.

Expectations:

E1. Students understand what it means to "engineer" software. (ESOF 322)

E2. Students understand quality issues such as usability, reliability, availability, maintainability, portability, and performance, and how these must be considered throughout the life cycle. (ESOF 322)

E3. Understand the importance of software inspections throughout the life cycle, and will have performed several such inspections. (ESOF 322)

Course Outcomes:

At the conclusion of this course, those students who received a grade of C- or better will be able to perform the following:

R1. Develop unit tests to thoroughly test methods, including database interactions, in at least two programming languages.

R2. Perform value-based, state-based and interaction-based unit testing.

R3. Perform test-driven development in at least two different programming languages.

R4. Perform V-model software development, including acceptance, system, integration and unit testing.

R5. Be familiar with common testing terms such as black box and white box testing, equivalence partitioning, boundary value analysis, and alpha and beta testing.

R6. Understand concepts related to data flow analysis and its application to distributed systems.

R7. Accurately describe the importance of collecting and analyzing effort, defect, and defect severity data. (EAC-g, i, k, 1)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
College SME
Program Computer Science and Software Engineering
CRC Representative Jeff Braun

Description of Request: Change description and prerequisites.

Current Course or Program Information:

Description: Builds on the student's existing knowledge of and experience designing software. This course focuses on high level design of software systems so that those systems satisfy quality attributes such as security, availability, performance, and modifiability. Students will learn the importance of developing, documenting, communicating, and adhering to a software architecture that achieves not only the functional but also the non-functional requirements of a software system.

Prerequisite(s): ESOF 322 Course generally offered 1st semester.

Proposed Change

Course # Name	Credits	Pre-req.
ESOF 427 Software Design and Architecture	**3**	**ESOF 328 and CSCI 332**

Builds on the student's existing knowledge of and experience designing software. This course focuses on high-level design of software systems, so those systems satisfy quality attributes such as security, availability, performance, scalability, modifiability, and maintainability. Students learn the importance of designing software according to specific engineering principles using well understood software patterns and software architectures that isolate within the code base where change is likely to take place and ensure a robust code base that is engineered to integrate required changes over time through evolving requirements.

Prerequisite: ESOF 328 and CSCI 332. (1st)

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the description and pre-requisites.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

ESOF 427

Software Design and Architecture

3 Cr. (Hrs.: 3 Lec.)

Builds on the student's existing knowledge of and experience designing software. This course focuses on high-level design of software systems, so those systems satisfy quality attributes such as *security*, *availability*, *performance*, *scalability*, *modifiability*, and *maintainability*. Students learn the importance of designing software according to specific engineering principles using well understood software patterns and software architectures that isolate within the code base where change is likely to take place and ensure a robust code base that is engineered to integrate required changes over time through evolving requirements. Prerequisite: ESOF 328 and CSCI 332. (1st)

Expectations:

E1. Students have a conceptual understand of and practical experience with the steps of requirements production, including requirements elicitation, requirements validation, and requirements management. (ESOF 328)
E2. Students have worked in a group to design, implement, test, and maintain a small software system (5000 lines of code) and appreciate the complexities of implementing a large software system. Students have made at least two presentations on aspects of the software systems that they implemented. (ESOF 322)
E3. Students should have a solid understanding of commonly used data structures and well-known algorithms and how to implement them in a high-level object-oriented programming language. (CSCI 332)

Course Outcomes:

R1. Be able to design and implement a term project in a high-level object-oriented program language by utilizing at least two (2) software design patterns and conforming to a well-known software architecture.
R2. Be able to analyze and articulate the impact of their engineered design on the quality attributes of their code base.
R3. Understand the concept of software design patterns, why they are useful, and how they are created and promulgated.
R4. Be familiar with some of the 23 "Gang of Four" design patterns and other useful patterns and give the requirements for an application for which at least one of the patterns studied applies, can select and appropriately utilize the pattern.
R5. Must be able to provide a complete design document – using the latest version of UML – for the software being written.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
Program Computer Science and Software Engineering
College SME
CRC Representative Jeff Braun

Description of Request: Change description, prerequisites and credit.

Current Course or Program Information:

Description: This two semester sequence is the capstone course for a Software Engineering degree. Students will work in teams of two to five under the direction of the instructor to either develop or re-engineer a complex software product. Each team will go through all of the steps of a software development process. Each team will develop a Software Requirements Specification, a Software Design Description, a Software Test Plan/Report, in accordance with the Montana Tech Methods software development standards and any other docuemtns required for their product. Each team will prepare a campus presentation on their project. ESOF 486/487 must be taken in sequence. In unusual personal circumstances 487 may be taken a year after 487.

Prerequisite(s): ESOF 328 **Corequisite(s):** CSCI 443 Course generally offered both semesters.

Proposed Change

Course # Name	Credits	Pre-req.
ESOF 486 Senior Design Project I	**2**	**ESOF 328; Co-requisite: COMX338, ESOF 427**

This two semester sequence is the capstone course for a Software Engineering degree. Students will work in teams of two to five under the direction of a mentor to either develop or re-engineer a complex software product. Each team will go through all of the steps of a software development process. Each team will develop a Software Requirements Specification, a Software Development Plan, a Software Design Description, and a Software Test Plan/Report and any other documents required for their product. Each team will prepare a campus presentation on their project.

Course generally offered first semester.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the description, pre-requisites and credit.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

ESOF 486

Senior Design Project I

2 Cr. (Hrs.:1 Lec., 3 Lab)

This two semester sequence is the capstone course for a Software Engineering degree. Students will work in teams of two to five under the direction of a mentor to either develop or re-engineer a complex software product. Each team will go through all of the steps of a software development process. Each team will develop a Software Requirements Specification, a Software Development Plan, a Software Design Description, and a Software Test Plan/Report and any other documents required for their product. Each team will prepare a campus presentation on their project.

Prerequisite: ESOF 328 (Requirements & Specifications)
Corequisite: COMX 338 (Usability Testing), ESOF 427 (Software Design & Architecture).

Course is generally offered 1st Semester

ESOF 486/487 must be taken in sequence.

Expectations:

E1. The student must have good knowledge of programming (from CSCI 136 and CSCI 332), algorithm design and analysis (from CSCI 232, CSCI 332 and ESOF 427), databases (from CSCI 340 or BMIS 375) and software engineering (from ESOF 322, ESOF 326, ESOF 328 and COMX 338).

E2. The student should be able to write software development documents: a Software Requirements Specification (from ESOF 328), a Software Design Description and a Software Test Plan/Report (from ESOF 326 or ESOF 411).

E3. The student should be able to quickly learn to use a high level programming language necessary for the assigned project.

Course Outcomes:

R1. Will have demonstrated the ability to work effectively in a team setting on a multi-programmer, multi-month and multi-phase software project. (EAC-a, c, e, g, i, k; 1, 2, 3, 4)

R2. Will be able to describe and discuss the professional and ethical responsibilities related to their project and similar projects. (EAC-f, g)

R3. Will have demonstrated the ability to interact effectively with a client or customer in

eliciting and/or verifying system requirements. (EAC-c, e, g, k; 1, 3)

R4. Will have demonstrated the ability to have developed or modified software requirements and specifications for a software system.

R5. Will have demonstrated the ability to develop a software development plan.

R6. Will have demonstrated the ability to describe a system/module design by creating or extensively modifying a software design description. (EAC-a, c, k; 1, 2, 3)

R7. Will have demonstrated the ability to develop a software test plan/report.

R8. Will have demonstrated the ability to rigorously inspect or review all of the software engineering documents used in their project. (EAC-a, k; 1, 2, 3)

R9. Will have demonstrated a working knowledge of software version and change management control. (EAC-a, k; 1, 2, 3)

R10. Will have demonstrated a working knowledge of all the software development tools used in the development of the project's product. (EAC-a, i, k; 1, 2, 3)

R11. Will have demonstrated an understanding of the impact of engineering solutions in a global, economic, environment and societal context. (EAC-h)

R12. Will have demonstrated an understanding of contemporary issues. (EAC-j)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/04/2019
Dept. Computer Science
College SME
Program Computer Science and Software Engineering
CRC Representative Jeff Braun

Description of Request: Change description, prerequisites and credit.

Current Course or Program Information:

Description: This two semester sequence is the capstone course of a Software Engineering degree. Students will work in teams of two to five under the direction of the instructor to either develop or re-engineer a complex software product. Each team will go through all of the steps of a software development process. Each team will develop a Software Requirements Specification, a Software Design Description, a Software Test Plan/Report, in accordance with the Montana Tech Methods software development standards and any other documents required for their products. Each team will prepare a campus presentation on their project.

ESOF 486/487 must be taken in sequence. In unusual personal circumstances 487 may be taken a year after 486.

Prerequisite(s): ESOF 486

Proposed Change

Course # Name	Credits	Pre-req.
ESOF 487 Senior Design Project II	**2**	**ESOF 486; Co-requisite: ESOF 411**

This two semester sequence is the capstone course of a Software Engineering degree. Students will work in teams of two to five under the direction of the instructor to either develop or re-engineer a complex software product. Each team will go through all of the steps of a software development process. Each team will develop a Software Requirements Specification, a Software Development Plan, a Software Design Description, a Software Test Plan/Report, and any other documents required for their products. Each team will prepare a campus presentation on their project.

Course generally offered second semester.

List of supporting documentation attached:

1. **Course Description and Outcomes**

Assessment Leading to Request
Part of a departmental effort to review all courses in the curricula to ensure consistency and correctness.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the description, pre-requisites and credit.

Date to take effect: Upon approval.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

ESOF 487

Senior Design Project II

2 Cr. (Hrs.: 6 Lab)

This two semester sequence is the capstone course of a Software Engineering degree. Students will work in teams of two to five under the direction of the instructor to either develop or re-engineer a complex software product. Each team will go through all of the steps of a software development process. Each team will develop a Software Requirements Specification, a Software Development Plan, a Software Design Description, a Software Test Plan/Report and any other documents required for their products. Each team will prepare a campus presentation on their project.

Prerequisite: ESOF 486 (Senior Design Project I)
Corequisite: ESOF 411 (Software Validation and Verification).

Course is generally offered 2nd Semester

ESOF 486 and 487 must be taken in sequence.

Expectations:

E1. The student must have good knowledge of programming (from CSCI 136 and CSCI 332), algorithm design and analysis (from CSCI 232, CSCI 332 and ESOF 427), databases (from CSCI 340 or BMIS 375, and CSCI 440) and software engineering (from ESOF 322, ESOF 326, ESOF 328 and COMX 338).

E2. The student should be able to write software development documents: a Software Requirements Specification (from ESOF 328), a Software Design Description and a Software Test Plan/Report (from ESOF 326 or ESOF 411).

E3. The student should be able to quickly learn to use a high level programming language necessary for the assigned project.

Course Outcomes:

R1. Will have demonstrated the ability to work effectively in a team setting on a multi-programmer, multi-month and multi-phase software project. (EAC-a, c, e, g, i, k; 1, 2, 3, 4)

R2. Will be able to create a new product from scratch or extensively modify an existing product and will have demonstrated the ability to learn new technologies independently and/or the ability to apply technologies previously learned to new situations. (EAC-a, c, e, g, k, 1, 2, 3)

R3. Will be able to describe what their team accomplished on their project. (EAC-g)

R4. Will have demonstrated the ability to use a software development plan to successfully complete a multi-programmer, multi-month and multi-phase software development project, and to be able to apply quantitative measures in assessing progress toward the on-time, high-quality completion of a software development project. (EAC-c; 1, 2, 3, 4)

R5. Will have demonstrated the ability to describe a system/module design by creating or extensively modifying a software design description. (EAC-a, c, k; 1, 2, 3)

R6. Will have demonstrated the ability to follow a software test plan and to report on the results.

R7. Will have demonstrated the ability to rigorously inspect or review all of the documents used in their project. (EAC-a, k; 1, 2, 3)

R8. Will have demonstrated a working knowledge of software version and change management control. (EAC-a, k; 1, 2, 3)

R9. Will have demonstrated a working knowledge of all the software development tools used in the development of the project's product. (EAC-a, i, k; 1, 2, 3)

R10. Will have completed and demonstrated a nontrivial project.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/16/2019
Dept. **Business and Information Technology** **College** CLSPS
Program Bachelor of Science **CRC Representative David Hood**

Description of Request: The Department of Business and Information Technology respectively requests approval of a list of courses to be completed under the individual Options of study under its Bachelor of Science program.

The Department, in adherence with the recommendations of the Program Prioritization Committee, has reduced the options of study under its Bachelor of Science program from six options to four options (Accounting, Management of Information, Management of Natural Resources and Health Information Technology). This proposal was approved at the March 2019 meeting of the Curriculum Review Committee. Each option of study requires a total of nine courses labeled as concentration requirements or concentration electives. The Department would like to take this opportunity to present of list of acceptable concentration courses, under each of the four options, to be included in the 2019-2020 University Catalog.

Current Course or Program Information: The current requirements for each Option under the Bachelor of Science program are listed in the 2018-2019 University catalog. Each Option includes nine courses listed as either concentration requirements or concentration electives.

Proposed Change

Course # Name	Credits	Pre-req.

The Department will have four Options available under its Bachelor of Science program starting with the 2019 – 2020 University Catalog.

- Accounting
- Health Information Technology
- Management of Information
- Management of Natural Resources

Each Option requires nine courses identified as Concentration requirements or Concentration electives. The Department would like to take this opportunity to update the courses that will be either concentration requirements or allowed as concentration electives under each Option.

List of supporting documentation attached:
This request includes a list of accepted coursework for each of the four options of study under the bachelor of science program.

Assessment Leading to Request
This proposal is a result of the recommendations of the Program Prioritization Committee and has been thoroughly discussed by the department faculty members. Additionally, this proposal has been discussed with members of our Industrial Advisory Board (IAB) as well as potential employers. All parties support the proposal for similar reasons.
It is believed these four options, and the related coursework in this proposal, reflect the mission and vision of the Department of Business and Information Technology going forward.

Anticipated Impacts to "Other" Programs
There are no anticipated impacts to other programs.

Impact on Library:. It is believed there will be no incremental impact on library resources. Scott Juskiewicz was briefed on this proposal.
Date to take effect: The change will be incorporated in the 2019-20 University Catalog.

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval _____ Date 4/16/2019

Dean Approval _____ Date 4/24/19

Graduate Council Approval _____ Date _____

CRC Approval _____ Date 04/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

Establish a new course for the catalog (please contact the Registrar of MUS CCN information)

Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing

- [X] Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- [ ] New degree certification program of 29 credits or less
- [ ] Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

Placing a postsecondary educational program into moratorium

- [ ] Withdrawing a postsecondary educational program from moratorium
- [ ] Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- [ ] Establishing a B.A.S./A.A./A.S. area of study
- [ ] Offering an existing postsecondary educational program via distance or online delivery
- [ ] Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

Re-titling an existing postsecondary educational program

- [ ] Terminating an existing postsecondary educational program
- [ ] Consolidating existing postsecondary educational programs
- [ ] Establishing a new minor where there is a major or an option in a major
- [ ] Revising a postsecondary educational program
- [ ] Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- [ ] Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- [ ] Establishing a new postsecondary educational program
- [ ] Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- [ ] Forming, eliminating or consolidating an academic, administrative, or research unit
- [ ] Re-titling an academic, administrative, or research unit
- [ ] Other:

Business and Information Technology
Bachelor of Science Program
Proposed Concentration Requirements and Electives under each Option
April 2019

Accounting Option

Concentration Requirements

ACTG 301	Intermediate Accounting I	3
ACTG 302	Intermediate Accounting II	3
ACTG 303	Intermediate Accounting III	3
ACTG 321	Accounting Information Systems	3
ACTG 401	Federal Income Tax for Individuals	3
ACTG 410	Cost/Managerial Account I	3
ACTG 411	Auditing I	3
	Total Concentration Requirements	21

Concentration Electives (pick 2)

ACTG 335	Natural Resource Acct, Tax, and Fin Report	6
ACTG 402	Advanced Tax	
ACTG 412	Auditing II	
ACTG 415	Governmental and Nonprofit Acct	
ACTG 420	Cost/Managerial Account II	
ACTG 436	Advanced Accounting	
ACTG 498	Internship*	
BGEN 360	International Business	
Others as approved by the Department Head		
Total Concentration Electives/Requirements		**27**

Natural Resource Management Option

Concentration Requirements

PET 201	Elements of Petroleum Engineering	3
ACTG 335	Natural Resource Acct, Tax, and Fin Report	3
BGEN 430	Basic Oil & Gas Law I	3
BGEN 431	Basic Oil & Gas Law II	3
BGEN 432	Basic Property and Probate Law	3
BGEN 433	Oil and Gas Land Management	3
	Total Concentration Requirements	18

Concentration Electives (pick 3)

GPHY 284	Introduction to GIS Science Cartography	9
PET 446	Petroleum Project Evaluation	
MIN 408	Valuation of Mineral Properties	
MIN 458	Mine Management	
BMGT 498	Internship*	
BMGT 329	Human Resource Management	
BMGT 362	Labor Relations	
BMGT 448	Entrepreneurship	
BGEN 360	International Business	
Others as approved by the Department Head		
Total Concentration Electives/Requirements		**27**

Information Management Option

Concentration Requirements

BMIS 415	Management of IT	3
BMIS 416	Enterprise Systems	3
HCI 320	Information Systems Security	3
	Total Concentration Requirements	9

Concentration Electives (pick 6)

Programming: Pick one of the following:		18
CSCI 111	Programming with Java or	
CSCI 112	Programming with C I or	
CSCI 114	Programming with C# or	
CSCI 116	Introduction to Python Programming or	
CSCI 135	Programming with Matlab	
Other: pick any of the courses from this list:		
CSCI 347	Data Mining	
STAT 332	Statistics for Scientists & Engineers	
STAT 432	Regression & Model Building	
STAT 453	Statistical Learning & Data Science I	
HCI 410	Project and System Mgmt.	
BMGT 362	Labor Relations	
BGEN 236	Business Law II	
BMGT 329	Human Resource Management	
BMGT 448	Entrepreneurship	
BMGT 353	Organizational Behavior	
BMKT 342	Marketing Research	
ACTG 410	Cost/Management Accounting I	
BMGT 491	Special Topics	
BMGT 498 /BMIS 498	Internship*	
BGEN 360	International Business	
Others as approved by the Department Head		
Total Concentration Electives/Requirements		**27**

Health Information Technology

Concentration Requirements

HCI 410	Project MGT and System Analysis	4
HIT 230	Overview of HCI Systems	4
HIT 260	Workflow Process and Redesign	3
HCI 310	Health Care Delivery in the US Part I	3
HCI 422	Health Care Finance and Revenue Cycle Manag	3
	Total Concentration Requirements	17

Concentration Electives (pick 4)

CSCI 114	Programming with C#	12
HCI 320	Information Systems Security (add stewardship)	
HCI 440	Data Integration and Exchange (Add HIE)	
CSCI321	Systems Design	
HIT 265	EHR in Medical Practice	
BMIS 498	Internship	
BMIS 415	MGT of IT	
HCI 498 /BMIS 498	Internship*	
	others as approved by department head	
Total Concentration Electives/Requirements		**29**

* a maximum of 3 credits of Internship may be used to fulfill concentration elective requirements

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 03/04/2019
Dept. Environmental Engineering
Program Environmental Engineering
College SME
CRC Representative Raja Nagisetty

Description of Request:
1. Change the current Industrial Ecology (IE) course number to EENV 4xx (will finalize course number with the registrar's office)
2. Cross-list the IE course as a graduate-level course EENV 5xx (will finalize course number with the registrar's office)
3. Change the semester in which the IE course is offered: from the fall semester to the spring semester
4. Replace EENV 455 Environmental Transport Processes with the new IE course in the Environmental Engineering Curriculum

Current Course or Program Information:
EENV 490: Special Topic: System Approach to Industrial Ecology. 3 Cr.

Proposed Change

Course # Name	Credits	Pre-req.
EENV 4xx Industrial Ecology	**3**	**N/A**

The course will introduce students to the field of industrial ecology.

Course Outcomes:
- Students will understand the fundamentals of system analysis, with special attention given to navigating the tradeoffs of economic and environmental impacts.
- Students will learn tools for economic (technoeconomic analysis, TEA; economic Input-Output Analysis) and environmental sustainability (life cycle assessment, LCA; material flow analysis) assessments.
- Students will be able to design engineered technologies using the economic and environmental sustainability indicators under uncertainty.

Proposed time and location: MWF 11:00-11:50, ELC 315 (A computer lab is needed. ELC315 appears to be available based on 25Live)

List of supporting documentation attached:
1. Syllabus
2. Curriculum worksheet

Assessment Leading to Request
Understanding how to analyze the economic and environmental impacts of complex engineered systems is increasingly important to next-generation environmental engineering students. Adding the proposed Industrial Ecology course to the curriculum will help the students understand this emerging field and adapt to the changing demand.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the course number, course name, or course pre-requisites.

Date to take effect: 08/15/2019

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval _____ **Date** 03/25/2019

Dean Approval _____ **Date** 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval _____ Date _____

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☒ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ☒ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☒ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☒ **Other: Change the semester in which the course is offered**

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

EENV 491 System Approach to Industrial Ecology

Fall 2018

Instructor	Daqian Jiang S&E 324 | 406-496-4203 | djiang@mtech.edu Office Hours: Thursday/Friday, 3:00-5:00pm or by appointment
Course Meeting Time and Location	Tuesday/Thursday, 12:30-1:45 PM S&E 308 (Computer Lab)
Text *(not required)*	There is no required text for this class.
Course Description	The course will introduce students to the field of industrial ecology. Students will work individually and in teams to design engineered technologies, and analyze the economic and environmental sustainability impacts under uncertainty.
Course Outcomes	At the completion of the course, students should be able to: 1. Conceptually describe a system using mass balance and energy balance principles. 2. Assess the economic sustainability of technologies and engineered infrastructure using technoeconomic analysis (TEA). 3. Assess the environmental impacts of technologies and engineered infrastructure using life cycle assessment (LCA). 4. Assess the economic and environmental impacts of regional to national policies using material flow analysis (MFA) and Input-Output Analysis. 5. Design environmental technologies and infrastructure under uncertainty to meet specific objectives within environmental, social, and economic constraints. 6. Work in teams to identify the need for a process, propose evaluation criteria, formulate design alternatives, and recommend the most sustainable alternative in oral and written form.
Course Outline	Module 1. Introduction Module 2. Technoeconomic analysis Module 3. Life cycle assessment Module 4. Material flow analysis Module 5. (Environmentally Extended) Economic Input-Output Analysis Module 6. Uncertainty analysis
Grading	Class Participation and Conduct 5% Individual Homeworks 30% Design Project Progress Deliverables 36% Design Project Final Report 15% Design Project Final Presentation 14%

Class Participation and Conduct	Class sessions will regularly include activities during which students will work with partners to improve their understanding of course material. Participation in these activities, coupled with instructor observations and attendance, will be incorporated into the assignment of Class Participation and Conduct grades.
Homework	Homework is to be done individually unless otherwise noted, but students are encouraged to discuss solution strategies in groups and work through them during in-class working sessions. Assignments turned in up to 24 hours late will incur a 25% penalty, 24-48 hours late a 50% penalty, and will not be accepted more than 48 hours after the due date. To receive full credit, all steps to solving problems need to be presented in a clear and logical manner. All problem assumptions, known parameters, and governing equations should be clearly listed, and all assumptions should be adequately tested when feasible. A person who is technically literate should be able to read your problem solutions and easily follow the logic that you used to arrive at your final solution. Points will be deducted for sloppy presentations.
Design Project	This course includes an integrated final design project. The design project will be completed in self-assembled teams, and will include a final report and oral presentation at the end of the semester, as well as deliverables (e.g., design details, LCA methodology write-up, update presentation, etc.) throughout the semester. Additional details will be provided at the start of the semester. Students must also notify the instructor prior to the presentation period to be eligible for a make-up presentation.
Academic Integrity	All students are expected to uphold the highest ethical standards, be honest, and practice academic integrity in this class. **Plagiarism will not be tolerated**. Students are expected to produce original work and properly cite any sources used. Students with questions about plagiarism should contact the instructor or consult the university catalogue (https://catalog.mtech.edu/content.php?catoid=3&navoid=655&hl=plagiarism&returnto=search).
Students with Disabilities	To obtain disability-related accommodations for this class, students are advised to contact the course instructor and the Student Disability Services as soon as possible (https://www.mtech.edu/disability/index.html). Please contact the instructor after class, at his office anytime, by phone, or by email to discuss your needs.

MONTANA TECH – ENVIRONMENTAL ENGINEERING DEPARTMENT

1300 W Park St, Butte, MT ■ Phone: 406-496-4115 ■ Fax: 406-496-4650 ■ Email: kganesan@mtech.edu ■ Home Page: http://www.mtech.edu/academics/mines/environmental/

FRESHMAN YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
CHMY 141	College Chemistry I	___	3					
CHMY 142	College Chemistry Lab I	___	1					
EGEN 101	Intro to Engr Calc & Problem Solving I	___		3				
EGEN 194	Freshman Engineering Seminar	___		1				
M 171	Calculus I	___	3					
*WRIT 121	Introduction to Technical Writing	___					3	
	Humanities Elective	___				3		17
CHMY 143	College Chemistry II	___	3					
EENV 106	Environmental Software			2				
GEO 101	Introduction to Physical Geology	___	3					
M 172	Calculus II	___	3					
PHSX 234	General Physics - Mechanics	___	3					
	Humanities Elective	___				3		17

* WRIT 121 (preferred) or WRIT 101

SOPHOMORE YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
**ECNS 203	Principles of Micro & Macro	___				3		
EENV 204	Environmental Process Engineering	___		2	1			
EENV 243	Environmental Sampling I	___	1					
EGEN 201	Engineering Mechanics - Statics	___		3				
M 273	Multivariable Calculus	___	4					
PHSX 235	General Physics - HS&O	___	3					
PHSX 236	General Physics - HS&O Lab	___	1					18
BIOB 101	Discover Biology	___	3					
CHMY 210	Survey of Organic Chem w/Biochem	___	3					
EENV 242	Environmental Sampling II	___	1					
EENV 250W	Pollution Prevention & Sustainability	___		3				
M 274	Intro to Differential Equations	___	3					
PHSX 237	General Physics - EM&M	___	3					
PHSX 238	General Physics - EM&M Lab	___	1					17

** ECNS 203 (preferred) or ECNS 201 or ECNS 202

JUNIOR YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
EENV 313	Air Diffusion Modeling	___		3				
EENV 387	Environmental Laws & Regulations	___		3				
EENV 445	Hazardous Waste Treatment	___			3			
EGEN 335	Fluid Mechanics	___		3				
GEOE 420	Hydrogeology for Engineers	___	3					
STAT 332	Statistics for Scientists & Engineers	___	3					18
EENV 402	Surface Water Hydrology	___			3			
EENV 443	Air Pollution Control I	___			3			
EGEN 324	Applied Thermodynamics	___		3				
EGEN 325	Engineering Economics Analysis	___					3	
WRIT 321W	Advanced Technical Writing	___					3	
	Social Science Elective	___				3		18

SENIOR YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
EENV 404	Surface Water Quality	___			3			
EENV 414	Land and Stream Restoration	___			3			
EENV 444	Air Pollution Control II	___			3			
~~EENV 455~~ EENV 403	~~Environmental Transport Processes~~ Water & Waste Water Treatment	___		~~2~~	~~1~~ 3			
EENV 489W	Environmental Engineering Design I	___			1			
NRSM 435	Restoration I		3					16
~~EENV 403~~ EENV 4xx	~~Water & Waste Water Treatment~~ Industrial Ecology	___		2	~~3~~ 1			
EENV 421	Risk Analysis & Toxicology	___		3				
EENV 430	Soil and Subsurface Remediation	___			3			
EENV 460W	Energy and Sustainability	___			3			
EENV 494	Seminar: Environmental Engineering	___		1				
EENV 499	Capstone: Env Engineering Design II	___			2			15
CREDIT TOTALS:			**51**	**32**	**32**	**12**	**9**	**136**

Revised 080118

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 03/04/2019
Dept. Environmental Engineering
Program Environmental Engineering
College SME
CRC Representative Raja Nagisetty

Description of Request:
1. Change the semester in which EENV 403 Water and Wastewater Treatment is offered: from the spring semester to the fall semester

Current Course or Program Information:
EENV 403: Water and Wastewater Treatment. 3 Cr.

Proposed Change

Course # Name	Credits	Pre-req.
EENV 403 Water and Wastewater Treatment	**3**	**EENV 204, EGEN 335**

This course is an introduction to the field of water and wastewater treatment. It provides an engineering application of physical, chemical, and biological unit processes and operations for removal of impurities and pollutants.

Proposed time and location: MWF 10:00-10:50, no location restrictions

List of supporting documentation attached:
1. Curriculum worksheet

Assessment Leading to Request
Water and wastewater treatment gives students exposure to engineering design, and prepares them for subsequent, more complex analyses of engineered technologies in EENV 4xx Industrial Ecology.

Anticipated Impacts to "Other" Programs
None.

Impact on Library: No consultation is required since changes are only in the semester in which the course is offered.

Date to take effect: 08/15/2019

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval _____ **Date** 03/25/2019

Dean Approval _____ **Date** _____

Graduate Council Approval _____ Date _____

CRC Approval _____ Date 04/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ☐ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☒ **Other: Change the semester in which the course is offered**

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

MONTANA TECH – ENVIRONMENTAL ENGINEERING DEPARTMENT

1300 W Park St, Butte, MT ■ Phone: 406-496-4115 ■ Fax: 406-496-4650 ■ Email: kganesan@mtech.edu ■ Home Page: http://www.mtech.edu/academics/mines/environmental/

FRESHMAN YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
CHMY 141	College Chemistry I	___	3					
CHMY 142	College Chemistry Lab I	___	1					
EGEN 101	Intro to Engr Calc & Problem Solving I	___		3				
EGEN 194	Freshman Engineering Seminar	___		1				
M 171	Calculus I	___	3					
*WRIT 121	Introduction to Technical Writing	___					3	
	Humanities Elective	___				3		17
CHMY 143	College Chemistry II	___	3					
EENV 106	Environmental Software			2				
GEO 101	Introduction to Physical Geology	___	3					
M 172	Calculus II	___	3					
PHSX 234	General Physics - Mechanics	___	3					
	Humanities Elective	___				3		17

* WRIT 121 (preferred) or WRIT 101

SOPHOMORE YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
**ECNS 203	Principles of Micro & Macro	___				3		
EENV 204	Environmental Process Engineering	___		2	1			
EENV 243	Environmental Sampling I	___	1					
EGEN 201	Engineering Mechanics - Statics	___		3				
M 273	Multivariable Calculus	___	4					
PHSX 235	General Physics - HS&O	___	3					
PHSX 236	General Physics - HS&O Lab	___	1					18
BIOB 101	Discover Biology	___	3					
CHMY 210	Survey of Organic Chem w/Biochem	___	3					
EENV 242	Environmental Sampling II	___	1					
EENV 250W	Pollution Prevention & Sustainability	___		3				
M 274	Intro to Differential Equations	___	3					
PHSX 237	General Physics - EM&M	___	3					
PHSX 238	General Physics - EM&M Lab	___	1					17

** ECNS 203 (preferred) or ECNS 201 or ECNS 202

JUNIOR YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
EENV 313	Air Diffusion Modeling	___		3				
EENV 387	Environmental Laws & Regulations	___		3				
EENV 445	Hazardous Waste Treatment	___			3			
EGEN 335	Fluid Mechanics	___		3				
GEOE 420	Hydrogeology for Engineers	___	3					
STAT 332	Statistics for Scientists & Engineers	___	3					18
EENV 402	Surface Water Hydrology	___			3			
EENV 443	Air Pollution Control I	___			3			
EGEN 324	Applied Thermodynamics	___		3				
EGEN 325	Engineering Economics Analysis	___					3	
WRIT 321W	Advanced Technical Writing	___					3	
	Social Science Elective	___				3		18

SENIOR YEAR

COURSE NUMBER	COURSE DESCRIPTION		MATH & SCI	ENGR SCI	ENGR DESIGN	HSS	OTHER	SEM TOTAL
EENV 404	Surface Water Quality	___			3			
EENV 414	Land and Stream Restoration	___			3			
EENV 444	Air Pollution Control II	___			3			
~~EENV 455~~ EENV 403	~~Environmental Transport Processes~~ Water & Waste Water Treatment	___		~~2~~	~~1~~ 3			
EENV 489W	Environmental Engineering Design I	___			1			
NRSM 435	Restoration I		3					16
~~EENV 403~~ EENV 4xx	~~Water & Waste Water Treatment~~ Industrial Ecology	___		2	~~3~~ 1			
EENV 421	Risk Analysis & Toxicology	___		3				
EENV 430	Soil and Subsurface Remediation	___			3			
EENV 460W	Energy and Sustainability	___			3			
EENV 494	Seminar: Environmental Engineering	___		1				
EENV 499	Capstone: Env Engineering Design II	___			2			15
CREDIT TOTALS:			**51**	**32**	**32**	**12**	**9**	**136**

Revised 080118

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/15/2019
Dept. Computer Science **College** SME
Program Data Science **CRC Representative Jeff Braun**

Description of Request: Computer Science Worksheet: Change CSCI 194 name to Freshman Seminar; Move CSCI 255 from sophomore fall to freshman spring; Move social science elective from junior fall to sophomore spring; Remove CSCI 340; Add BMIS 375 to junior fall; Replace Professional Elective junior spring with CSCI 440; Increase credits for ESOF 326 to 3; Change name of CSCI 494 to Senior Seminar, senior spring; Remove Health Care Informatics focus area; Reduce all other focus areas to 9 credits.

Current Course or Program Information: (See attached current worksheet.)

Proposed Change

Course # Name	Credits	Pre-req.
N/A		
See attached proposed worksheet with highlighted changes		

List of supporting documentation attached:

1. **Current Computer Science curriculum worksheet**
2. **Proposed Computer Science curriculum worksheet**

Assessment Leading to Request
The curricular changes addressed in this meeting will require the requested changes as shown on the proposed worksheet.

Anticipated Impacts to "Other" Programs
BMIS 375 will see an increase in enrollment.

Impact on Library: No consultation is required since changes are only in the offering of courses, not in course content.

Date to take effect: AY 2019/2020 (August 2019)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

Montana Tech of the University of Montana

Bachelor of Science in COMPUTER SCIENCE

with

Name: _____

Choose One Option Sophomore Year

- ☐ Business Applications Option
- ☐ Electronic Control Systems Option
- ☐ Engineering Applications Option
- ☐ Game Development Option
- ☐ Statistical Applications Option
- ☐ Technical Communications Option
- ☐ Health Care Informatics Option
- ☐ No Option

2018 - 2019

Fall Semester						Spring Semester					
FRESHMAN YEAR			Credits	Sem	Grade				Credits	Sem	Grade
CSCI	135	Fund. of Computer Science I	3			CSCI	136	Fund. of Computer Science II	3		
CSCI	194	Seminar	1			COMX	230	Presenting Technical Inf.**	3		
M	171	Calculus I	3			M	172	Calculus II	3		
WRIT	121	Intro to Technical Writing**	3			--	--	*Social Science Elective*	--	--	--
--	--	*Humanities Elective*	--	--	--				3		
			3			--	--	*Science Elective**	--	--	--
--	--	*Social Science Elective*	--	--	--				3		
			3								
		Total Credits	***16***					***Total Credits***	***15***		
SOPHOMORE YEAR											
CSCI	232	Data Struct & Algorithms	3			CSCI	332	Design and Analysis of Algor	3		
CSCI	246	Discrete Structures	3			CSCI	340	Database Design	3		
CSCI	255	Intro. To Embedded Systems	3			M	274	Intro. to Differential Equations	3		
M	273	Multivariable Calculus	4			M	333	Linear Alegbra	3		
--	--	*Science Elective**	--	--	--	--	--	*Science Elective**	--	--	--
			4						4		
		Total Credits	***17***					***Total Credits***	***16***		
JUNIOR YEAR											
CSCI	305	Concepts of Prog. Languages	3			CSCI	361	Computer Architecture	3		
ESOF	322	Software Engineering	3			ESOF	326	Software Maintenance	2		
★STAT	332	Stats for Scientists & Engin	3			M	410	Numerical Computing**	3		
--	--	*Free Elective*	--	--	--	--	--	*Humanities Elective*	--	--	--
			1						3		
--	--	*Free Elective****	--	--	--	--	--	*Free Elective****	--	--	--
			3						3		
		Total Credits	***13***					***Total Credits***	***14***		
SENIOR YEAR											
CSCI	446	Artificial Intelligence	3			CSCI	438	Theory of Computation	3		
CSCI	466	Networks	3			CSCI	460	Operating Systems	3		
CSCI	498	Internship**	2			CSCI	470	Web Science	3		
WRIT	321W	Advanced Technical Writing**	3			CSCI	494	Seminar	1		
--	--	*Free Elective****	--	--	--	CSCI	498	Internship **	2		
			3			--	--	*Free Elective****	--	--	--
		Total Credits	***14***						3		
								Total Credits	***15***		

Minimum credits for B.S. degree in Computer Science = 120

*Science electives must include a two-semester sequence of laboratory science (min. of 11 credits total): Either (1) two of the three following sets (BIOB 101/102), (BIOB 170) or (BIOE 305) plus 3 more science credits; (2) CHMY 141 w/lab 142, CHMY 143 w/lab 144 plus 3 more science credits; (3) GEO 101, GEO 257, GEO 259 plus 4 more science credits (4) PHSX 234, 235 w/lab 236, and PHSX 237 w/lab 238 (take the physics sequence for the Electronic Control Systems Option.)

**WRIT 101 College Writing I can replace WRIT 121 Intro to Technical Writing. COMX 211 Adv. Public Speaking or COMX 111 Intro. to Public Speaking can replace COMX 230. CSCI 486 Senior Project can replace internship. WRIT 325W Writing in the Sciences or WRIT 322W Advanced Business Writing can replace WRIT 321W, M 426 Mathematical Modeling can replace M 410

***Students may elect to pursue a 12-credit Computer Science degree option (reverse side) with free electives.

★Students in the Statistics Option need to take STAT 332 before beginning the courses in the option.

Official in catalog 2018-2019

COMPUTER SCIENCE DEGREE OPTIONS

Professional Electives --- Junior and Senior Years

12 Credits for Each Option

Business Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	ACTG	201	Principles of Financial Accounting	3		
	ACTG	202	Principles of Managerial Accounting		3	
	Senior Year					
*	BMKT	325W	Principles of Marketing		3	
*	BGEN	235	Business Law	3		
*	BMGT	335W	Management and Organization		3	
*	BFIN	322	Business Finance	3		

** select 2 courses out of 4*

Electronic Control Systems

				Fall	Spring	Sem/Gr
	Junior Year					
	EELE	201	Circuits I for Engineering (coreq M 172)	3		
*	EELE	202	Circuits I for Engineering Lab (coreq EELE 201)	1		
*	EELE	261	Intro. To Logic Circuits (prereq EELE 201, 202)		3	
*	EELE	465	Microcontroller Applications (prereq CSCI 255) (even years only)		3	
	Senior Year					
*	PHSX	322	Electronics for Scientists (prereq PHSX 237, 238)		3	
*	EELE	203	Circuits II for Engineering (prereq EELE 201, 202 & M 274)	4		
*	EELE	320	Process Instrumentation and Control (prereq EELE 201 & 202)	4		
*	EELE	317	Electronics (prereq EELE 203)		3	
*	GEOP	446	Applied Linear Systems (prereq M274)		3	

** select 3 or more courses to reach a minimum of 12 elective credits within the option*

Engineering Applications

				Fall	Spring	Sem/Gr
	Junior Year					
*	EGEN	105	Introduction to General Engineering	*1*		
	EGEN	201	Statics (prereq PHSX 234)	3		
	EGEN	215	Introduction to Computer Aided Design & Problem Solving (pereq M172, EGEN 101, 201)		2	
*	EGEN	202	Dynamics (prereq EGEN 201 & M 172)		3	
	Senior Year					
	EGEN	305	Mechanics of Materials (prereq EGEN 201 & M 172)	3		
*	EGEN	306	Mechanics of Materials Lab (coreq EGEN 305)	1		
*	EGEN	318	Computer Applications for Engineering Design (prereq EGEN 215/305)		2	
*	ENGR	4150	Engineering Computer Applications (even years only, prereq EGEN 215, 305, M274)		3	

** select 2 or more courses to reach a minimum of 12 elective credits within the option.*

Statistical Applications

				Fall	Spring	Sem/Gr
	Junior Year					
*	STAT	441	Experimental Design (every other year, prereq STAT 332)	3		
*	STAT	432	Regression and Model Building (every other year, prereq STAT 332)		3	
	Senior Year					
	STAT	421	Probability Theory (every other year, prereq STAT 332)	3		
*	STAT	422	Mathematical Statistics (every other year, prereq STAT 421)		3	
*	STAT	435	Statictical Computing & EDA (prereq STAT 332)		3	

** select 3 courses out of 4*

Technical Communication

				Fall	Spring	Sem/Gr
	Junior Year					
*	PTC	3156	Digital Video Productions	3		
	PTC	3406W	New Media I	3		
+*	WRIT	321W	Advanced Technical Writing		3	
+*	WRIT	322W	Advanced Business Writing		3	
*	CSCI	311	Data Driven Web Applications (prereq CSCI 135, or 110, or 114, or 112, or 117)		3	
	Senior Year					
*	COMX	442	History, Technology, & Communication		3	
+*	WRIT	325W	Writing in the Sciences	3		
*	WRIT	350W	Technical Editing (prereq WRIT 321W, or 322W, or 325W)		3	
*	WRIT	412W	Advanced Writing: Documentation (prereq WRIT 321W, or 322W, or 325W)		3	
*	PTC	4406	New Media II		3	

+in addition to GenEd 300 level writing requirement.

**select 3 courses out of 9*

Health Care Informatics

				Fall	Spring	Sem/Gr
	Junior Year					
	HIT	101	Intro to Health Care Informatics	3		
*	HIT	230	Overview of HCI Systems (prereq HCI 101)		4	
*	HIT	260	Workflow Process and Redesign (coreq HIT 101, CAPP 158)	3		
*	HCI	310	Health Care Delivery in US I (coreq HIT 101)	3		
*	HCI	316	Health Care Ethics and Regulation		3	
	Senior Year					
*	HCI	312	Health Care Delivery in the US II (prereq HCI 310)		3	
*	HCI	320	Information Systems Security		3	
*	HCI	410	Projects and Systems Management	4		
*	HCI	420	Public Health Inf. (prereq HCI 310)	3		

** Select 3 courses of 8; student must have the approval of the student's advisor & HCI department*

Game Development

				Fall	Spring	Sem/Gr
	Junior Year					
	PTC	330	Introduction to Game Design	3		
	PTC	3406W	New Media I	3		
	CSCI	441	Computer Graphics (prereq CSCI 332, M 333)		3	
	Senior					
	PTC	4406W	New Media II		3	
	COMX	338	Usability Testing	3		
	CSCI	491	Special Topics - Computer Game Development		3	
	CSCI	492	Independent Study - Computer Game Development Project*	3		

*Select 12 credtis from listed courses; *Project must be approved by CS faculty*

Montana Tech of the University of Montana

Bachelor of Science in COMPUTER SCIENCE

with

Name: _____

Choose One Focus Area Sophomore Year

- ☐ Business Applications
- ☐ Electronic Control Systems
- ☐ Engineering Applications
- ☐ Game Development
- ☐ Statistical Applications
- ☐ Technical Communications
- ☐ Health Care Informatics
- ☐ None

2019-2020

Fall Semester						Spring Semester					
FRESHMAN YEAR			Credits	Sem	Grade				Credits	Sem	Grade
CSCI	135	Fund. of Computer Science I	3			CSCI	136	Fund. of Computer Science II	3		
CSCI	194	**Freshman Seminar**	1			COMX	230	Presenting Technical Inf.**	3		
M	171	Calculus I	3			M	172	Calculus II	3		
WRIT	121	Intro to Technical Writing**	3			**CSCI**	**255**	**Intro. To Embedded Systems**	**3**		
--	--	*Humanities Elective*	--	--	--	--	--	*Science Elective**	--	--	--
			3						3		
--	--	*Social Science Elective*	--	--	--						
			3					***Total Credits***	***15***		
		Total Credits	***16***								
SOPHOMORE YEAR											
CSCI	232	Data Struct & Algorithms	3			CSCI	332	Design and Analysis of Algor	3		
CSCI	246	Discrete Structures	3			M	274	Intro. to Differential Equations	3		
M	273	Multivariable Calculus	4			M	333	Linear Alegbra	3		
~~--~~	~~--~~	~~***Free Elective***~~	~~--~~	~~--~~	~~--~~	--	--	***Social Science Elective***	--	--	--
			~~1~~						3		
--	--	*Science Elective**	--	--	--	--	--	*Science Elective**	--	--	--
			4						4		
		Total Credits	***14***					***Total Credits***	***16***		
JUNIOR YEAR											
CSCI	305	Concepts of Prog. Languages	3			CSCI	361	Computer Architecture	3		
ESOF	322	Software Engineering	3			ESOF	326	Software Maintenance	**3**		
★STAT	332	Stats for Scientists & Engin	3			M	410	Numerical Computing**	3		
BMIS	**375**	**Data Analytics**	**3**			**CSCI**	**440**	**Advanced Database**	**3**		
--	--	*Professional or Free Elective****	--	--	--	--	--	*Humanities Elective*	--	--	--
			3						3		
		Total Credits	***15***					***Total Credits***	***15***		
SENIOR YEAR											
CSCI	446	Artificial Intelligence	3			CSCI	438	Theory of Computation	3		
CSCI	466	Networks	3			CSCI	460	Operating Systems	3		
CSCI	498	Internship**	2			CSCI	470	Web Science	3		
WRIT	321W	Advanced Technical Writing**	3			CSCI	494	**Senior Seminar**	1		
--	--	*Professional or Free Elective****	--	--	--	CSCI	498	Internship **	2		
			3			--	--	*Professional or Free Elective***	--	--	--
		Total Credits	***14***						3		
								Total Credits	***15***		

Minimum credits for B.S. degree in Computer Science = 120

*Science electives must include a two-semester sequence of laboratory science (min. of 11 credits total): Either (1) two of the three following sets (BIOB 101/102) or (BIOB 117 & BIOE 172) or (BIOE 305/306) plus 3 more science credits; (2) CHMY 141 w/lab 142, CHMY 143 w/lab 144 plus 3 more science credits; (3) GEO 101, GEO 257, GEO 259 plus 4 more science credits (4) PHSX 234, 235 w/lab 236, and PHSX 237 w/lab 238 (take the physics sequence for the Electronic Control Systems Option.)

**WRIT 101 College Writing I can replace WRIT 121 Intro to Technical Writing. COMX 211 Adv. Public Speaking or COMX 111 Intro. to Public Speaking can replace COMX 230. CSCI 486 Senior Project can replace internship. WRIT 325W Writing in the Sciences or WRIT 322W Advanced Business Writing can replace WRIT 321W, M 426 Mathematical Modeling can replace M 410

***Students may elect to pursue a 12-credit Computer Science degree focus area (reverse side) with free electives.

★Students in the Statistics Option need to take STAT 332 before beginning the courses in the focus area.

Official in catalog 2019-2020

COMPUTER SCIENCE DEGREE FOCUS AREAS

Professional Electives --- Junior and Senior Years
12 Credits for Each Focus Area

Business Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	ACTG	201	Principles of Financial Accounting	3		
	ACTG	202	Principles of Managerial Accounting		3	
	Senior Year					
*	BMKT	325W	Principles of Marketing		3	
*	BGEN	235	Business Law	3		
*	BMGT	335W	Management and Organization		3	
*	BFIN	322	Business Finance	3		

**** select 1 course out of 4***

Electronic Control Systems

				Fall	Spring	Sem/Gr
	Junior Year					
	EELE	201	Circuits I for Engineering (coreq M 172)	3		
*	EELE	202	Circuits I for Engineering Lab (coreq EELE 201)	1		
*	EELE	261	Intro. To Logic Circuits (prereq EELE 201, 202)		3	
*	EELE	465	Microcontroller Applications (prereq CSCI 255) (even years only)		3	
	Senior Year					
*	PHSX	322	Electronics for Scientists (prereq PHSX 237, 238)		3	
*	EELE	203	Circuits II for Engineering (prereq EELE 201, 202 & M 274)	4		
*	EELE	320	Process Instrumentation and Control (prereq EELE 201 & 202)	4		
*	EELE	317	Electronics (prereq EELE 203)		3	
*	GEOP	446	Applied Linear Systems (prereq M274)		3	

**** select 2 or more courses to reach a minimum of 9 elective credits within the focus area***

Engineering Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	EGEN	101	Introduction Engineering Calculations & Problem Solving	*3*		
	EGEN	201	Statics (prereq PHSX 234)		3	
*	EMEC	215	Intro to Modeling for Mechanical Engineers (prereq M172, EGEN 101)		1	
	Senior Year					
*	EGEN	202	Dynamics (prereq EGEN 201 & M 172)	3		
*	EGEN	305	Mechanics of Materials (prereq EGEN 201 & M 172)	3		
*	EGEN	306	Mechanics of Materials Lab (co-req EGEN 305)	1		
*	EGEN	318	Computer Applications for Engineering(prereq EMEC 215, coreq EGEN 305)		2	

**** select 1 or more courses to reach a minimum of 9 elective credits within the focus area***

Statistical Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	STAT	421	Probability Theory (every other year, prereq STAT 332)	3		
*	STAT	422	Mathematical Statistics (every other year, prereq STAT 421)		3	
*	STAT	441	Experimental Design (prereq STAT 332)	3		
*	STAT	432	Regression and Model Building (prereq STAT 332)		3	
	Senior Year					
*	STAT	435	Statistical Computing & EDA (prereq STAT 332)		3	
*	STAT	453	Statistical Learning and Data Science I (every other year, prereq STAT 432)	3		
*	STAT	454	Statistical Learning and Data Science II (every other year, prereq STAT 453)		3	

**** select 2 courses out of 6***

Technical Communication

				Fall	Spring	Sem/Gr
	Junior Year					
*	PTC	3156	Digital Video Productions	3		
	MART	**310W**	New Media I	3		
+*	WRIT	321W	Advanced Technical Writing		3	
+*	WRIT	322W	Advanced Business Writing		3	
*	CSCI	311	Data Driven Web Applications (prereq CSCI 135, or 110, or 114, or 112, or 117)		3	
	Senior Year					
*	COMX	442	History, Technology, & Communication		3	
+*	WRIT	325W	Writing in the Sciences	3		
*	WRIT	350W	Technical Editing (prereq WRIT 321W, or 322W, or 325W)		3	
*	PTC	4406	New Media II		3	

+in addition to GenEd 300 level writing requirement.

****select 2 courses out of 8***

~~Health Care Informatics~~

				Fall	Spring	Sem/Gr
	~~***Junior Year***~~					
	~~HIT~~	~~101~~	~~Intro to Health Care Informatics~~	~~3~~		
~~*~~	~~HIT~~	~~230~~	~~Overview of HCI Systems (prereq HCI 101)~~		~~4~~	
~~*~~	~~HIT~~	~~260~~	~~Workflow Process and Redesign (coreq HIT 101, CAPP 158)~~	~~2~~		
~~*~~	~~HCI~~	~~310~~	~~Health Care Delivery in US I (coreq HIT 101)~~	~~3~~		
~~*~~	~~HCI~~	~~316~~	~~Health Care Ethics and Regulation~~		~~3~~	
	~~***Senior Year***~~					
~~*~~	~~HCI~~	~~312~~	~~Health Care Delivery in the US II (prereq HCI 310)~~		~~3~~	
~~*~~	~~HCI~~	~~320~~	~~Information Systems Security~~		~~3~~	
~~*~~	~~HCI~~	~~410~~	~~Projects and Systems Management~~	~~4~~		
~~*~~	~~HCI~~	~~420~~	~~Public Health Inf. (prereq HCI 310)~~	~~3~~		

~~** Select 3 courses of 8; student must have the approval of the student's advisor & HCI department*~~

Game Development

				Fall	Spring	Sem/Gr
	Junior Year					
	PTC	330	Introduction to Game Design	3		
	MART	**310W**	New Media I	3		
	CSCI	441	Computer Graphics (prereq CSCI 332, M 333)		3	
	Senior					
	PTC	4406W	New Media II		3	
	COMX	338	Usability Testing	3		
	CSCI	491	Special Topics - Computer Game Development		3	
	CSCI	492	Independent Study - Computer Game Development Project*	3		

Select 9 credits from listed courses; *Project must be approved by CS faculty

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 02/18/2019
Dept. Computer Science **College** SME
Program Data Science **CRC Representative Jeff Braun**

Description of Request: Eliminate CSCI 102, Computational Thinking, as a requirement for Data Science majors and replace it with a Social Science elective. Eliminate CSCI 340, Database Design, as a requirement for Data Science majors and replace it with BMIS 375, Data Analytics. Change the curriculum worksheet to reflect course offerings and timing of courses.

Current Course or Program Information: Current Data Science majors are required to take CSCI 102 and CSCI 340. (See attached current worksheet.)

Proposed Change

Course # Name	Credits	Pre-req.
N/A		
See attached proposed worksheet with highlighted changes		

List of supporting documentation attached:

1. **Current Data Science curriculum worksheet**
2. **Proposed Data Science curriculum worksheet**

Assessment Leading to Request

1. Eliminating the requirement for CSCI 102 as a social science was determined not to be necessary for all students. Students entering the program with some programming experience find the course to be too basic, in which case, they should be allowed to take a social science elective of their choice. For students with no programming background, we would still advise them into CSCI 102.
2. CSCI 340, Database Design, is concerned with the design of databases. Data science students need to have knowledge of database access and issues with data, so it is more appropriate for them to take the BMIS 375, Data Analytics, course instead.
3. With the above two changes, and the timing of offerings of courses, it is necessary to adjust the curriculum worksheet to reflect that.

Anticipated Impacts to "Other" Programs
BMIS 375 will see an increase in enrollment.

Impact on Library: No consultation is required since changes are only in the courses required number, not in course content.

Date to take effect: AY 2019/2020 (August 2019)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Hyne Date 4/5/19

Dean Approval [signature] Date 4-5-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

Montana Tech of the University of Montana

Bachelor of Science in Data Science

Name: _____

2018-2019

		Fall Semester	Credits	Sem	Grade			Spring Semester	Credits	Sem	Grade
FRESHMAN YEAR											
M	171	Calculus I	3			COMX	111	Public Speaking**	3		
CSCI	102	Computational Thinking	3			M	172	Calculus II	3		
CSCI	135	Fund. of Computer Science I	3			CSCI	136	Fund. of Computer Science II	3		
WRIT	121	Intro to Technical Writing	3			*		*Science Elective*	4		
*		*Science Elective*	3					*Humanities Elective*	3		
		Total Credits	15					Total Credits	16		
SOPHOMORE YEAR											
M	273	Multivariable Calculus	4			M	274	Intro. To Diff. Equations	3		
M	333	Matrices & Linear Algebra	3			STAT	332	Stats for Scientists & Engin	3		
CSCI	232	Data Struct & Algorithms	3			CSCI	332	Design and Analysis of Algorithms	3		
CSCI	246	Discrete Structures	3			CSCI	340	Database Design	3		
		Humanities Elective	3					*Free Elective*	3		
		Total Credits	16					Total Credits	15		
JUNIOR YEAR											
STAT	421	Probability Theory	3			STAT	422	Mathematical Statistics	3		
CSCI	347	Data Mining	3			STAT	432	Regression & Model Building	3		
ESOF	322	Software Engineering	3			STAT	456	Bayesian Statistical Inference	3		
ECNS	203	Princ.of Micro & Macro	3			CSCI	444	Data Visualization	3		
		Free Elective	3			***		*Free Elective*	3		
		Total Credits	15					Total Credits	15		
SENIOR YEAR											
STAT	441	Experimental Design	3			STAT	435	Statistical Computing & EDA	3		
STAT	453	Statistical Learning & Data Science I	3			STAT	454	Statistical Learning & Data Science II	3		
CSCI	446	Artificial Intelligence	3			CSCI	447	Machine Learning	3		
WRIT	321W	Advanced Technical Writing**	3			STAT	499	Capstone: Data Science Project **or**			
***		*Free Elective*	3			CSCI	499	Capstone: Data Science Project	4		
		Total Credits	15					Total Credits	13		

Minimum credits for B.S. degree in Data Science = 120

* Science Electives must include at least one semester of laboratory science, either (1) BIOB 101/102, 160/161, BIOO 235, or BIOH 201/202; (2) CHMY 121 with lab or CHMY 141 with lab 142; (3) GEO 101 with lab GEOE 104 or GEO 209; or (4) PHSX 234 and PHSX 235 with lab 236.

** COMX 211 Adv. Public Speaking or COMX 230 Presenting Technical Information can replace COMX 111. WRIT 325W Writing in the Sciences or WRIT 322W Advanced Business Writing can replace WRIT 321W

*** Recommended electives include M 410 Numerical Computing, M 426 Mathematical Modeling, CSCI 477 Computer Simulation and Modeling, or BMIS 491 Business Intelligence & Analytics

The sequence STAT 421-422 and the courses STAT 432 & STAT 435 are offered on alternate year basis.

Last Updated 8/27/18

Montana Tech of the University of Montana

Bachelor of Science in Data Science

Name: _____

2019-2020

		Fall Semester	Credits	Sem	Grade			Spring Semester	Credits	Sem	Grade
FRESHMAN YEAR											
M	171	Calculus I	3			COMX	111	Public Speaking**	3		
CSCI	135	Fund. of Computer Science I	3			M	172	Calculus II	3		
WRIT	121	Intro to Technical Writing	3			CSCI	136	Fund. of Computer Science II	3		
*1		*Social Science Elective*	3			*		*Science Elective*	4		
*		*Science Elective*	3					*Humanities Elective*	3		
		Total Credits	15					Total Credits	16		
SOPHOMORE YEAR											
M	273	Multivariable Calculus	4			M	274	Intro. To Diff. Equations	3		
STAT	332	Stats for Scientists & Engin	3			M	333	Matrices & Linear Algebra	3		
CSCI	232	Data Struct & Algorithms	3			CSCI	332	Design and Analysis of Algorithms	3		
CSCI	246	Discrete Structures	3			CSCI	347	Data Mining	3		
BMIS	375	Data Analytics	3					*Free Elective*	3		
		Total Credits	16					Total Credits	15		
								Total Credits	15		
JUNIOR YEAR											
STAT	421	Probability Theory	3			STAT	422	Mathematical Statistics	3		
ESOF	322	Software Engineering	3			STAT	432	Regression & Model Building	3		
ECNS	203	Princ.of Micro & Macro	3			STAT	456	Bayesian Statistical Inference	3		
		Humanities Elective	3			CSCI	444	Data Visualization	3		
		Free Elective	3			***		*Free Elective*	3		
		Total Credits	15					Total Credits	15		
SENIOR YEAR											
STAT	441	Experimental Design	3			STAT	435	Statistical Computing & EDA	3		
STAT	453	Statistical Learning & Data Science I	3			STAT	454	Statistical Learning & Data Science II	3		
CSCI	446	Artificial Intelligence	3			CSCI	447	Machine Learning	3		
WRIT	321W	Advanced Technical Writing**	3			STAT	499	Capstone: Data Science Project **or**			
***		*Free Elective*	3			CSCI	499	Capstone: Data Science Project	4		
		Total Credits	15					Total Credits	13		

Minimum credits for B.S. degree in Data Science = 120

* Science Electives must include at least one semester of laboratory science, either (1) BIOB 101/102, 160/161, BIOO 235, or BIOH 201/202; (2) CHMY 121 with lab or CHMY 141 with lab 142; (3) GEO 101 with lab GEOE 104 or GEO 209; or (4) PHSX 234 and PHSX 235 with lab 236.

** COMX 211 Adv. Public Speaking or COMX 230 Presenting Technical Information can replace COMX 111. WRIT 325W Writing in the Sciences or WRIT 322W Advanced Business Writing can replace WRIT 321W

*** Recommended electives include M 410 Numerical Computing, M 426 Mathematical Modeling, CSCI 477 Computer Simulation and Modeling, or BMIS 491 Business Intelligence & Analytics

*1 *If no programming background, CSCI 102 is recommended as the social science elective*

The sequence STAT 421-422 and the courses STAT 432 & STAT 435 are offered on alternate year basis.

Last Updated 3/12/2019

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

Date 04/15/2019
Dept. Computer Science **College** SME
Program Data Science **CRC Representative Jeff Braun**

Description of Request: On Software Engineering Worksheet: Change ESOF 194 to CSCI 194; Move CSCI 255 from sophomore fall to freshman spring; Move COMX 338 from junior fall to sophomore fall; Move social science elective from junior fall to sophomore spring; Remove CSCI 340; Add BMIS 375 to junior fall; Replace Professional Elective junior spring with CSCI 440; Increase credits for ESOF 326 to 3; Change name of ESOF 486 to Senior Design Project I and reduce to 2 credits, senior fall; Add Free Elective, 1 credit, senior fall; Change ESOF 487 name to Senior Design Project II and reduce to 2 credits, senior spring; Change ESOF 494 to CSCI 494, senior spring; Remove Health Care Informatics focus area; Reduce all other focus areas to 9 credits.

Current Course or Program Information: (See attached current worksheet.)

Proposed Change

Course # Name	Credits	Pre-req.
N/A		
See attached proposed worksheet with highlighted changes		

List of supporting documentation attached:

1. **Current Software Engineering curriculum worksheet**
2. **Proposed Software Engineering curriculum worksheet**

Assessment Leading to Request
The curricular changes addressed in this meeting will require the requested changes as shown on the proposed worksheet.

Anticipated Impacts to "Other" Programs
BMIS 375 will see an increase in enrollment.

Impact on Library: No consultation is required since changes are only in the offering of courses, not in course content.

Date to take effect: AY 2019/2020 (August 2019)

MontanaTech *Curriculum Change Request Form Dated 6 September 2018*

APPROVALS

Department Head Approval Michele Van Dyne Date 4/16/19

Dean Approval [signature] Date 4-16-19

Graduate Council Approval _____ Date _____

CRC Approval [signature] Date 4/24/19

Faculty Senate Approval _____ Date _____

VCAA Approval (see below) _____ Date _____

Chancellor Approval (see below) _____ Date _____

LEVEL of Request

Please indicate the type of request(s) by selecting *all that apply*:

Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ✓ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification program of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium
- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- ☐ Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

Montana Tech of the University of Montana

Bachelor of Science in SOFTWARE ENGINEERING

with

Name: _____

Choose One Option Sophomore Year

- ☐ Business Applications
- ☐ Electronic Control Systems Option
- ☐ Engineering Applications
- ☐ Statistical Applications
- ☐ Technical Communications
- ☐ Health Care Informatics
- ☐ Game Development

2018- 2019 Catalog

			Fall Semester						Spring Semester					
FRESHMAN YEAR			Credits	Sem	Grade					Credits	Sem	Grade		
ESOF	194	CS&SE Freshman Seminar	1			CSCI	136	Fund. of Computer Science II	3					
CSCI	135	Fund. of Computer Science I	3			COMX	230	Presenting Technical Information*	3					
M	171	Calculus I	3			M	172	Calculus II	3					
WRIT	121	Intro to Technical Writing**	3			PHSX	234	General Physics - Mechanics	3					
CHMY	141	College Chemistry I*	3			--	--	*Humanities Elective***	--	--	--			
CHMY	142	College Chemistry I Lab *	1						3					
--	--	*Humanities Elective***	--	--	--	--	--	*Social Science Elective***	--	--	--			
			3						3					
		Total Credits	***17***					***Total Credits***	***18***					
SOPHOMORE YEAR														
CSCI	232	Data Struct & Algorithms	3			CSCI	332	Design and Analysis of Algor.	3					
CSCI	246	Discrete Structures	3			CSCI	340	Database Design	3					
CSCI	255	Intro. To Embedded Systems	3			ECNS	203	Principles of Micro and Macro	3					
M	273	Multivariable Calculus	4			M	274	Intro to Differential Equations	3					
PHSX	235	General Physics - H, S, & O	3			PHSX	237	General Phys - Elect, Mag, & Wave	3					
PHSX	236	General Physics-H, S, & O Lab	1			PHSX	238	General Phys-Elect, Mag, & Wave Lab	1					
		Total Credits	***17***					***Total Credits***	***16***					
JUNIOR YEAR														
CSCI	305	Concepts of Programming Lang	3			CSCI	361	Computer Architecture	3					
COMX	338	Usability Testing	3			ESOF	326	Software Maintenance	2					
ESOF	322	Software Engineering	3			ESOF	328	Requirements & Specifications	3					
★STAT	332	Statistics for Scientists & Engin	3			WRIT	321W	Adv. Technical Writing****	3					
--	--	*Professional Elective****	--	--	--	--	--	*Professional Elective****	--	--	--			
			3						3					
		Total Credits	***15***					***Total Credits***	***14***					
SENIOR YEAR														
CSCI	466	Networks	3			CSCI	460	Operating Systems	3					
EGEN	325	Engr. Economic Analysis	3			CSCI	470	Web Science	3					
ESOF	427	Software Design & Architecture	3			ESOF	411	Software Verification & Validation	3					
ESOF	486	Software Eng. Design Project I	3			ESOF	487	Software Eng. Design Project II	3					
--	--	*Professional Elective****	--	--	--	ESOF	494	Senior Seminar	1					
			3			--	--	*Professional Elective****	--	--	--			
		Total Credits	***15***						3					
								Total Credits	***16***					

Minimum credits for B.S. degree in Software Engineering = 128

* BIOB 101 (Discover Biology) and BIOB 102 (Discover Biology Lab) or GEO 101 (Intro to Physical Geology) may be substituted for CHMY 141/142.
COMX 111 Intr to Public Speaking or COMX 211 Adv Public Speaking can replace COMX 230.

**Electives must be chosen to meet GER (3 credits in Social Sciences & 6 credits in Humanities).

*** Professional electives are the classes that meet the Software Engineering degree options. (Professional electives on other side.)

****WRIT 101 College Writing I can replace WRIT 121 Intro to Technical Writing. WRIT 325W Writing in the Sciences,WRIT 322W Advanced Business Writing can replace WRIT 321W.

★Students in the Statistics Option need to take STAT 332 before beginning the courses in the option.

Official in catalog 2018 - 2019

SOFTWARE ENGINEERING DEGREE OPTIONS

Professional Electives --- Junior and Senior Years

12 Credits for Each Option

Business Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	ACTG	201	Principles of Financial Accounting	3		
	ACTG	202	Principles of Managerial Accounting		3	
	Senior Year					
*	BMKT	325W	Principles of Marketing		3	
*	BGEN	235	Business Law	3		
*	BMGT	335W	Management and Organization		3	
*	BFIN	322	Business Finance	3		

** select 2 courses out of 4*

Electronic Control Systems

				Fall	Spring	Sem/Gr
	Junior Year					
	EELE	201	Circuits I for Engineering (coreq M 172)	3		
*	EELE	202	Circuits I for Engineering Lab (coreq EELE 201)	1		
*	EELE	261	Intro. To Logic Circuits (prereq EELE 201, 202)		3	
*	EELE	465	Microcontroller Applications (prereq CSCI 255) (even years only)		3	
	Senior Year					
*	PHSX	322	Electronics for Scientists (prereq PHSX 237, 238)		3	
*	EELE	203	Circuits II for Engineering (prereq EELE 201, 202 & M 274)	4		
*	EELE	320	Process Instrumentation and Control (prereq EELE 201 & 202)	4		
*	EELE	317	Electronics (prereq EELE 203)		3	
*	Geop	446	Applied Linear Systems (prereq M274)		3	

** select 3 or more courses to reach a minimum of 12 elective credits within the option*

Engineering Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	EGEN	101	Introduction Engineering Calculations & Problem Solving	*3*		
	EGEN	201	Statics (prereq PHSX 234)		3	
*	EMEC	215	Intro to Modeling for Mechanical Engineers (prereq M172, EGEN 101)		1	
	Senior Year					
*	EGEN	202	Dynamics (prereq EGEN 201 & M 172)	3		
*	EGEN	305	Mechanics of Materials (prereq EGEN 201 & M 172)	3		
*	EGEN	306	Mechanics of Materials Lab (co-req EGEN 305)	1		
*	EGEN	318	Computer Applications for Engineering(prereq EMEC 215, coreq EGEN 305)		2	

** select 2 or more courses to reach a minimum of 12 elective credits within the option.*

Statistical Applications

				Fall	Spring	Sem/Gr
	Junior Year					

	STAT	421	Probability Theory (every other year, prereq STAT 332)	3		
*	STAT	422	Mathematical Statistics (every other year, prereq STAT 421)		3	
*	STAT	441	Experimental Design (prereq STAT 332)	3		
*	STAT	432	Regression and Model Building (prereq STAT 332)		3	
	Senior Year					
*	STAT	435	Statistical Computing & EDA (prereq STAT 332)		3	
*	STAT	453	Statistical Learning and Data Science I (every other year, prereq STAT 432)	3		
*	STAT	454	Statistical Learning and Data Science II (every other year, prereq STAT 453)		3	

** select 3 courses out of 6*

Technical Communication

				Fall	*Spring*	*Sem/Gr*
	Junior Year					
*	PTC	3156	Digital Video Productions	3		
	PTC	3406W	New Media I	3		
+*	WRIT	321W	Advanced Technical Writing		3	
+*	WRIT	322W	Advanced Business Writing		3	
	Senior Year					
*	CSCI	311	Data Driven Web Applications (prereq CSCI 135, or 110, or 114, or 112, or 117)		3	
*	COMX	442	History, Technology, & Communication		3	
+*	WRIT	325W	Writing in the Sciences	3		
*	WRIT	350W	Technical Editing (prereq WRIT 321W, or 322W, or 325W)		3	
*	PTC	4406	New Media II		3	

+ in addition to GenEd 300-level writing requirement.

** select 3 courses out of 8*

Health Care Informatics

				Fall	*Spring*	*Sem/Gr*
	Junior Year					
	HIT	101	Intro to Health Care Informatics	3		
*	HIT	230	Overview of HCI Systems (prereq HIT 101)		4	
*	HIT	260	Workflow Process and Redesign (coreq HIT 101, CAPP 158)	3		
*	HCI	310	Health Care Delivery in the US I (coreq HIT 101)	3		
*	HCI	316	Health Care Ethics and Regulations		3	
	Senior Year					
*	HCI	312	Health Care Delivery in the US II (prereq HCI 310)		3	
*	HCI	320	Information Systems Security		3	
*	HCI	410	Projects and Systems Management	4		
*	HCI	420	Public Health Inf. (prereq HCI 310)	3		

** select 3 courses of 8; student must have the approval of the student's advisor & HCI department*

Game Development

				Fall	*Spring*	*Sem/Gr*
	Junior Year					
	PTC	330	Introduction to Game Design	3		
	PTC	3406W	New Media I	3		
	CSCI	441	Computer Graphics (prereq CSCI 332, M333)		3	
	Senior					
	PTC	4406W	New Media II		3	
	CSCI	446	Artificial Intelligence (prereq CSCI 332)	3		
	CSCI	491	Special Topics - Computer Game Development		3	
	CSCI	492	Independent Study - Computer Game Development Project *	3		

*Select 12 credits from listed courses; *Project must be approved by CS faculty*

Montana Tech of the University of Montana

Bachelor of Science in SOFTWARE ENGINEERING

with

Name: _____

Choose One Focus Area Sophomore Year

- ☐ Business Applications
- ☐ Electronic Control Systems Option
- ☐ Engineering Applications
- ☐ Statistical Applications
- ☐ Technical Communications Option
- ☐ Health Care Informatics
- ☐ Game Development

2019- 2020 Catalog

Fall Semester						Spring Semester					
FRESHMAN YEAR			Credits	Sem	Grade				Credits	Sem	Grade
CSCI	**194**	**Freshman Seminar**	1			CSCI	136	Fund. of Computer Science II	3		
CSCI	135	Fund. of Computer Science I	3			COMX	230	Presenting Technical Information*	3		
M	171	Calculus I	3			M	172	Calculus II	3		
WRIT	121	Intro to Technical Writing**	3			PHSX	234	General Physics - Mechanics	3		
CHMY	141	College Chemistry I*	3			**CSCI**	**255**	**Intro. To Embedded Systems**	**3**		
CHMY	142	College Chemistry I Lab *	1			--	--	*Humanities Elective***	--	--	--
--	--	*Humanities Elective***	--	--	--				3		
			3					***Total Credits***	***18***		
		Total Credits	***17***								
SOPHOMORE YEAR											
CSCI	232	Data Struct & Algorithms	3			CSCI	332	Design and Analysis of Algor.	3		
CSCI	246	Discrete Structures	3			ECNS	203	Principles of Micro and Macro	3		
COMX	**338**	**Usability Testing**	**3**			M	274	Intro to Differential Equations	3		
M	273	Multivariable Calculus	4			PHSX	237	General Phys - Elect, Mag, & Wave	3		
PHSX	235	General Physics - H, S, & O	3			PHSX	238	General Phys-Elect, Mag, & Wave Lab	1		
PHSX	236	General Physics-H, S, & O Lab	1			--	--	***Social Science Elective****	--	--	--
		Total Credits	***17***						**3**		
								Total Credits	***16***		
JUNIOR YEAR											
CSCI	305	Concepts of Programming Lang	3			CSCI	361	Computer Architecture	3		
BMIS	**375**	**Data Analytics**	**3**			ESOF	326	Software Maintenance	**3**		
ESOF	322	Software Engineering	3			ESOF	328	Requirements & Specifications	3		
★STAT	332	Statistics for Scientists & Engin	3			WRIT	321W	Adv. Technical Writing****	3		
--	--	*Professional Elective****	--	--	--	**CSCI**	**440**	**Advanced Database**	**3**		
			3					***Total Credits***	***15***		
		Total Credits	***15***								
SENIOR YEAR											
CSCI	466	Networks	3			CSCI	460	Operating Systems	3		
EGEN	325	Engr. Economic Analysis	3			CSCI	470	Web Science	3		
ESOF	427	Software Design & Architecture	3			ESOF	411	Software Verification & Validation	3		
ESOF	486	**Senior Design Project I**	**2**			ESOF	487	**Senior Design Project II**	**2**		
--	--	***Free Elective***	--	--	--	**CSCI**	494	Senior Seminar	1		
			1			--	--	*Professional Elective****	--	--	--
--	--	*Professional Elective****	--	--	--				3		
			3					***Total Credits***	***15***		
		Total Credits	***15***								

Minimum credits for B.S. degree in Software Engineering = 128

* BIOB 101 (Discover Biology) and BIOB 102 (Discover Biology Lab) or GEO 101 (Intro to Physical Geology) may be substituted for CHMY 141/142.
COMX 111 Intr to Public Speaking or COMX 211 Adv Public Speaking can replace COMX 230.

**Electives must be chosen to meet GER (3 credits in Social Sciences & 6 credits in Humanities).

*** Professional electives are the classes that meet the Software Engineering degree focus areas (Professional electives on other side.)

****WRIT 101 College Writing I can replace WRIT 121 Intro to Technical Writing. WRIT 325W Writing in the Sciences,WRIT 322W Advanced Business Writing can replace WRIT 321W.

★Students in the Statistics Focus Area need to take STAT 332 before beginning the courses in the focus area.

Official in catalog 2019 - 2020

SOFTWARE ENGINEERING DEGREE FOCUS AREAS

Professional Electives --- Junior and Senior Years
12 Credits for Each Focus Area

Business Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	ACTG	201	Principles of Financial Accounting	3		
	ACTG	202	Principles of Managerial Accounting		3	
	Senior Year					
*	BMKT	325W	Principles of Marketing		3	
*	BGEN	235	Business Law	3		
*	BMGT	335W	Management and Organization		3	
*	BFIN	322	Business Finance	3		

**** select 1 course out of 4***

Electronic Control Systems

				Fall	Spring	Sem/Gr
	Junior Year					
	EELE	201	Circuits I for Engineering (coreq M 172)	3		
*	EELE	202	Circuits I for Engineering Lab (coreq EELE 201)	1		
*	EELE	261	Intro. To Logic Circuits (prereq EELE 201, 202)		3	
*	EELE	465	Microcontroller Applications (prereq CSCI 255) (even years only)		3	
	Senior Year					
*	PHSX	322	Electronics for Scientists (prereq PHSX 237, 238)		3	
*	EELE	203	Circuits II for Engineering (prereq EELE 201, 202 & M 274)	4		
*	EELE	320	Process Instrumentation and Control (prereq EELE 201 & 202)	4		
*	EELE	317	Electronics (prereq EELE 203)		3	
*	Geop	446	Applied Linear Systems (prereq M274)		3	

**** select 2 or more courses to reach a minimum of 9 elective credits within the focus area***

Engineering Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	EGEN	101	Introduction Engineering Calculations & Problem Solving	*3*		
	EGEN	201	Statics (prereq PHSX 234)		3	
*	EMEC	215	Intro to Modeling for Mechanical Engineers (prereq M172, EGEN 101)		1	
	Senior Year					
*	EGEN	202	Dynamics (prereq EGEN 201 & M 172)	3		
*	EGEN	305	Mechanics of Materials (prereq EGEN 201 & M 172)	3		
*	EGEN	306	Mechanics of Materials Lab (co-req EGEN 305)	1		
*	EGEN	318	Computer Applications for Engineering(prereq EMEC 215, coreq EGEN 305)		2	

**** select 1 or more courses to reach a minimum of 9 elective credits within the focus area***

Statistical Applications

				Fall	Spring	Sem/Gr
	Junior Year					
	STAT	421	Probability Theory (every other year, prereq STAT 332)	3		
*	STAT	422	Mathematical Statistics (every other year, prereq STAT 421)		3	
*	STAT	441	Experimental Design (prereq STAT 332)	3		
*	STAT	432	Regression and Model Building (prereq STAT 332)		3	
	Senior Year					
*	STAT	435	Statistical Computing & EDA (prereq STAT 332)		3	
*	STAT	453	Statistical Learning and Data Science I (every other year, prereq STAT 432)	3		
*	STAT	454	Statistical Learning and Data Science II (every other year, prereq STAT 453)		3	

**** select 2 courses out of 6***

Technical Communication

				Fall	Spring	Sem/Gr
	Junior Year					
*	PTC	3156	Digital Video Productions	3		
	MART	**310W**	New Media I	3		
+*	WRIT	321W	Advanced Technical Writing		3	
+*	WRIT	322W	Advanced Business Writing		3	
	Senior Year					
*	CSCI	311	Data Driven Web Applications (prereq CSCI 135, or 110, or 114, or 112, or 117)		3	
*	COMX	442	History, Technology, & Communication		3	
+*	WRIT	325W	Writing in the Sciences	3		
*	WRIT	350W	Technical Editing (prereq WRIT 321W, or 322W, or 325W)		3	
*	PTC	4406	New Media II		3	

+ in addition to GenEd 300-level writing requirement.

**** select 2 courses out of 8***

~~Health Care Informatics~~

				~~Fall~~	~~Spring~~	~~Sem/Gr~~
	~~***Junior Year***~~					
	~~HIT~~	~~101~~	~~Intro to Health Care Informatics~~	~~3~~		
~~*~~	~~HIT~~	~~230~~	~~Overview of HCI Systems (prereq HIT 101)~~		~~4~~	
~~*~~	~~HIT~~	~~260~~	~~Workflow Process and Redesign (coreq HIT 101, CAPP 158)~~	~~3~~		
~~*~~	~~HCI~~	~~310~~	~~Health Care Delivery in the US I (coreq HIT 101)~~	~~3~~		
~~*~~	~~HCI~~	~~316~~	~~Health Care Ethics and Regulations~~		~~3~~	
	~~***Senior Year***~~					
~~*~~	~~HCI~~	~~312~~	~~Health Care Delivery in the US II (prereq HCI 310)~~		~~3~~	
~~*~~	~~HCI~~	~~320~~	~~Information Systems Security~~		~~3~~	
~~*~~	~~HCI~~	~~410~~	~~Projects and Systems Management~~	~~4~~		
~~*~~	~~HCI~~	~~420~~	~~Public Health Inf. (prereq HCI 310)~~	~~3~~		

~~** select 3 courses of 8; student must have the approval of the student's advisor & HCI department*~~

Game Development

				Fall	Spring	Sem/Gr
	Junior Year					
	PTC	330	Introduction to Game Design	3		
	MART	**310W**	New Media I	3		
	CSCI	441	Computer Graphics (prereq CSCI 332, M333)		3	
	Senior					
	PTC	4406W	New Media II		3	
	CSCI	446	Artificial Intelligence (prereq CSCI 332)	3		
	CSCI	491	Special Topics - Computer Game Development		3	
	CSCI	492	Independent Study - Computer Game Development Project *	3		

Select 9 credits from listed courses; *Project must be approved by CS faculty

MontanaTech *Curriculum Change Request Form Dated 2 Feb 2017*

Protocol: The department requesting curriculum change holds a discussion at the departmental level, and if agreed upon by the department head, discuss with the Dean for approval. Forward the completed form along with supporting information to the CRC chair after approval from the department head, dean, and graduate council if necessary. Final changes are then made by the registrar after faculty senate approval. Guidance: https://www.umt.edu/provost/faculty/curriculum/default.php.

Date 4/15/19
Dept. Petroleum Engineering **College** SME
Program: BS Petroleum Engineering

Description of Request/Summary:
Create a minor in Petroleum Engineering.

Current Course Program Information:
No minor currently exists, however, BS degree exists.

Proposed Change (Attach syllabus or curriculum for new course or curriculum changes.)

Course # Name	Credits	Pre-req.
N/A		

See attached sheet for Petroleum Engineering Minor curriculum requirements.

List of supporting documentation attached:
Petroleum Engineering Minor Application Worksheet

Assessment Leading to Request
The addition of a Petroleum Engineering minor has been suggested by individuals (Department Head, Faculty and students) to provide an organized method of opportunity for students in other engineering majors, specifically mechanical, to obtain education in petroleum courses to enhance the opportunities available for employment in the petroleum industry. Traditionally, a number of General Engineering (and more recently, Mechanical Engineering) graduates have targeted the petroleum industry for their career path and this minor would give them a definite advantage over graduates without the background and knowledge obtained through this minor.

Anticipated Impacts to "Other" Programs:
No negative impacts are anticipated, but it will provide an opportunity for students in other majors to enhance employment potential by including the minor in their studies.

Impact on Library: None.

Date to take effect: 2019-2020 Catalog

LEVEL of Request
Please indicate the type of request(s) by selecting *all that apply*:
Faculty Approvals (directly to CRC, then Faculty Senate):

- ☐ Establish a new course for the catalog (please contact the Registrar of MUS CCN information)
- ☐ Changed course: addition, deletion or change of title, credit, course number, pre-req, description, or cross listing.
- ☐ Amend an existing degree program. Making changes to programs such as adding a writing course to a major, changing the list of accepted electives or removing a requirement of a minor
- ☐ New degree certification of 29 credits or less
- ☐ Other:

Campus Approvals (must be approved by the VCAA prior to CRC submission):

- ☐ Placing a postsecondary educational program into moratorium

- ☐ Withdrawing a postsecondary educational program from moratorium
- ☐ Establishing, re-titling, terminating or revising a campus certificate of 29 credits or more
- ☐ Establishing a B.A.S./A.A./A.S. area of study
- ☐ Offering an existing postsecondary educational program via distance or online delivery
- ☐ Other:

OCHE Approvals *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Re-titling an existing postsecondary educational program
- ☐ Terminating an existing postsecondary educational program
- ☐ Consolidating existing postsecondary educational programs
- X Establishing a new minor where there is a major or an option in a major
- ☐ Revising a postsecondary educational program
- ☐ Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years
- ☐ Other:

Level II *(must be approved by the VCAA and Chancellor prior to CRC submission)*:

- ☐ Establishing a new postsecondary educational program
- ☐ Exceeding the 120 credit maximum for baccalaureate degrees Exception to policy 301.11
- ☐ Forming, eliminating or consolidating an academic, administrative, or research unit
- ☐ Re-titling an academic, administrative, or research unit
- ☐ Other:

APPROVALS

Department Head Approval _____ **Date** 4/17/2019

Dean Approval _____ **Date** _____

VCAA Approval (see above) _____ Date _____

Chancellor Approval (see above) _____ Date _____

Graduate Council Approval _____ Date _____

CRC Approval _____ Date _____

Faculty Senate Approval _____ Date _____

MontanaTech
THE UNIVERSITY OF MONTANA

Application for a Petroleum Engineering

Name: _____

Major: _____ **Student ID#** _____

NOTE: At least one-third of courses used must be upper division (300-400).
Please list below the courses you are using to complete the requirements for your Petroleum Engineering Minor.

Course	Course Title	Credits	Term Completed	Grade Received
Complete the following:				
GEO 101	Introduction to Physical Geology	3		
GEO 257	Sedimentology & Petroleum Geology	3		
PET 201	Elements of Petroleum Engineering	3		
PET 205	Petroleum Engineering Lab I	1		
PET 304	Rock Properties	3		
PET 372	Petroleum Fluids & Thermodynamics	3		
Select 6 credits from the following:				
PET 301	Introduction to Well Drilling	3		
PET 302	Petroleum Production Engineering	3		
PET 305	Introduction to Well Completions	3		
PET 404	Reservoir Engineering	3		
PET 300-, 400-	or 500-level PET Elective	3		

The TOTAL Required Credits for this Minor is a minimum of 22. **TOTAL** _____

Signatures of Approval:

Student: _____ **Date:** _____

Major Advisor: _____ **Date:** _____

Pet. Eng. Department Head: _____ **Date:** _____