Computer Science
MONTANA TECH OF THE UNIVERSITY OF MONTANA

Computer Science Industry Advisory Board Meeting Minutes
September 12, 2018

Industry Members Present:

- Bill Ivanich, IAB Member representing EchoStar
- Justin Malsam, IAB Member representing Micron
- Kamie Garner, IAB Member representing Zoot Enterprises, Inc.
- Greg Waring, IAB Member representing Energy Laboratories, Inc.
- Davis Almanza, IAB Member representing Computers Unlimited
- Kim Bray, IAB Member representing NorthWestern Energy
- Haythem Memmi, IAB Member representing Adobe

Montana Tech Representatives Present:

- Michele Van Dyne, C.S. Dept. Chair
- Frank Ackerman, C.S. Faculty
- Jeff Braun, C.S. Faculty
- Phillip Curtiss, C.S. Faculty
- Celia Schahczenski, C.S. Faculty
- Tami Windham, C.S. Administrative Associate
- Cody Baker, C.S. Student
- Dalton Caron, C.S. Student
- Carson Fiechtner, S.E. Student
- Jessica Jones, D.S. Student

Welcome and Introductions

Introduction of all attending the meeting were made. Michele Van Dyne, Department Head welcomed the board members to Montana Tech and thanked the members for taking the time to attend the meeting and for their input to the department.

Computer Science Department Updates (Michele Van Dyne)

Montana Tech Updates

- **Enrollment is down somewhat again this year**
    - Still operating under the 10+% budget cuts from last year
- **Buildings**
    - Construction continues on the new dormitory
- **Special Focus Designation**
    - New name: Montana Technological University
    - Still "Montana Tech"
    - Wire Committee
        - Embraces the "special focus" designation in science and engineering
        - Nationally competitive applied research culture
        - Focus on integrated problem solving
        - Future relationship with Highlands College – still up in the air
- **Program Prioritization**
    - State mandate:
        - Looking at both academic and administrative programs
        - "We're number 30!"

Department Updates

Faculty/Staff:

- Brian Koontz
  - Left us in Spring 2017
  - Not … Currently searching for his replacement, Assistant Professor
- Brent Donoven
  - Left us in Spring 2017
  - Came back as our Outreach Coordinator in fall 2017
- Frank Ackerman
  - Retiring at the end of this semester
  - Starting to search for replacement now

Curriculum:

- **Data Science B.S.**
  - Developed marketing materials
  - Because of students changing majors into DS, may be looking at graduation our first students this year
- **Computational Science**
  - No students yet, though there has been interest
  - Currently offering courses in that track
- **"Center for Excellence in Cyber Defense"**
  - Our department is not, at present pursuing this, but Network Technology is working on the 2-year version

Graduate Program(s)

- "Intent to plan" MS in Computer Science
- Pursuing getting on the Master of Engineering degree list with SE

Recruiting Efforts

- **CodeMontana started Fall 2013**
  - Publicity for need of more CS graduates
  - Introduce high schools students to coding
  - $4000 scholarships offered from Tech
  - CSCI 191 CodeMontana: Intro to CS course
- **Gianforte Family Foundation Grant**
  - Originally 2 ½ years funding for Outreach Coordination
  - Extended by another 1 ½ years, until Apr. 2019
    - Will request additional funding this year
  - The department continues to host and manage the CodeMontana website
  - More on outreach efforts and results later this morning

Scholarships

- **Chancellor pledged 40 CodeMontana Scholarships, $4000 over 2 years**
  - Criteria:
    - ACT 24+ and (AP CS or CSP 4+ or CodeHS or College course B or better)
    - Discussed opening it up to nontraditional students
- **R.E.A.L. Scholarship Program – Year 9**
  - Earn up to $600 by completing 4 online modules + $600 more for Competitive Programming Challenges
  - 7 new recipients this year
  - Currently helps support 15 students

Current Year Numbers

Enrollment	FR	SO	JR	SR	PB	Grand Total
201870CURRENT	**34**	**13**	**6**	**20**	**4**	**77**
Computer Science	**21**	**5**	**4**	**13**	**3**	**46**
F	2			1		3
M	19	5	4	12	3	43
Data Science	**2**	**2**		**2**	**1**	**7**
F	1	1		2	1	5
M	1	1				2
Software Engineering	**11**	**6**	**2**	**5**		**24**
F		1				1
M	11	5	2	5		23

New Students	Freshmen	Transfers	Grand Total
201870CURRENT	**28**	**4**	**32**
Computer Science	**16**	**3**	**19**
F	2		2
M	14	3	17
Data Science	**3**	**1**	**4**
F	1	1	2
M	2		2
Software Engineering	**9**		**9**
M	9		9

Row Labels	Summer 2017	Fall 2017	Spring 2018	Grand Total
110701 BS Computer Science	1		4	5
140903 BS Software Engineering			5	5
Grand Total	**1**	**0**	**9**	**10**

Enrollment Trends

Year	Total SE Students	Total CS Students	Total DS Students	Total Students
2001	16	100		116
2002	18	86		104
2003	28	69		97
2004	26	45		71
2005	20	45		65
2006	21	36		57
2007	25	26		51
2008	21	26		47
2009	26	27		53
2010*	20	28		48
2011	22	26		48
2012	24	34		58
2013	27	31		58
2014**	32	40		72
2015	24	48		72
2016	25	40		65
2017	29	40	5/2	71.5
018***	24	46	7/2	73.5

*** FESP began**
**** FESP ended**
***** Unofficial**

Retention to Graduation

Year	Total Freshmen	Total Graduates	Graduation Percent
2001	41		
2002	34		
2003	40	13	
2004	22	7	14%
2005	21	7	17%
2006	17	10	29%
2007	24	11	28%
2008	23	5	23%
2009	24	4	19%
2010*	19	4	24%
2011	18	2	8%
2012	16	4	17%
2013	18	6	25%
2014**	34	8	42%
2015	28	7	39%
2016	15	11	68%
2017	22.5	3	17%
2018	28***	8***	24%

*** FESP began**
**** FESP ended**
***** Unofficial**

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- Ranking of the Computer Science Department: (Discussion)
    - Focus on figuring out how administration focuses on these numbers and work within the framework to increase the numbers.
    - Own it and turn that number around
    - Pair off freshmen with other students
    - ACM has stepped up to help students that are having a difficult time in their classes
    - Administrative side needs to consider who is teaching classes that students are having a difficult time in and leaving the program.
- Curriculum (Discussion)
    - Would pursuing ME in SE with School of Engineering impact need for additional faculty?
    - No our courses would be dual listed, it would allow us to work more closely with the engineering department
    - Dean of Engineering has approached the CS department to move under engineering

Computer Science and Software Engineering Program Assessment (Jeff Braun)

CS Assessment Results: Fall 2017 - Spring 2018

Assessment Process Summary

- ABET Accreditation uses assessment of educational objectives and student outcomes as part of their process of evaluating computing programs
- We gather assessment data on objectives and outcomes and report this to the assessment committee annually
- The assessment committee is comprised of members of industry (our IAB), a recent alumnus, a student, and the faculty
- This annual meeting is the platform for presenting those assessment results and gathering input on any changes we might make based on results

Student Outcomes Assessment

- Student outcomes are those criteria we expect students to meet immediately after completing coursework within the CS and SE programs
- Each course has course outcomes, and these are mapped to more general student outcomes
    - These more general student outcomes are one part of how our programs are evaluated by the ABET accreditation teams.
- Outcomes between the two programs are similar but do have differences

Student Outcomes: CAC

(a) *An ability to apply knowledge of computing and mathematics appropriate to the discipline*
(b) *An ability to analyze a problem, and identify and define the computing requirements appropriate to its solutions*
(c) *An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs*
(d) *An ability to function effectively on teams to accomplish a common goal*
(e) *An understanding of professional, ethical, legal, security and social issues and responsibilities*
(f) *An ability to communicate effectively with a range of audiences*
(g) *An ability to analyze the local and global impact of computing on individuals, organizations and society*
(h) *Recognition of the need for and an ability to engage in continuing professional development*
(i) *An ability to use current techniques, skills and tools necessary for computing practices*
(j) *An 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*
(k) *An ability to apply design and development principles in the construction of software systems of varying complexity*

Student Outcomes: EAC

(a) *An ability to apply knowledge of mathematics, science and engineering*
(b) *An ability to design and conduct experiments, as well as to analyze and interpret data*
(c) *An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability*
(d) *An ability to function on multidisciplinary teams*
(e) *An ability to identify, formulate and solve engineering problems*
(f) *An understanding of professional and ethical responsibility*
(g) *An ability to communicate effectively*
(h) *The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context*
(i) *A recognition of the need for and an ability to engage in life-long learning*
(j) *A knowledge of contemporary issues*
(k) *An ability to use the techniques, skills and modern engineering tools necessary for engineering practice*
The program must demonstrate that graduates have: (SEC-1) the ability to analyze, design, verify, validate, implement, apply and maintain software systems; (SEC-2) the ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems; (SEC-3) the ability to work in one or more significant application domains; and (SEC-4) the ability to manage the development of software systems.

Course Numbers and Names

Course Number	Course Name
CSCI 135	Fundamentals of Computer Science I
CSCI 136	Fundamentals of Computer Science II
CSCI 194	Freshman Seminar
CSCI 232	Data Structures & Algorithms
CSCI 246	Discrete Structures
CSCI 255	Introduction to Embedded Systems
CSCI 305	Concepts of Programming Languages
CSCI 332	Design & Analysis of Algorithms
CSCI 340	Database Design
CSCI 361	Computer Architecture
CSCI 438	Theory of Computation
CSCI 446	Artificial Intelligence
CSCI 460	Operating Systems
CSCI 466	Networks
CSCI 470	Web Science
CSCI 494	Senior Seminar
CSCI 498	Internship
ESOF 322	Software Engineering
ESOF 326	Software Maintenance
ESOF 328	Requirements & Specification
ESOF 411	Software Verification and Validation
ESOF 427	Software Design and Architecture
ESOF 486/487	Senior Design Project
ESOF 494	Senior Seminar

Fall 2017 - Spring 2018 Outcome Assessment Results

- Our expectation is that 75% of students will meet each outcome at a level at 70 % or above
- The percentages in this table are the percent of students meeting that outcome
- None of our outcomes fell below 75% across all courses

Outcome	Fall 2017	Spring 2018	Row Average
CAC a	94%	91%	93%
CAC b	90%	94%	92%
CAC c	94%	92%	93%
CAC d	100%	100%	100%
CAC e	81%	-	81%
CAC f	97%	100%	99%
CAC g	81%	-	81%
CAC h	96%	89%	92%
CAC i	98%	92%	95%
CAC j	93%	87%	90%
CAC k	97%	97%	97%
EAC 1	99%	92%	96%
EAC 2	94%	92%	93%
EAC 3	96%	94%	95%
EAC 4	-	100%	100%
EAC a	99%	94%	97%
EAC b	100%	100%	100%
EAC c	95%	88%	91%
EAC d	-	100%	100%
EAC e	93%	92%	93%
EAC f	93%	83%	88%
EAC g	97%	100%	99%
EAC h	100%	-	100%
EAC i	94%	93%	94%
EAC j	-	100%	100%
EAC k	98%	93%	95%

Fall 2017 – Spring 2018 CS Outcome Assessment Results Details

Course	CAC a	CAC b	CAC c	CAC d	CAC e	CAC f	CAC g	CAC h	CAC i	CAC j	CAC k	Row Average
CSCI 135		86%	100%						100%	100%	86%	94%
CSCI 136		100%	93%						93%	93%	86%	93%
CSCI 194						89%		82%				85%
CSCI 232	100%	100%	100%		100%				100%	100%	100%	100%
CSCI 246	100%											100%
CSCI 255	95%		95%						95%			95%
CSCI 305	70%								90%	80%		80%
CSCI 332	100%	100%	100%						100%	100%	100%	100%
CSCI 340												
CSCI 361	76%		61%			100%				76%		78%
CSCI 438	83%	83%							83%	83%		83%
CSCI 446	87%	75%	75%		62%		62%	100%		87%		78%
CSCI 460	100%		100%			100%		66%	66%	66%		83%
CSCI 466	100%					100%			100%	100%	100%	100%
CSCI 470	87%		100%						100%	100%	100%	97%
CSCI 486												
CSCI 494						100%		100%				100%
CSCI 498	100%			100%		100%		100%	100%		100%	100%
ESOF 322	100%	100%	100%			100%	100%	100%	100%	92%	100%	99%
ESOF 326			100%	100%		100%			100%			100%
Column Average	92%	92%	93%	100%	81%	98%	81%	91%	94%	90%	96%	

Fall 2017 – Spring 2018 SE Outcome Assessment Results Details

	EAC 1	EAC 2	EAC 3	EAC 4	EAC a	EAC b	EAC c	EAC d	EAC e	EAC f	EAC g	EAC h	EAC i	EAC j	EAC k	Row Ave.
CSCI 135							86%								100%	93%
CSCI 136							93%								93%	93%
CSCI 194											89%		82%			85%
CSCI 232	100%				100%	100%	100%		100%	100%					100%	100%
CSCI 246		75%			100%											87%
CSCI 255	95%		95%		95%		95%		66%						95%	90%
CSCI 305															90%	90%
CSCI 332	100%				100%				100%						100%	100%
CSCI 340																
CSCI 361	61%				76%		61%		69%		100%			100%		78%
CSCI 460	100%				100%						100%		66%		66%	86%
CSCI 466	100%	100%			100%				100%		100%				100%	100%
CSCI 470	100%	100%			100%	100%	100%		100%						100%	100%
CSCI 494											100%		100%	100%		100%
ESOF 322	100%	100%			100%		100%		100%		100%	100%	100%		100%	100%
ESOF 326	100%		100%	100%				100%			100%				100%	100%
ESOF 328	100%	100%			100%				100%		100%				100%	100%
ESOF 411		83%	100%	100%	100%	100%	100%		100%		100%		100%		100%	98%
ESOF 427	100%	100%			100%		100%		100%		100%				100%	100%
ESOF 486							85%			85%			100%			90%
ESOF 487	83%	83%	83%	100%	83%		83%		83%	66%	100%		100%		83%	86%
Column Average	95%	92%	94%	100%	96%	100%	91%	100%	92%	84%	99%	100%	92%	100%	95%	

Additional Independent/External Assessments

- Educational Testing Service (ETS) Proficiency Profile Exam
- ETS Computer Science Major Field Test

Results of the Educational Testing Service (ETS) Proficiency (2017 - 2018)

2017-2018 DEPARTMENT SUMMARIES OF PROFICIENCY DOCTORAL/RESEARCH I & II, MASTER'S COMPREHENSIVE I & II, AND LIBERAL ARTS I & II INSTITUTIONS (20351 JUNIORS AT 72 FOUR YEAR INSTITUTIONS)		READING LEVEL 1	READING LEVEL 2	CRITICAL THINKING LEVEL 3	WRITING LEVEL 1	WRITING LEVEL 2	WRITING LEVEL 3	MATH LEVEL 1	MATH LEVEL 2	MATH LEVEL 3
MONTANA TECH (N = 363)	PROFICIENT	82%	62%	8%	69%	28%	9%	83%	65%	30%
	MARGINAL	10%	16%	39%	17%	36%	34%	11%	17%	31%
	NOT PROFICIENT	8%	22%	53%	14%	37%	58%	6%	18%	39%
COMPUTER SCIENCE & SOFTWARE ENGINEERING (N = 11)	PROFICIENT	91%	85%	27%	82%	55%	27%	91%	91%	64%
	MARGINAL	9%	6%	36%	0%	27%	36%	9%	0%	27%
	NOT PROFICIENT	0%	9%	36%	18%	18%	36%	0%	9%	9%
MARGINAL (N-SCHOOLS = 72, N-STUDENTS = 20351)		63%	34%	3%	59%	18%	8%	51%	25%	5%
PROFICIENT (N-SCHOOLS = 72, N-STUDENTS = 20351)		19%	21%	19%	28%	36%	23%	26%	25%	15%
NOT PROFICIENT (N-SCHOOLS = 72, N-STUDENTS = 20351)		18%	45%	78%	13%	46%	69%	23%	50%	80%

Results of the Educational Testing Service (ETS) Proficiency (2015 – 2016)

2015-2016 Department Summaries of Proficiency Doctoral/Research I & II, Master's Comprehensive I & II, and Liberal Arts I & II Institutions (132,422 Seniors at 294 four year Institutions)		Reading Level 1	Reading Level 2	Critical Thinking Level 3	Writing Level 1	Writing Level 2	Writing Level 3	Mth Level 1	Math Level 2	Math Level 3
Montana Tech (N = 302)	Proficient	87%	68%	13%	76%	29%	8%	89%	73%	36%
	Marginal	8%	15%	41%	17%	45%	38%	9%	15%	31%
	Not Proficient	5%	18%	46%	7%	26%	54%	2%	12%	32%
Computer Science & Software Engineering (N = 5)	Proficient	100%	80%	40%	100%	40%	20%	100%	100%	80%
	Marginal	0%	20%	60%	0%	60%	60%	0%	0%	20%
	Not Proficient	0%	0%	0%	0%	0%	20%	0%	0%	0%
Marginal (N-schools = 294, N-students = 132,422)		69%	41%	7%	66%	22%	10%	60%	33%	9%
Proficient (N-schools = 294, N-students = 132,422)		17%	21%	22%	25%	38%	26%	23%	25%	18%
Not Proficient (N-schools = 294, N-students = 132,422)		14%	39%	72%	9%	40%	63%	18%	41%	72%

Results of the ETS Computer Science Major or Field Test

Computer Science Major Field Test									
Test 4CMF (given 2006-11)	Mean*	2008		2009		2010		2011	
		Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Total Score	148	160	85%	167	95%	164	95%	163	90%
Programming Fundamentals	55%	74%	95%	71%	90%	75%	95%	76%	95%
Discrete Structures and Algorithms	35%	47%	90%	55%	95%	46%	85%	48%	90%
Systems (Architecture, OS, DB, Networking	42%	45%	55%	62%	95%	60%	95%	48%	70%
#students	9095	7		3		4		3	
	*Mean is based on 232 institutions								
Test 4HMF (given 2012-15)	Mean*	2012		2013		2014		2015	
		Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Total Score	147.2	164	95%	169	99%	164	95%	169	99%
Programming & SE	47%	61%	89%	65%	95%	64%	93%	63%	92%
Discrete Structures and Algorithms	39%	54%	94%	60%	98%	58%	98%	55%	95%
Systems (Architecture, OS, DB, Networking	38%	57%	98%	60%	99%	49%	90%	72%	99%
#students	7530	7		5		10		6	
	*Mean is based on 214 institutions								

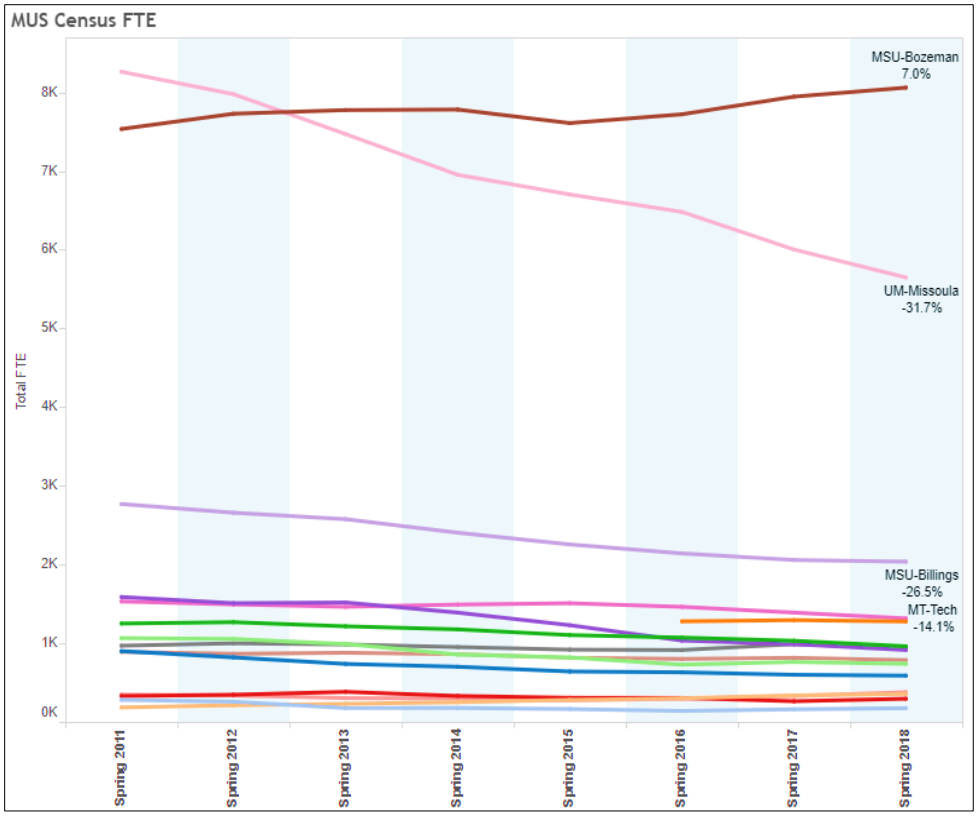
Results of the ETS Computer Science Major Field Test

Computer Science Major Field Test									
Test 4HMF (given 2012-15)	Mean*	2012		2013		2014		2015	
		Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Total Score	147.2	164	95%	169	99%	164	95%	169	99%
Programming & SE	47%	61%	89%	65%	95%	64%	93%	63%	92%
Discrete Structures and Algorithms	39%	54%	94%	60%	98%	58%	98%	55%	95%
Systems (Architecture, OS, DB, Networking	38%	57%	98%	60%	99%	49%	90%	72%	99%
#students	7530	7		5		10		6	
	*Mean is based on 214 institutions								
Test 4LMF (given 2016-17)	Mean*	2016		2017		2018			
		Score	Percentile	Score	Percentile	Score	Percentile		
Total Score	145.8	163	97%	163	97%	158	90%		
Programming & SE	53%	65%	92%	65%	92%	63%	88%		
Discrete Structures and Algorithms	43%	61%	97%	59%	97%	53%	87%		
Systems (Architecture, OS, DB, Networking	43%	60%	98%	60%	98%	51%	85%		
#students	8382	12		4		10			
	*Mean is based on 184 institutions								

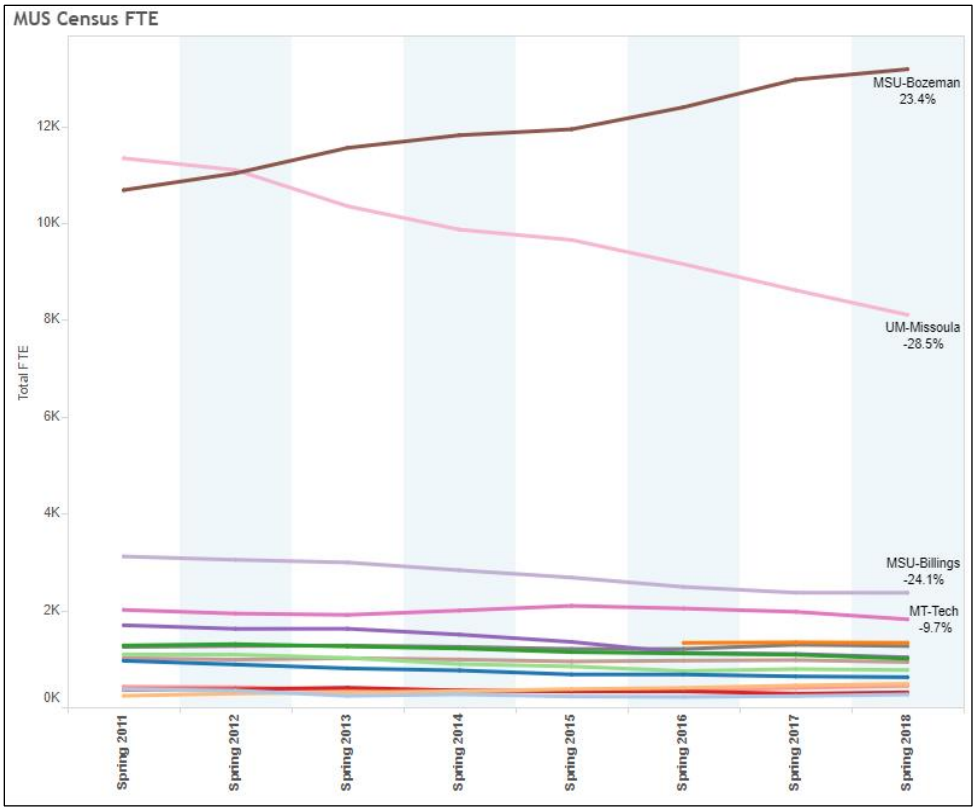
Outreach Coordination Update (Brent Donoven)

	2015	2016	2017	2018
CS Dept New Freshman	27	27	28	41
CodeMT Scholarships		3	4	11
CS Dept Total Enrollment	72	65	73	77
Percent Change in Enrollment		-11%	11%	5%
North Campus Undergraduate Total	1920	1817	1659	
North Campus Graduate Total	210	215	250	
South Campus Undergraduate Total	850	777	769	
Montana Tech Total	2980	2809	2678	
		-6%	-5%	

MT Resident Enrollment Since 2011



MT Resident and Non-Resident Enrollment Since 2011



Verification and Validation (Frank Ackerman)

Background

- A few years ago our SE ABET auditors encouraged us to add a V&V component to our curriculum.
- We created a course, ESOF 411 that has tried to address the IEEE definition of V&V:

IEEE Definition of V&V

- The process of determining whether:
  - the requirements for a system or component are complete and correct,
  - the products of each development phase fulfill the requirements or conditions imposed by the previous phase,
  - and the final system or component complies with specified requirements

Problems With This Approach

- The process of determining whether:
  - Need to have a <u>stable</u>, good size, but relatively simple application that uses technology our students (and the instructor) are familiar with
- The application should be of some intrinsic interest to our students
  - We've talked about how we might do this at previous IAB meetings, but so far I have not been successful.

Experience With This Approach

- Several course offerings
- Each trying different approaches using different projects
- I recommend that going forward we use a different approach

Recommendation for refocusing our V&V efforts

- Have the V&V course concentrate on static analysis and testing, especially unit testing and test driven development.
- Have our other two focused SE courses, Requirements and Design incorporate V&V concepts and techniques for those areas

Rationale for refocusing our V&V efforts

- Both static analysis and unit testing can be taught using relatively small components
- There is a lot of instructional material that is applicable to these two areas
- Covering these two areas well will take a full semester

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- Consider using an application that is already on campus – do continuous improvements
- I have used AbOut for this purpose, V&V doesn't change anything, just identifies problems
- As changes are made, you need to revalidate the software again
- We need to do unit testing, this is the only course where it is tested
- Unit testing should be done with an existing software application
- Why is it difficult to get a stable good size problem; use code from surf projects for this

Campus Collaborations (Phillip Curtiss)

Motivations for Collaborations

- May 7, 2018 – Board of Regents approves Montana Tech as a Special Focus Four-Year University: STEM +HEALTH
- January 24, 2018 – Program Prioritization Committee (PPC) Formed
  - Mission: Align programs with University focus in as efficient a manner as possible.
  - Develop Metrics: Soft/Hard by which programs will be measured.
  - Models to Follow: Delaware Study and Oregon Institute of Technology
  - Fundraising Metric: $35,804.22 total given 1yr (10/25 programs)
  - 1st Performance Metric:
    - Salaries, Benefits, Personnel Costs (Instructional Expense Metrics)
    - Student Credit Hours converted into FTEs for Comparison with Expenses (Delaware Study)
    - March 28, 2018: Composite Matrix – CS Dept scored #30 out of 30
    - Possible outcomes: Combining Programs; Canceling Low-Enrollment Courses
- January 24, 2018 – Program Prioritization Committee (PPC) Formed
  - 2nd Performance Metric: 5 Yr Average of Department Summaries of Proficiency (2012-2016) – ETS Data
    - Critical Thinking: #1 22 - CSD 27% - Avg 15% [CSD N = 53; TECH N = 1740]
    - Writing: #7 / 22 - CSD 15% - Avg 11% [CSD N = 53; TECH N = 1740]
    - Math: #1 / 22 – CSD 68% - Avg 38% [CSD N = 53; TECH N = 1740]
    - Composite: #1 / 22 – CSD 36% - Avg 21% [CSD N = 53; TECH N = 1740]
  - 2nd Performance Metric: 5 Yr Average of Department Summaries of Proficiency (2012-2016) – ETS Data
    - 3 yr Average Awarded (Degrees and Certificates) compared to AY Student FTE per Instructional FTE
    - Possible Outcomes: Discontinued Options for certain programs
- Program Prioritization Committee (PPC) Upcoming Milestones
  - 9/26/2018 – Deans will share with the committee a recommendation of which metrics will be applied in their prioritization process
  - Prior to the end of F18: PPC will make recommendations to the Chancellor
  - Campus trying to obtain Kansas Data Set to form alternate study to the Delaware study.
- Faculty Composition:
  - Spring 2017 (end): lost faculty member Brian Koontz
    - Failed search for Brian Koontz's replacement – due to budget delay, then timing

        - Hopeful to obtain authorization for search Fall 2018
    - Fall 2018 (end): retiring faculty member Frank Ackerman
        - PRA authorized for to search for his replacement
- Induced Overload by Approved Programs coming on-line:
    - Data Science Program
        - Courses began being offered in Fall 2017
    - Computation Science and Engineering Graduate Certificate
        - Courses began being offered in Fall 2018

Motivations for Collaborations – Instructional

- Data Science Program
    - Jointly Offered with Statistics Department – (7 students)
    - STAT 453 – Statistical Learning & Data Science I (F18)
        - Four (4) Data Science Students Enrolled; One (1) Student in CS/Math/Stat; One (1) Student in Geophysics; One (1) Student in Mathematics
    - CSCI 347 – Data Mining (F18)
        - Retired Petroleum Engineering Professor taking course; interested in learning techniques to apply to data from the Bakken Oil Fields
    - Developing a Data Science Minor for Petroleum Engineering Program
- Computational Science and Engineering
    - CSCI477/577 - Computational Modeling and Simulation (F18)
        - 477: Petroleum Engineering (x1); Data Science (x1); Geophysics (x1); Mathematics (x1)
          577: Petroleum Engineering MS (x1); Material Science PhD (x2);
          Electrical Engineering MS (x1)
        - Focus: explore DEDS and CTDS using Python to build software implementing a computation model that can simulate dynamic behavior from domain specific problems
        - First Graduate-level Course Offering with four (4) undergraduates and four (4) graduate students; one of which is remove from University of Missoula

Campus Collaborations – Research

- Summer Undergraduate Research Fellowship (SURF)
    - Digital Signage – CS/SE;PTC; PSYX; external entities (SM, WMM, BPA)
        - Summer 2017 – Funded by SURF Program; Semantic Network driving Digital Signage
        - Spring 2018 - Used as Case Study in S18 ESOF 328 Requirements and Specifications
        - Summer 2018 – Funded by Science Mine; Distributed Content Element Library; Renderer; Model Editor
        - Fall 2018 – Graduate Research Assistant (GRA) position funded by Science Mine; Develop User Interface for Digital Signage System with difficult requirements
        - Future – GRA with Scott Riser (Psychology) funded by IMLS Grant; Develop evaluation framework for analysis of semantic network traversals
- Summer Undergraduate Research Fellowship (SURF)
    - Open Architecture Medical Devices – CS; HCI; Nursing; external Organ Talk
        - Summer 2018 – Funded by SURF Program; Use Open Standards to move medical data from Medical Device to EHR database
            - Open Hardware (Raspberry PI); Open Software (HTTP/REST/MongoDB);
              Open Representations (FHIR); Medical Device Hardware (Welch Allyn Atlas 9k)
            - Medical Mannequin Simulated Use Case; Atlas monitor collected EKG data; moved through framework and into DB; Simulated EKG data graphed and compared to Atlas strip chart
        - Fall 2018 – OrganTalk Company Formed; Secured Business Accelerator Position at the new Praxis Center for Rural Healthcare Medical Simulation and Training

        - Further Research must be done in this area – engaging with BIT folks for business modeling
- Secure the Bulk Electrical Network
    - Department of Electrical Engineering – Matt Donnelly; Kevin Negus
        - Using a block-chain model with a modified composite keying strategy
        - Enhance automated decision making using a system view of the BE Network
        - Possible custom field-programmable gate array hardware for extremely rapid processing decision networks
        - Using the BE network (>400kva) as the network medium – custom hardware
    - Seeking funding through NSF
    - Partner, Idaho National Labs for prototype testing
    - Health Sciences (Highlands) – Ryan Mulcahy
    - Nursing Program – Megan Rediske
    - Liberal Studies – Scott Risser
        - Igloo Vision Dome Environment for Model-Driven Scenario-Based Training of Mental Health Professionals – Recognize the Signs and Symptoms
        - Scaled Down Immersive Environment via OR for in-clinic use
        - Therapeutic Activities (CBT) using Immersive Training Environments
    - Seeking funding through State-Wide Suicide Prevention Task Force
    - Partner, Praxis Center for Rural Healthcare Medical Simulation and Training

Essential Intent: Our Goals & Objectives

- Since last year's meeting
    - "People who don't have goals work for people who do" – Thank you Justin Malsam
    - Weekly meetings and emails
        - Vision
        - Mission
        - Goals
        - Objectives
        - Mapping between goals & objectives
        - Possible actions
- **Vision**
  The atmosphere in our department is vibrant with the faculty and students engaged and empowered to pursue projects and innovative ideas, working individually and together. We combine theoretical and hands-on education for rigorous skill development with a solid foundation in fundamentals, supporting continuous learning. We welcome diversity in both students and faculty and have the most desirable program in the science and engineering of software and data.
- **Mission**
  Provide our students with an educational experience in the science and engineering of software and data that will equip them to pursue satisfying careers.
- **Overall Goals**
    - Create an educational environment that welcomes diversity and promotes acceptance, compromise and collaboration within and between all our constituents.
    - Assess and revise our programs and processes to assure we achieve continuous improvement such that we continue to meet the changing needs of all our constituents.
    - Provide computer science education, expertise and project collaboration to the institution, and the local and extended community.
    - Be identified as a valued resource by the institution and the community.

- **Goals to our Students**
    - Create an educational environment that fosters creative thinking, innovative ideas, and problem solving through collaboration and teamwork.
    - Provide fundamental courses in computer programming, computer systems, computer science, software engineering and data science to students in our programs and to Montana Tech students in other programs.
    - Provide scholarships and work opportunities that enable our students to realize their educational objectives.
    - Equip our graduate school-bound students with broad problem-solving abilities and the ability to pursue research and add to the knowledge of the field.
    - Equip our industry-bound graduates with broad problem-solving abilities and the ability to engineer effective and robust products such that they are strong workplace contributors from the start.
    - Provide an environment that encourages student participation in research.
- **Goals to Industry**
    - Provide strong graduates who are workplace contributors from the start.
    - Provide graduates with excellent education in the knowledge areas needed by their future employers.
- **Goals to Faculty**
    - Provide an environment where our faculty can grow professionally and explore research interests.
    - Provide a workplace that is efficient in operations and fair in work distribution.
    - Recognize and reward excellence.

- **Goals to the Institution**
    - Honor Montana Tech's departmental guidelines and obligations, and pursue departmental growth and excellence.
    - Operate in an efficient and effective manner both financially and productively.
- **Objectives**
    - Increase enrollment
    - Increase retention
    - Promote multidisciplinary teamwork
    - Increase student contact hours
    - Assure robustness, security, reliability and redundancy of our hardware and software assets
    - Pursue external funding of REAL Scholarship
    - Maintain ABET accreditation
    - Maintain high placement rates
    - …. many more

- **Mapped Objectives to Goals**

		Objectives								
Number	Goal	Develop a graduate program	Increase enrollment	Increase retention	Promote multidisciplinary teamwork	Increase student contact hours	Maintain robustness, security, reliability and redundancy of our hardware and software assets.	Pursue external partnership and funding	Provide physical spaces that are conducive to student learning	Continue to stay curr industry processes a standards
1.3	Provide computer science education, expertise and project collaboration to the institution, and the local and extended community.	X			X	X		X		
1.4	Be identified as a valued resource by the institution and the community.	X			X			X	X	
2	To our students:									
2.1	Create an educational environment that fosters creative thinking, innovative ideas, and problem solving through collaboration and teamwork.	X	X	X	X		X		X	
2.2	Provide fundamental courses in computer programming, computer systems, computer science, software engineering and data science to students in our programs and to Montana Tech students in other programs.					X				
2.3	Provide scholarships and work opportunities that enable our students to realize their educational objectives.	X						X		
2.4	Equip our graduate school-bound students with broad problem-solving abilities and the ability to pursue research and add to the knowledge of	X			X			X		X
2.5	Equip our industry-bound graduates with broad problem-solving abilities and the ability to engineer effective and robust products such that they are strong workplace contributors from the start.	X			X			X		X
2.6	Provide an environment that encourages student participation in research.	X						X	X	
3	To industry:									
3.1	Provide strong graduates who are workplace contributors from the start.	X			X			X		X
3.2	Provide graduates with excellent education in the knowledge areas needed by their future employers.	X			X			X		X
4	To our faculty:									
4.1	Provide an environment where our faculty can grow professionally and explore research interests.	X					X	X		
4.2	Provide a workplace that is efficient in									

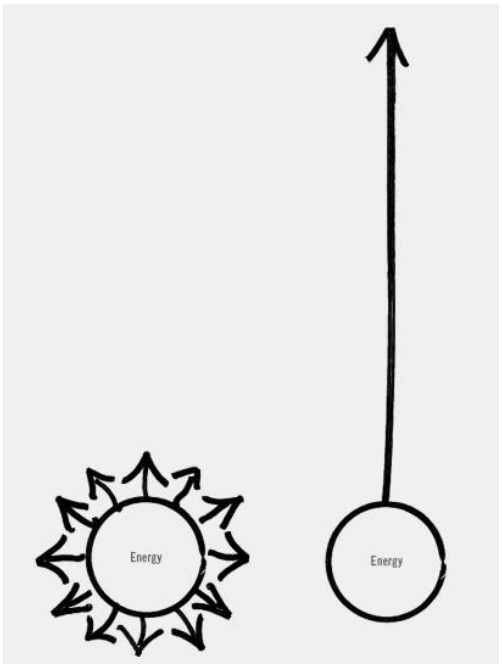
- **Possible Actions**

		Objectives								
Number	Goal	Develop a graduate program	Increase enrollment	Increase retention	Promote multidisciplinary teamwork	Increase student contact hours	Maintain robustness, security, reliability and redundancy of our hardware and software assets.	Pursue external partnership and funding	Provide physical spaces that are conducive to student learning	Continue to stay curr industry processes a standards
1.3	Provide computer science education, expertise and project collaboration to the institution, and the local and extended community.	X			X	X		X		
1.4	Be identified as a valued resource by the institution and the community.	X			X			X	X	
2	To our students:									
2.1	Create an educational environment that fosters creative thinking, innovative ideas, and problem solving through collaboration and teamwork.	X	X	X	X		X		X	
2.2	Provide fundamental courses in computer programming, computer systems, computer science, software engineering and data science to students in our programs and to Montana Tech students in other programs.					X				
2.3	Provide scholarships and work opportunities that enable our students to realize their educational objectives.	X						X		
2.4	Equip our graduate school-bound students with broad problem-solving abilities and the ability to pursue research and add to the knowledge of	X			X			X		X
2.5	Equip our industry-bound graduates with broad problem-solving abilities and the ability to engineer effective and robust products such that they are strong workplace contributors from the start.	X			X			X		X
2.6	Provide an environment that encourages student participation in research.	X						X	X	
3	To industry:									
3.1	Provide strong graduates who are workplace contributors from the start.	X			X			X		X
3.2	Provide graduates with excellent education in the knowledge areas needed by their future employers.	X			X			X		X
4	To our faculty:									
4.1	Provide an environment where our faculty can grow professionally and explore research interests.	X					X	X		
4.2	Provide a workplace that is efficient in									

Essentialist

In both images the same amount of effort is exerted.

On the right, energy is invested to create a satisfying experience of making significant progress in the thing that matter most.



Essentialism: The Disciplined Pursuit of Less by Greg McKeown

- **Essential Intent**

	general	**concrete**
inspirational	Vision/Mission	Essential Intent Makes one decision that eliminates 1,000 later decisions
bland	Values	Quarterly Objectives

general **concrete**

	general	**concrete**
inspirational	Vibrant, engaged, empowered innovative ideas, rigorous skill development. Welcome diversity, have the most desirable program (vision)	
bland	~Educational experience equip students to pursue satisfying careers (mission)	• Graduate program • Increase enrollment • Increase retention • Promote multidisciplinary teamwork • Increase stud. contact hours • Maintain robustness of hardware & software assets

Inspirational	Vibrant, engaged, empowered innovative ideas, rigorous skill development Welcome diversity, have the most desirable program (vision**)**	• **Increase # of students retained** • **Create a graduate program** • **Create a buddy system between freshmen and upper classmen** • **Where is an opportunity to increase our number of graduates** • **Collect data** • **Make a CS requirement in all engineering programs**
bland	~Educational experience equip students to pursue satisfying careers (mission)	• Graduate program • Increase enrollment • Increase retention • Promote multidisciplinary teamwork • Increase stud. contact hours • Maintain robustness of hardware & software assets

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- Important to get the right student in the door; do things to keep them there
- Program is going in the right direction
- ACM has stepped up to help mentor students
- Adapt practical applications to more of what the students want
- Identify what students know about Tech
- Students that want to get into the program, end up realizing they can't make it
- Students find themselves in the program and realize they don't like it
- Do they get scared or do they really not like it?
- Faculty could interface with students who are interested in the program before they enter the program
- What is Tech's boarding package for students? What do they get? What do they expect?
- Tag students who complete CodeMontana
- Students entering are not math ready, do not qualify for the program
- If student are math deficient – we lose them

- Students lack certain skills:
    - Essential ideas
    - Listen and focus

    - Take good notes
- Can't these skills be taught in Freshmen Seminar?
- Students may make it with the right mentoring
- Focus on the retention number not the per cent
- Identify struggling students early, pair them up with a mentor
- Need concrete steps to get the right people into the program
- Concern – faculty is just trying to stay afloat, how do you get faculty excited again?
- Set goals for faculty
- Progress towards grad program. Program would have grad students to ease instructional problem. This would be huge step of easing instructional efforts
- Start a buddy system for students
- Teach more of other majors. Engineering wants our grads to work with their grad students (this may already be a reality).
- Working with other degree departments makes sense – you may get students from these programs
- If we didn't have so many road blocks, we could be more successful
- There has been more stability in the CS program with faculty – this is a plus
- Money talks – support the R.E.A.L Scholarship
- Department is doing amazing work, I encourage you to work on a level of ideas to increase the graduation rate
- Talk about what gets faculty excited!

Industry Input - IAB Members

Justin Malsam, Micron

- **Where/what would you recommend we cut?**
    - Curriculum is solid
- **Homework: Charitable Arm**
    - Micron Foundation – send information and Justin will take it to the foundation
- **Skills for New hires:**
    - Data Science – moving towards the right foundation

Greg Waring, Energy Laboratories, Inc.

- **Where/what would you recommend we cut?**
    - Would not touch curriculum. Hit the administration with the facts. Curriculum cuts are non-negotiable; required by accreditation. Ask administration to provide you with an alternative.
- **Homework: Charitable Arm**
    - N/A
- **Skills for New hires:**
    - Software as a service is continuing to drive – integration of existing software systems

Kamie Garner, Zoot Enterprises, Inc.

- **Where/what would you recommend we cut?**
    - Would not touch the curriculum
- **Homework: Charitable Arm**
    - Internship program – worked with interns from MSU and Tech. Very impressed with interns from Tech, offered to keep them on. Will provide contact information for Human Resources.
- **Skills for New hires:**
    - SAS, interested in cybersecurity

Bill Ivanich, EchoStar

- **Where/what would you recommend we cut?**
  - N/A
- **Homework: Charitable, Arm**
  - Dish has a budget for recruiting efforts at MT Tech. Budget isn't used every year but will provide it for MT Tech purposes if not used.
- **Skills for New hires:**
  - Transition period, wireless Internet of Things (IoT). Embedded systems becoming really important, still a C language show, but are investigating other languages, such as Go; backend services are also desirable; test-driven development is important; and soft skills are important as well.

Davis Almanza, Computers Unlimited

- **Where/what would you recommend we cut?**
  - Would not touch curriculum. Would suggest prioritizing areas you wish to focus on
- **Homework: Charitable, Arm**
  - Most of the charity is local to our community, don't really have a charitable arm
- **Skills for New hires:**
  - Cybersecurity, mobile applications cross-platform, analytics

Haythem Memmi, Adobe

- **Where/what would you recommend we cut?**
  - Difficult to imagine cutting anything from the curriculum. Try to increase students, maybe offer incentive to existing students to recruit with scholarships; market to other institutions. Use the programming contest to handout information about MT Tech.
- **Homework: Charitable, Arm**
  - Adobe has a foundation – will forward information to department
- **Skills for New hires:**
  - Software Engineers who have a basic knowledge of machine learning and AI

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- Can the program drop Assembly Language? (*No, important*)

Discuss and Wrap-up

- Department is on the right path, you are doing good work, keep it up.

Meeting adjourned.

Respectfully submitted,

Tami Windham