Campus Curricula Committee Meeting Agenda
October 31, 2017
8:30am - 10:00am, 106 Parker Hall
(For Faculty Senate Meeting of November 9, 2017)

Review of submitted Course Change forms:

File: 2327.1	BUS 5115: Introduction to Individual and Group Dynamics in Business
File: 4470	BUS 5730: Machine Learning and Artificial Intelligence for Business
File: 2160.7	CER ENG 3220: Phase Equilibria
File: 1195.1	CER ENG 3325: Ceramic Processing Lab II
File: 1659.1	CER ENG 4250: Thermal Properties Of Ceramics
File: 716.3	COMP ENG 5170: Real-Time Systems
File: 4375	COMP SCI 5602: Introduction to Cryptography
File: 912.1	ECON 4300: Research Methods and Applications in Economics and Business
File: 565.1	ERP 5410: Use of Business Intelligence
File: 2561.4	GEOLOGY 4010: Seminar
File: 779.1	GEOLOGY 5010: Seminar
File: 152.1	GEOLOGY 6511: Advanced Petroleum Geology
File: 1775.1	GEOPHYS 5010: Seminar
File: 791.1	GEOPHYS 6251: Geophysical Inverse Theory
File: 4478	IS&T 4444: Introduction to Data Warehouses
File: 2339.1	IS&T 5423: Foundations of Data Management
File: 4407.2	IS&T 5520: Data Science and Machine Learning with Python
File: 4471	IS&T 5535: Machine Learning Algorithms and Applications
File: 28.1	IS&T 6444: Essentials of Data Warehouses

Review of submitted Degree Change forms:

File: 146.19	BIO SC-BA: Biological Sciences BA
File: 123.3	PRE-MED-MI: Pre-Medicine Minor
File: 253	PROPOSED: Minor in Artificial Intelligence and Machine Learning in Business

Review of submitted Experimental Course forms:

File: 4485	GEOLOGY 5001.001: Petroleum Geochemistry
File: 4481	MS&E 5001.002: Molecular Engineering and Soft Nanomaterials
File: 4482	MS&E 6001.002: Advanced Molecular Engineering and Soft Nanomaterials
File: 4480	SPANISH 3001.002: Spanish Translation for Technical Applications

Review of tabled items:

File: 942.1	ARCH ENG 4800: Principles of HVAC I

File: 2069.5	ARCH ENG 4820: Building Lighting Systems
File: 4219.5	ARCH ENG 4850: Building Electrical Systems
File: 4440	CHEM ENG 4001.001: Introduction to Phase Equilibrium
File: 249	PROPOSED: Master of Science in Explosives Technology

Course Change Request

Date Submitted: 08/23/17 8:33 am

Viewing: **BUS 5115 : Introduction to Individual ~~Teambuilding~~ and Group Dynamics ~~Leadership~~ in Business ~~Settings~~**

File: 2327.1

Last edit: 08/23/17 8:33 am

Changes proposed by: barryf

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Business and Information Technology
Discipline	Business (BUS)
Course Number	5115
Title	

In Workflow

1. **RBUSADMN Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 08/24/17 12:37 pm
   siauk: Approved for RBUSADMN Chair
2. 08/24/17 4:01 pm
   Brittany Parnell (ershenb):

Approved for CCC Secretary

3. 09/20/17 4:15 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 1:17 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Introduction to Individual ~~Teambuilding~~ and **Group Dynamics** ~~Leadership~~ in Business ~~Settings~~

Abbreviated Course Title	**Indiv and Group Dynamics**
	~~Teambuilding in Business~~

Catalog Description

This course **will cover contemporary theories of business** ~~covers~~ leadership **styles** ~~styles, principles, models, issues,~~ and **group dynamics.** ~~applications through analytical and intellectual examination.~~ **Leadership theories, group dysfunction/function, positive group interactions, change impacts, the importance of business ethics as well as the role of gender and culture on the group will be examined.** ~~Key components of teams are introduced, with opportunities to practice and develop both leadership and teambuilding skills.Case studies required.~~

Prerequisites

Field Trip Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0
Required for Majors	No			
Elective for Majors	No			

Justification for change:

Update course to use more current terminology and explicitly mention ethics as well as the role of gender and culture in description.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 2327

Preview Bridge

Course Change Request

New Course Proposal

Date Submitted: 09/20/17 1:56 pm

Viewing: **BUS 5730 : Machine Learning and Artificial Intelligence for Business**

File: 4470

Last edit: 09/20/17 1:56 pm

Changes proposed by: barryf

Requested Effective Change Date	01/09/2018
Department	Business and Information Technology
Discipline	Business (BUS)
Course Number	5730
Title	

In Workflow

1. **RBUSADMN Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/21/17 5:27 pm siauk: Approved for RBUSADMN Chair
2. 09/22/17 10:14 am Brittany Parnell (ershenb):

Approved for CCC Secretary

3. 09/22/17 5:28 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 1:19 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Machine Learning and Artificial Intelligence for Business

Abbreviated Course Title: Mach Learning AI for BUS

Catalog Description:

Explores various approaches to machine learning and artificial intelligence, along with their numerous applications in business. Describes some of the many technological approaches to business problems that are considered part of machine learning and artificial intelligence, such as neural networks and deep learning.

Prerequisites:

IS&T 1552 or Comp Sci 1510; or Graduate Standing, understanding of management information systems, programming knowledge.

Field Trip Statement:

Credit Hours: LEC: 3 LAB: 0 IND: 0 RSD: 0 Total: 3

Required for: No

Majors	
Elective for Majors	Yes

Justification for new course:

Required for proposed new Graduate Certificate in AI, Machine Learning, and Automation in Business.

Also for proposed new Minor in Aritificial Intelligence and Machine Learning in Business.

Semesters previously offered as an experimental course

None

Co-Listed Courses:

Course Reviewer Comments

Key: 4470

Preview Bridge

Course Change Request

Date Submitted: 09/08/17 3:00 pm

Viewing: CER ENG 3220 : Phase Equilibria

File: 2160.7

Last approved: 10/21/16 2:24 pm

Last edit: 09/20/17 8:48 am

Changes proposed by: smiller

Programs referencing this course

CR ENG-BS: Ceramic Engineering BS

Requested Effective Change Date	**Fall 2018** ~~Spring 2017~~
Department	Materials Science & Engineering
Discipline	Ceramic Engineering (CER ENG)
Course Number	3220
Title	

In Workflow

1. **RMATSENG Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/08/17 9:32 pm Greg Hilmas (ghilmas): Approved for RMATSENG Chair
2. 09/11/17 10:02 am Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 09/20/17 8:48 am sraper: Approved for Engineering DSCC Chair
4. 10/12/17 1:19 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Oct 21, 2016 by smiller (2160.1)

Phase Equilibria

Abbreviated Course Title: Phase Equilibria

Catalog Description:
The study of unary, binary and ternary inorganic, phase equilibrium systems with examples for solving practical engineering problems.

Prerequisites:
A ~~"C" or better~~ grade **of "C" or better** in **Cer** ~~Chem 1320 or Met~~ Eng **3230.** ~~1210.~~

Field Trip Statement:

Credit Hours: LEC: 3 LAB: 0 IND: 0 RSD: 0
Total: 3

Required for: Yes

Majors	
Elective for Majors	No

Justification for change:

previous prerequisite (Met 1210) deactivated. Prefer thermodynamics (Cer 3230) as prerequisite knowledge.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

sraper (09/20/17 8:48 am): Changed Effective Date per S. Miller.

Key: 2160

Preview Bridge

Course Change Request

Date Submitted: 09/08/17 3:05 pm

Viewing: **CER ENG 3325 : Ceramic Processing Lab II**

File: 1195.1

Last edit: 09/15/17 12:27 pm

Changes proposed by: smiller

Programs referencing this course

CR ENG-BS: Ceramic Engineering BS

Requested Effective Change Date	Fall **2018** ~~2014~~
Department	Materials Science & Engineering
Discipline	Ceramic Engineering (CER ENG)
Course Number	3325
Title	

In Workflow

1. **RMATSENG Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/08/17 9:33 pm Greg Hilmas (ghilmas): Approved for RMATSENG Chair
2. 09/11/17 10:10 am Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 09/20/17 8:49 am sraper: Approved for Engineering DSCC Chair
4. 10/12/17 1:20 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Ceramic Processing Lab II

Abbreviated Course Title	Ceramic Process Lab II

Catalog Description

The second half of a two-semester sequence that gives students practical knowledge of the methods and techniques used in the fabrication of ceramics.

Prerequisites

A ~~"C" or better~~ grade **of "C" or better** in Cer Eng **2325.** ~~3315.~~

Field Trip Statement

Credit Hours Total: 2	LEC: **1** ~~0~~	LAB: **1** ~~2~~	IND: 0	RSD: 0
Required for Majors	**Yes** ~~No~~			
Elective for Majors	No			

Justification for change:

Change to 1 hr LEC and 1 hr LAB allows for a common 50 minute lecture time at the beginning of each week, and then three sections of lab on T, W, and Th, due to limited space and equipment in the lab.

Change prerequisite to allow out of sequence students to proceed through the curriculum.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

kristyg (09/08/17 3:03 pm): Rollback: Rollback per Scott Miller.

sraper (09/13/17 4:04 pm): changed to required for majors.

sraper (09/15/17 12:27 pm): changed effective date to FS 2018

Key: 1195

Preview Bridge

Course Change Request

Date Submitted: 09/08/17 3:07 pm

Viewing: CER ENG 4250 : Thermal Properties Of Ceramics

File: 1659.1

Last edit: 09/15/17 12:27 pm

Changes proposed by: smiller

Programs referencing this course

CR ENG-BS: Ceramic Engineering BS

Requested Effective Change Date	Fall **2018** ~~2014~~
Department	Materials Science & Engineering
Discipline	Ceramic Engineering (CER ENG)
Course Number	4250
Title	

In Workflow

1. **RMATSENG Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/08/17 9:33 pm Greg Hilmas (ghilmas): Approved for RMATSENG Chair
2. 09/11/17 10:19 am Brittany Parnell (ershenb):

Approved for CCC Secretary

3. 09/20/17 8:45 am sraper: Approved for Engineering DSCC Chair
4. 10/12/17 1:20 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Thermal Properties Of Ceramics

Abbreviated Course Title	Thermal Prop Of Cer

Catalog Description

This course will teach the crystal physics underlying heat capacity, internal energy, phonon and photon conduction, and thermal expansion. These properties will be used to rationalize the behavior of a wide variety of ceramic materials in severe thermal environments.

Prerequisites

A grade of "C" or better in Cer Eng 3220. ~~Senior Standing.~~

Field Trip Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0
Required for Majors	**Yes** ~~No~~			
Elective for	No			

Majors

Justification for change:

Revise prerequisite to assure that students have the knowledge to succeed in the course.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

ershenb (09/11/17 10:19 am): updated Effective Change Date to Spring 2018.

sraper (09/13/17 4:07 pm): Changed to required for majors.

sraper (09/15/17 12:27 pm): Changed effective date to FS 2018

Key: 1659

Preview Bridge

Course Change Request

Date Submitted: 09/14/17 12:12 pm

Viewing: **COMP ENG 5170 : Real-Time Systems**

File: 716.3

Last approved: 06/30/14 3:55 am

Last edit: 10/12/17 1:32 pm

Changes proposed by: stanleyj

Programs referencing this course

CP ENG-BS: Computer Engineering BS

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Electrical and Computer Engineering
Discipline	Computer Engineering (COMP ENG)
Course Number	5170
Title	

In Workflow

1. **RELECENG Chair**
2. **CCC Secretary**
3. **RCOMPSCI Chair**
4. **Engineering DSCC Chair**
5. **Pending CCC Agenda post**
6. **CCC Meeting Agenda**
7. Campus Curricula Committee Chair
8. FS Meeting Agenda
9. Faculty Senate Chair
10. Registrar
11. CAT entry
12. Peoplesoft

Approval Path

1. 09/14/17 8:24 pm
   Daryl Beetner (daryl): Approved for RELECENG Chair
2. 09/15/17 10:42 am
   Brittany Parnell

(ershenb): Approved for CCC Secretary
3. 09/15/17 11:17 am George Markowsky (markowskyg): Approved for RCOMPSCI Chair
4. 09/20/17 8:46 am sraper: Approved for Engineering DSCC Chair
5. 10/12/17 2:12 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Jun 30, 2014 by lahne (716.1)

Real-Time Systems

Abbreviated Course Title: Real-Time Systems

Catalog Description

Introduction to real-time (R-T) systems and R-T kernels, also known as R-T operating systems, with an emphasis on scheduling algorithms. The course also includes specification, analysis, design and validation techniques for R-T systems. Course includes a team project to design an appropriate R-T operating system.

Prerequisites

COMP ENG 3150 or COMP SCI 3800.

Field Trip Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
Total: 3				
Required for Majors	No			
Elective for Majors	**Yes** ~~No~~			

Justification for change:

The material in the existing course Comp Eng 5170 is on the boundary between Computer Engineering and Computer Science. The ECE and CS departments would like to alternate their instructors teaching this course. The request to co-list Comp Eng 5170 with the new Comp Sci 5205 course will facilitate Computer Engineering and Computer Science students being able to count this course towards their degree programs. The request is to co-list the permanent course Comp Eng 5170 with a new course Comp Sci 5205.

Co-listed with Comp Sci 5205.

Semesters previously offered as an experimental course

Co-Listed Courses:

COMP SCI 5205 - Course Not Found

Course Reviewer

Comments

Key: 716

Preview Bridge

Course Change Request

New Course Proposal

Date Submitted: 09/13/17 4:46 pm

Viewing: **COMP SCI 5602 : Introduction to Cryptography**

File: 4375

Last edit: 10/12/17 2:13 pm

Changes proposed by: tauritzd

Requested Effective Change Date	01/09/2018
Department	Computer Science
Discipline	Computer Science (COMP SCI)
Course Number	5602
Title	

In Workflow

1. RCOMPSCI Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/14/17 9:38 am Brittany Parnell (ershenb): Approved for RCOMPSCI Chair
2. 09/14/17 9:39 am Brittany Parnell (ershenb): Rollback to

RCOMPSCI Chair for CCC Secretary
3. 09/14/17 9:59 am George Markowsky (markowskyg): Approved for RCOMPSCI Chair
4. 09/14/17 10:14 am Brittany Parnell (ershenb): Approved for CCC Secretary
5. 09/20/17 8:46 am sraper: Approved for Engineering DSCC Chair
6. 10/12/17 2:14 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Introduction to Cryptography

Abbreviated Course Title	Intro to Cryptography

Catalog Description

Introduces fundamentals of modern cryptography. Topics include basic number theory, public & private key encryption schemes, cryptographic hash functions, message authentication codes, elliptic curve cryptography, Diffie-Hellman key agreements, digital signatures, PUFs, quantum cryptography, and generation of

prime numbers and pseudo-random sequences.

Prerequisites

A grade of "C" or better in COMP SCI 5200 or a grade of "B" or better in COMP SCI 2500.

Field Trip Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0
Required for Majors	No			
Elective for Majors	Yes			

Justification for new course:

This course covers material which is critical to cyber security, one of the CS department's up and coming focus areas. It is also very popular with the students, evidenced by an enrollment of forty in FS2016, which is highly unusual for a 6000 level course in the CS department.

Based on the instructor's experience teaching this course and the recognition that cryptography needs to be a foundational course for graduate students specializing in cyber security, we are requesting a change to 5000-level (in its experimental form it was offered at the 6000-level).

Semesters previously offered as an experimental course

Offered as COMP SCI 6001 - Cryptography in FS2016 and as COMP SCI 401 - Cryptography in FS2013.

Co-Listed Courses:

Course Reviewer

Comments

ershenb (09/13/17 3:20 pm): Rollback: Rollback so Dr. Markowsky can access the form.

ershenb (09/14/17 9:39 am): Rollback: edited email address for user workflow and rolling back again so Dr. Markowsky can access the form.

Key: 4375

Preview Bridge

Course Change Request

Date Submitted: 10/06/17 8:30 am

Viewing: **ECON 4300 ~~2300~~ : Research Methods ~~Economic~~ and ~~Business~~ Applications in Economics and Business**

File: 912.1

Last edit: 10/06/17 4:21 pm

Changes proposed by: ershenb

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Economics
Discipline	Economics (ECON)
Course Number	**4300** ~~2300~~
Title	

In Workflow

1. **RECONOMI Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 10/06/17 3:59 pm Gregory Gelles (gelles): Approved for RECONOMI Chair
2. 10/06/17 4:21 pm Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 10/06/17 10:08 pm
Barry Flachsbart (barryf):
Approved for Social Sciences DSCC Chair
4. 10/12/17 2:16 pm
Brittany Parnell (ershenb):
Approved for Pending CCC Agenda post

Research Methods ~~Economic~~ and ~~Business~~ Applications **in Economics and Business**

Abbreviated Course Title	**Res Mth** ~~Econ~~ & **Ecn** Bus **App** ~~Applications~~

Catalog Description

Introduction ~~and application~~ of basic econometric and statistical techniques **with empirical illustrations that reference** ~~to solve~~ real **economic and** business **issues.** ~~and economics problems.~~ **Students will be introduced to modern statistical software packages (STATA, R), but also work with productivity software (Excel, PowerPoint) to perform quantitative analysis and present their results.** ~~Practical, hands-on use of Excel and SPSS will be introduced in the course.~~

Prerequisites

Econ 1100 or **Econ** 1200; Math 1140 or higher; Stat 1115 or **Stat** 3111 or **Stat** 3113 or **Stat** 3115 or **Stat** 3117 or **Stat** 5643.

Field Trip Statement

Credit Hours Total: 3	LEC: 2	LAB: 1	IND: 0	RSD: 0
Required for Majors	**Yes** ~~No~~			
Elective for Majors	No			

Justification for change:

This is an upper-level applied quantitative methods course and the number upgrade better reflects the course content. The current title is too vague given the course content (applied quantitative methods) and the proposed title conveys that content more accurately. The modified course description includes the more modern, dedicated statistical packages currently used in the class.

Semesters previously offered as an experimental course

n/a

Co-Listed Courses:

Course Reviewer Comments

ershenb (10/06/17 4:21 pm): The form had CourseLeaf technical issues so it is correctly going through the workflow approval cycle again.

Key: 912

Preview Bridge

Course Change Request

Date Submitted: 09/21/17 1:26 pm

Viewing: **ERP 5410 : Use of Business Intelligence**

File: 565.1

Last edit: 09/21/17 1:26 pm

Changes proposed by: barryf

Catalog Pages referencing this course

Information Science and Technology

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Business and Information Technology
Discipline	Enterprise Resource Planning (ERP)
Course Number	5410
Title	

In Workflow

1. **RBUSADMN Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/21/17 5:27 pm siauk: Approved for RBUSADMN Chair
2. 09/22/17 10:27 am Brittany Parnell (ershenb):

Approved for CCC Secretary

3. 09/22/17 5:28 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 2:16 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Use of Business Intelligence

Abbreviated Course Title	Use of Business Intelligence

Catalog Description

This course introduces data-oriented techniques for business intelligence. Topics include Business Intelligence architecture, Business Analytics, and Enterprise Reporting. SAP Business Information Warehouse, Business Objects, or similar tools will be used to access and present data, generate reports, and perform analysis.

Prerequisites

IS&T **1750** ~~3423~~ or equivalent; ERP 2110 or preceded or accompanied by ERP 5110.

Field Trip Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
Total: 3				

Required for Majors	No

Elective for Majors	No

Justification for change:

Instructor plans to cover DBMS topics needed in the course, so the 3423 prereq is not needed; however, understanding of MIS is needed, so 1750 has been added (it was a prereq for 3423, hence not specified earlier).

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 565

Preview Bridge

Course Change Request

Date Submitted: 09/01/17 11:38 am

Viewing: GEOLOGY 4010 : Seminar

File: 2561.4

Last approved: 01/30/17 3:14 am

Last edit: 09/14/17 2:00 pm

Changes proposed by: jhogan

Programs referencing this course

GL&GPH-BS: Geology and Geophysics BS

Requested Effective Change Date	**01/09/2018** ~~Fall 2017~~
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Geology (GEOLOGY)
Course Number	4010
Title	

In Workflow

1. **RGEOSENG Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/14/17 1:24 pm David Borrok (borrokd): Approved for RGEOSENG Chair
2. 09/14/17 2:00 pm Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 09/27/17 9:34 am Katie Shannon (shannonk): Approved for Sciences DSCC Chair
4. 10/12/17 2:17 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Jan 30, 2017 by liukh (2561.1)

Seminar

Abbreviated Course Title: Seminar

Catalog Description:
Discussion of current topics. Required for two semesters during senior year. (Course cannot be used for graduate credit).

Prerequisites:
Senior standing.

Field Trip Statement:

Credit Hours: LEC: **0.5** ~~0~~ LAB: 0 IND: 0 RSD: 0
Total: 0-6

Required for Majors	Yes
Elective for Majors	No

Justification for change:

1) Not assigning a fixed number of credits was an oversight. Students have found this loop-hole and were signing up for extra credits as a "GPA" boost. This is a "one credit course" spread over two semesters. Assigning 0.5 credits per semester fixes this problem.

2) In addition, this will align the credit hours of the Geology and Geophysics seminar with similar courses in the department at the request of the new department Chair.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

ershenb (09/14/17 2:00 pm): updated effective change date to Spring 2018.

Key: 2561

Preview Bridge

Course Change Request

Date Submitted: 09/14/17 2:01 pm

Viewing: GEOLOGY 5010 : Seminar

File: 779.1

Last edit: 09/14/17 2:01 pm

Changes proposed by: jhogan

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Geology (GEOLOGY)
Course Number	5010
Title	

In Workflow

1. **RGEOSENG Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/14/17 3:11 pm David Borrok (borrokd): Approved for RGEOSENG Chair
2. 09/15/17 9:32 am Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 09/27/17 9:34 am Katie Shannon (shannonk): Approved for Sciences DSCC Chair
4. 10/12/17 2:36 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Seminar

Abbreviated Course Title	Seminar

Catalog Description	Discussion of current topics.
Prerequisites	
Field Trip Statement	
Credit Hours	LEC: **0.5** ~~0~~ LAB: 0 IND: 0 RSD: 0 Total: **0** ~~0-6~~
Required for Majors	No
Elective for Majors	**Yes** ~~No~~

Justification for change:

The change in credit hours from 0-6 to 0.5 per semester, with the ability of students to sign up for more than one semester, is being made to bring this course in alignment with the work load. In the past students have somehow managed to sign-up for several credit hours in one semester for this course and we are closely this loop-hole.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 779

Preview Bridge

Course Change Request

Date Submitted: 09/12/17 10:40 am

Viewing: **GEOLOGY 6511 : Advanced Petroleum Geology**

File: 152.1

Last edit: 09/12/17 11:17 am

Changes proposed by: johfb

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Geology (GEOLOGY)
Course Number	6511
Title	

In Workflow

1. **RGEOSENG Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/12/17 11:07 am
   David Borrok (borrokd): Approved for RGEOSENG Chair
2. 09/12/17 11:18 am
   Brittany Parnell

(ershenb): Approved for CCC Secretary
3. 09/27/17 9:35 am Katie Shannon (shannonk): Approved for Sciences DSCC Chair
4. 10/12/17 2:37 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Advanced Petroleum Geology

Abbreviated Course Title: Adv Petroleum Geology

Catalog Description

The principles ~~Examples~~ of **petroleum geology** ~~various types of oil and gas accumulation~~ are **applied** ~~reviewed~~ in **solving hydrocarbon exploration and developmental problems.** ~~detail.~~ **Various types of oil and gas accumulations are reviewed in detail.** Study of criteria useful in evaluating the petroleum potential of undrilled areas. Special investigation assignment is required.

Prerequisites

Geology **3310, Geology 5513, Geology 5661 or Geology 6811.** ~~4511.~~

Field Trip Statement

Credit Hours: LEC: 1 LAB: 2 IND: 0 RSD: 0
Total: 3

Required for Majors	No
Elective for Majors	No

Justification for change:

4511 was renumbered to 5513 and other prerequisites are required so that students are better prepared for the class.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

ershenb (09/12/17 11:17 am): updated the effective change date to Spring 2018.

Key: 152

Preview Bridge

Course Change Request

Date Submitted: 09/14/17 2:03 pm

Viewing: GEOPHYS 5010 : Seminar

File: 1775.1

Last edit: 09/14/17 3:13 pm

Changes proposed by: jhogan

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Geophysics (GEOPHYS)
Course Number	5010
Title	

In Workflow

1. **RGEOSENG Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/14/17 3:13 pm David Borrok (borrokd): Approved for RGEOSENG Chair
2. 09/15/17 9:34 am Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 09/27/17 9:36 am Katie Shannon (shannonk): Approved for Sciences DSCC Chair
4. 10/12/17 2:37 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Seminar

Abbreviated Course Title	Seminar

Catalog Description	Discussion of current topics.
Prerequisites	
Field Trip Statement	

Credit Hours	LEC: **0.5** ~~0~~	LAB: 0	IND: 0	RSD: 0
Total: **0.5** ~~0~~ ~~6~~				

Required for Majors	No
Elective for Majors	No

Justification for change:

The change in credit hours from 0-6 to 0.5 per semester, with the ability of students to sign up for more than one semester, is being made to bring this course in alignment with the work load. In the past students have somehow managed to sign-up for several credit hours in one semester for this course and we are closing this loop-hole.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 1775

Preview Bridge

Course Change Request

Date Submitted: 09/15/17 2:26 pm

Viewing: **GEOPHYS 6251 : Geophysical Inverse Theory**

File: 791.1

Last edit: 09/15/17 2:43 pm

Changes proposed by: liukh

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Geophysics (GEOPHYS)
Course Number	6251
Title	

In Workflow

1. **RGEOSENG Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/15/17 2:27 pm David Borrok (borrokd): Approved for RGEOSENG Chair
2. 09/15/17 2:43 pm Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 09/27/17 9:36 am Katie Shannon (shannonk): Approved for Sciences DSCC Chair
4. 10/12/17 2:38 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Geophysical Inverse Theory

Abbreviated Course Title	**Geophys Inv** ~~Geophysical Inverse Theo~~

Catalog Description

A study of inverse theory applied to geophysical data, focusing on the relationship between data and model spaces and ways to estimate model parameters via global and local optimization techniques.

Prerequisites

Geophys 3210 or Graduate Standing in GGPE. ~~Geophys 286 or 384, Math 325, Stat 215.~~

Field Trip Statement

Credit Hours Total: 3	LEC: **2** ~~3~~	LAB: **1** ~~0~~	IND: 0	RSD: 0
Required for Majors	No			

Elective for Majors	**Yes** ~~No~~

Justification for change:

The prerequisites were incorrect.

A lab hour is added so that the students can have some hands-on experiences on inversion theory.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 791

Preview Bridge

Course Change Request

New Course Proposal

Date Submitted: 09/21/17 1:27 pm

Viewing: **IS&T 4444 : Introduction to Data Warehouses**

File: 4478

Last edit: 09/21/17 1:27 pm

Changes proposed by: barryf

Requested Effective Change Date	01/09/2018
Department	Business and Information Technology
Discipline	Info Science & Technology (IS&T)
Course Number	4444
Title	

In Workflow

1. **RINFSCTE Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/21/17 5:28 pm siauk: Approved for RINFSCTE Chair
2. 09/22/17 10:34 am Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 09/22/17 5:28 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 2:38 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Introduction to Data Warehouses

Abbreviated Course Title	Intro Data Warehouses

Catalog Description

This course presents the topic of data warehouses and the value to the organization. It takes the student from the database platform to structuring a data warehouse environment. Focus is placed on simplicity and addressing the user community needs.

Prerequisites

IS&T 3423

Field Trip Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0
Required for Majors	No			

Elective for Majors	Yes

Justification for new course:

Mirror course to IS&T 6444, for undergraduate students.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 4478

Preview Bridge

Course Change Request

Date Submitted: 09/20/17 1:54 pm

Viewing: **IS&T 5423 : Foundations of Data Management**

File: 2339.1

Last edit: 09/20/17 1:54 pm

Changes proposed by: barryf

Requested Effective Change Date	Fall **2018** ~~2017~~
Department	Business and Information Technology
Discipline	Info Science & Technology (IS&T)
Course Number	5423
Title	

In Workflow

1. **RINFSCTE Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/20/17 4:55 pm siauk: Approved for RINFSCTE Chair
2. 09/21/17 3:20 pm Brittany Parnell (ershenb): Approved for CCC Secretary

3. 09/21/17 3:30 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 2:38 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Foundations of Data Management

Abbreviated Course Title	Foundations Data Mgmt

Catalog Description

Foundational concepts of database management systems. Issues in database architecture, design, administration, and implementation. Extensive use of SQL with Oracle to create and manage databases. Significant project dealing with triggers or stored procedures.

Prerequisites

Graduate Standing, programming capability, knowledge of MIS. ~~IS&T 1750, IS&T 1552, and graduate standing.~~

Field Trip Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0
Required for Majors	No			

Elective for Majors	No

Justification for change:

Clarify prerequisites. For graduate students, the topics needed should be made known rather than the numbers of undergraduate courses.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 2339

Preview Bridge

Course Change Request

Date Submitted: 10/03/17 3:43 pm

Viewing: **IS&T 5520 : Data Science and Machine Learning with ~~Methodologies in~~ Python**

File: 4407.2

Last approved: 09/29/17 3:28 am

Last edit: 10/03/17 3:43 pm

Changes proposed by: barryf

Programs referencing this course

ANA&DTA-MI: Business Analytics and Data Science Minor

Requested Effective Change Date	**01/09/2018** ~~Fall 2017~~
Department	Business and Information Technology
Discipline	Info Science & Technology (IS&T)
Course Number	5520
Title	

In Workflow

1. **RINFSCTE Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 10/03/17 3:55 pm siauk: Approved for RINFSCTE Chair
2. 10/06/17 4:05 pm Brittany Parnell (ershenb): Approved for CCC Secretary

3. 10/06/17 10:08 pm
   Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 1:23 pm
   Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Sep 29, 2017 by Barry Flachsbart (barryf)

Data **Science and Machine Learning with** ~~Methodologies in~~ Python

Abbreviated	**Data Sci & M.L. w Python**
Course Title	~~Data Methods in Python~~

Catalog Description

Examines data science methodologies for scraping, manipulating, transforming, cleaning, visualizing, summarizing, and modeling large-scale data as well as supervised and unsupervised machine learning algorithms applied in various business analytics and data science scenarios. Python libraries such as Pandas, NumPy, Matplotib, and Scikit-learn are utilized. ~~Python methodologies for manipulating, processing, cleaning, grouping, slicing, reshaping and summarizing information in data-intensive applications; managing files, scraping web pages, mining social media; describing, modeling, analyzing, and visualizing data.Tools include pandas, NumPy, SciPy, and Matplotib libraries.~~

Prerequisites

One of Stat 3111, Stat 3113, Stat 3115, Stat 3117 and either IS&T 1552 or Comp Sci 1510; for Graduate Students: Graduate Standing and Knowledge of Calculus, Statistics, and Programming.

Field Trip Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0
Required for Majors	No			
Elective for Majors	Yes			

Justification for change:

Made title and description more precise.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 4407

Preview Bridge

Course Change Request

New Course Proposal

Date Submitted: 09/20/17 1:55 pm

Viewing: **IS&T 5535 : Machine Learning Algorithms and Applications**

File: 4471

Last edit: 09/20/17 1:55 pm

Changes proposed by: barryf

Requested Effective Change Date	01/09/2018
Department	Business and Information Technology
Discipline	Info Science & Technology (IS&T)
Course Number	5535
Title	

In Workflow

1. **RINFSCTE Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/20/17 4:55 pm siauk: Approved for RINFSCTE Chair
2. 09/22/17 10:39 am Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 09/22/17 5:28 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 1:20 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Machine Learning Algorithms and Applications

Abbreviated Course Title: ML Algs and Apps

Catalog Description:
Introduces techniques of modern machine learning methods with applications in marketing, finance, and other business disciplines. Topics include regression, classification, resampling methods, model selection, regularization, decision trees, support vector machines, principal component analysis, and clustering. R programming is required.

Prerequisites:
One of Stat 3111, Stat 3113, Stat 3115, Stat 3117 and either IS&T 1552 or Comp Sci 1510; or Graduate Standing with knowledge of calculus, statistics, and programming.

Field Trip Statement:

Credit Hours: LEC: 3 LAB: 0 IND: 0 RSD: 0 Total: 3

Required for: No

Majors	
Elective for Majors	Yes

Justification for new course:

Required for proposed new Graduate Certificate in AI, Machine Learning, and Automation in Business.

Also for proposed new Minor in Aritificial Intelligence and Machine Learning in Business.

Semesters previously offered as an experimental course

None

Co-Listed Courses:

Course Reviewer Comments

Key: 4471

Preview Bridge

Course Change Request

Date Submitted: 09/21/17 1:27 pm

Viewing: **IS&T 6444 : Essentials of Data Warehouses**

File: 28.1

Last edit: 09/21/17 1:27 pm

Changes proposed by: barryf

Catalog Pages referencing this course

Information Science and Technology

Requested Effective Change Date	**01/09/2018** ~~Fall 2014~~
Department	Business and Information Technology
Discipline	Info Science & Technology (IS&T)
Course Number	6444
Title	

In Workflow

1. **RINFSCTE Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 09/21/17 5:28 pm siauk: Approved for RINFSCTE Chair
2. 09/22/17 10:34 am Brittany Parnell (ershenb): Approved for CCC

Secretary
3. 09/22/17 5:28 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 2:39 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Essentials of Data Warehouses

Abbreviated Course Title: Data Warehouses

Catalog Description

This course presents the topic of data warehouses and the value to the organization. It takes the student from the database platform to structuring a data warehouse environment. Focus is placed on simplicity and addressing the user community needs. **Project required.**

Prerequisites

IS&T **5423** ~~3423~~ or equivalent relational database experience.

Field Trip Statement

Credit Hours: LEC: 3 LAB: 0 IND: 0 RSD: 0 Total: 3

Required for Majors: No

Elective for Majors	No

Justification for change:

Update prerequisite.

Clarify need for project as we create a mirrored 4444 course.

Semesters previously offered as an experimental course

Co-Listed Courses:

ERP 6444 - Essentials of Data Warehouses

Course Reviewer Comments

Key: 28

Preview Bridge

Program Change Request

Date Submitted: 08/17/17 5:08 pm

Viewing: BIO SC-BA : Biological Sciences BA

File: 146.19

Last approved: 06/28/17 10:11 am

Last edit: 10/04/17 11:39 am

Changes proposed by: shannonk

Catalog Pages Using this Program
Biological Sciences

Start Term	Fall **2018** ~~2017~~
Program Code	BIO SC-BA
Department	Biological Sciences
Title	

In Workflow

1. **RBIOLSCI Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 10/04/17 11:24 am David Duvernell (duvernelld): Approved for RBIOLSCI Chair
2. 10/04/17 11:40 am Brittany Parnell (ershenb): Approved for CCC Secretary
3. 10/12/17 10:20 am Katie Shannon (shannonk): Approved for Sciences DSCC Chair
4. 10/12/17 1:16 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Aug 1, 2014 by Katie Shannon

(shannonk)
2. Jul 14, 2015 by pantaleoa
3. Oct 7, 2016 by Katie Shannon (shannonk)
4. Jun 28, 2017 by Katie Shannon (shannonk)

Biological Sciences BA

Program Requirements and Description

Justification for request

DESE required changes to BS Educational emphasis degree
Choice of General Biology (BIO SCI 1113) in addition to Principles of Biology (BIO SCI 1213), Choice of Astronomy (PHYSICS 1505) in addition to College Physics I (PHYSICS 1145) and PSYCH 3310 replaces PSYCH 3311

Supporting Documents

Course Reviewer

Comments

ershenb (10/04/17 11:39 am): updated Start Term to Fall 2018

Key: 146

Program Change Request

Date Submitted: 06/24/17 11:06 pm

Viewing: PRE-MED-MI : Pre-Medicine Minor

File: 123.3

Last approved: 03/31/14 9:59 am

Last edit: 10/03/17 10:40 am

Changes proposed by: djwesten

Catalog Pages Using this Program
Prehealth Professions

Start Term	**Fall 2018** ~~8/15/2014~~
Program Code	PRE-MED-MI
Department	College of Arts & Sciences
Title	

In Workflow

1. **RA&SC Chair**
2. **Sciences DSCC Chair**
3. **CCC Secretary**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 10/03/17 10:40 am Brittany Parnell (ershenb): Approved for RA&SC Chair
2. 10/12/17 10:21 am Katie Shannon (shannonk): Approved for Sciences DSCC Chair
3. 10/12/17 11:19 am Brittany Parnell (ershenb): Approved for CCC Secretary
4. 10/12/17 2:41 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Mar 31, 2014 by pantaleoa

2. Mar 31, 2014 by pantaleoa

Pre-Medicine Minor

Program Requirements and Description

Justification for request

Math 1212 (Business calculus) is now an approved course for all Biology majors so this change is added for consistency.

The comment was changed to reflect the fact that four courses are now listed rather than three)

Bio Sci 242 (Human Physiology) is no longer offered and has been replaced by the 2 course series Bio Sci 3333 and Bio Sci 3343 (Human Anatomy and Physiology I and II). Pre-medicine students are encouraged to take both of these courses along with general genetics and general biochemistry.

Supporting Documents

Course Reviewer

Comments

ershenb (06/21/17 12:30 pm): Rollback: Per Katie Shannon's email, rolling back to David Westenberg to have edits completed.

ershenb (10/03/17 10:40 am): updated start term to Fall 2018

Key: 123

Program Change Request

New Program Proposal

Date Submitted: 09/20/17 1:59 pm

Viewing: PROPOSED : Minor in Aritificial Intelligence and Machine Learning in Business

File: 253

Last edit: 09/20/17 1:59 pm

Changes proposed by: barryf

Start Term	01/09/2018
Program Code	PROPOSED
Department	Business and Information Technology
Title	

Minor in Aritificial Intelligence and Machine Learning in Business

In Workflow

1. **RINFSCTE Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 09/20/17 4:55 pm siauk: Approved for RINFSCTE Chair
2. 09/22/17 10:14 am Brittany Parnell (ershenb): Approved for CCC Secretary
3. 09/22/17 5:28 pm Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 10/12/17 2:43 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Program Requirements and Description

Justification for request

Strong inputs from our Advisory Board, companies who hire our graduates, and our own research directions.

Supporting Documents

Course Reviewer Comments

Key: 253

Course Change Request

New Experimental Course Proposal

Date Submitted: 09/22/17 11:00 am

Viewing: **GEOLOGY 5001.001 : Petroleum Geochemistry**

File: 4485

Last edit: 10/13/17 8:36 am

Changes proposed by: borrokd

Requested Effective Change Date	01/09/2018
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Geology (GEOLOGY)
Course Number	5001
Topic ID	001
Experimental Title	

In Workflow

1. RGEOSENG Chair
2. CCC Secretary
3. Sciences DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 09/22/17 12:37 pm
   David Borrok (borrokd): Approved for RGEOSENG Chair
2. 09/22/17 4:00 pm
   Brittany Parnell (ershenb): Approved for CCC Secretary
3. 10/12/17 10:20 am
   Katie Shannon

(shannonk): Approved for Sciences DSCC Chair

4. 10/12/17 2:36 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Petroleum Geochemistry

Experimental Abbreviated Course Title	Petroleum Geochemistry
Instructors	David Borrok

Experimental Catalog Description

The focus of this course will be the organic geochemistry of petroleum systems. Students will gain a basic understanding of organic molecules, the burial of organic matter, and its maturation and migration, as well as an understanding of petroleum source rock evaluation in terms of kerogen type and thermal maturity.

Prerequisites

Students must be enrolled in a graduate program in the GGPE Department.

Field Trip Statement

NA

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0

Total: 3

Justification for new course:

This topic has grown in importance to become critical with the advent of oil and gas production from unconventional (shale) reservoirs. We need to teach this course to provide GGPE students with the knowledge they need to be successful in an evolving industry. There is no course like this in our catalog.

Semester(s) previously taught

None

Co-Listed Courses:

Course Reviewer Comments

ershenb (10/12/17 8:29 am): updated course number to 5001

Key: 4485

Preview Bridge

Course Change Request

New Experimental Course Proposal

Date Submitted: 09/15/17 3:05 pm

Viewing: **MS&E 5001.002 : Molecular Engineering and Soft Nanomaterials**

File: 4481

Last edit: 09/22/17 11:13 am

Changes proposed by: doganf

Requested Effective Change Date	01/09/2018
Department	Materials Science & Engineering
Discipline	Materials Science & Eng (MS&E)
Course Number	5001
Topic ID	002
Experimental Title	

In Workflow

1. RMATSENG Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 09/15/17 4:55 pm Greg Hilmas (ghilmas): Approved for RMATSENG Chair
2. 09/18/17 8:11 am Brittany Parnell (ershenb): Approved for CCC Secretary
3. 09/20/17 8:46 am sraper: Approved for Engineering DSCC Chair

4. 10/12/17 2:40 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Molecular Engineering and Soft Nanomaterials

Experimental Abbreviated Course Title	Molecular Engineering
Instructors	Fatih Dogan and Hakan Usta (AGU, Turkey)

Experimental Catalog Description

This course focuses on the fundamentals and applications of molecular engineering and soft nanomaterials. Topics include principles of carbon chemistry, rational molecular engineering, small molecules, polymers, macromolecules, nanoscience/nanotechnology, organic/printed optoelectronics, and metal(covalent)-organic frameworks.

Prerequisites

Senior standing.

Field Trip Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
Total: 3				

Justification for new course:

The course will be offered online through participation of students at S&T and Abdullah Gul University (AGU) in Turkey. There is a signed Memorandum of Understanding (MOU) between the two institutions.

The lead instructor will be Dr. Hakan Usta (Assoc. Prof.). Dr. Usta received his PhD in chemistry at Northwestern University (Advisor: Tobin Marks) in 2008 and has been a faculty member since 2013 at AGU in Department of Materials Science and Nanotechnology. http://people.agu.edu.tr/hakanusta/
The course will be co-taught by Dr. Dogan and Dr. Usta by utilizing a "Free for Teacher" Canvas account. The logistics of this online course are currently being coordinated by the staff of EdTech at S&T and AGU. The proposed course is a unique opportunity for students interested in molecular engineering of soft materials.

Semester(s)
previously taught
None

Co-Listed
Courses:

Course Reviewer
Comments
kristyg (09/15/17 2:58 pm): Rollback: Rollback per email to get chair approval.

Key: 4481

Preview Bridge

Course Change Request

New Experimental Course Proposal

Date Submitted: 09/15/17 3:05 pm

Viewing: **MS&E 6001.002 : Advanced Molecular Engineering and Soft Nanomaterials**

File: 4482

Last edit: 09/22/17 11:15 am

Changes proposed by: doganf

Requested Effective Change Date	01/09/2018
Department	Materials Science & Engineering
Discipline	Materials Science & Eng (MS&E)
Course Number	6001
Topic ID	002
Experimental Title	

In Workflow

1. RMATSENG Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 09/15/17 4:55 pm Greg Hilmas (ghilmas): Approved for RMATSENG Chair
2. 09/18/17 8:13 am Brittany Parnell (ershenb): Approved for CCC Secretary
3. 09/20/17 8:47 am sraper: Approved for Engineering DSCC Chair

4. 10/12/17 2:40 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Advanced Molecular Engineering and Soft Nanomaterials

Experimental Abbreviated Course Title	Molecular Engineering
Instructors	Fatih Dogan and Hakan Usta (AGU, Turkey)

Experimental Catalog Description

This comprehensive course encompasses fundamentals and applications of advanced molecular engineering and soft nanomaterials. Topics include principles of carbon chemistry, rational molecular engineering, small molecules, polymers, macromolecules, nanoscience/nanotechnology, organic/printed optoelectronics, metal(covalent)-organic frameworks, air/water clean

Prerequisites

Graduate standing.

Field Trip Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
Total: 3				

Justification for new course:

The course will be offered online through participation of students at S&T and Abdullah Gul University (AGU) in Turkey. There is a signed Memorandum of Understanding (MOU) between the two institutions.

The lead instructor will be Dr. Hakan Usta (Assoc. Prof.). Dr. Usta received his PhD in chemistry at Northwestern University (Advisor: Tobin Marks) in 2008 and has been a faculty member since 2013 at AGU in Department of Materials Science and Nanotechnology. http://people.agu.edu.tr/hakanusta/
The course will be co-taught by Dr. Dogan and Dr. Usta by utilizing a "Free for Teacher" Canvas account. The logistics of this online course are currently being coordinated by the staff of EdTech at S&T and AGU. The proposed course is a unique opportunity for students interested in molecular engineering of soft materials.

Semester(s)
previously taught
None

Co-Listed
Courses:

Course Reviewer
Comments
kristyg (09/15/17 2:58 pm): Rollback: Rollback per email to get chair approval.
sraper (09/20/17 8:47 am): Revised catalog description provided by Faith Dogan.

Key: 4482

Preview Bridge

Course Change Request

New Experimental Course Proposal

Date Submitted: 09/11/17 10:46 pm

Viewing: **SPANISH 3001.002 : Spanish Translation for Technical Applications**

File: 4480

Last edit: 09/26/17 9:16 am

Changes proposed by: porcelj

Requested Effective Change Date	01/09/2018
Department	Arts, Languages, & Philosophy
Discipline	Spanish (SPANISH)
Course Number	3001
Topic ID	002
Experimental Title	

In Workflow

1. RPHILOSO Chair
2. CCC Secretary
3. Arts & Humanities DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 09/20/17 8:10 am
   Audra Merfeld-Langston (audram): Approved for RPHILOSO Chair
2. 09/22/17 10:56 am
   Brittany Parnell (ershenb): Approved for CCC Secretary
3. 09/22/17 11:58

am
Petra Dewitt (dewittp): Approved for Arts & Humanities DSCC Chair
4. 10/12/17 2:43 pm
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Spanish Translation for Technical Applications

Experimental Abbreviated Course Title	Spanish Translation
Instructors	PORCEL, J

Experimental Catalog Description

This course will introduce students to the art and skills of translation. It will provide students practical experience translating technical and scientific documents from Spanish to English and from English to Spanish.

Prerequisites

Spanish 1180.

Field Trip Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0

Justification for

new course:

The demands of modern multicultural, multilingual societies usually require more than the traditional foreign language skills from new college graduates. In this context, the acquisition of technical and scientific linguistic skills for students in the STEM fields should be an essential component of their education. This course aims to enhance students' foreign language professional skills by introducing them to the fields of technical and scientific translation.

Semester(s)
previously taught

No

Co-Listed
Courses:

Course Reviewer
Comments

Key: 4480

Preview Bridge

Course Change Request

Date Submitted: 05/05/17 2:09 pm

Viewing: ARCH ENG 4800 ~~5872~~ : Principles of HVAC I ~~Environmental Controls~~

File: 942.1

Last edit: 05/16/17 9:18 am

Changes proposed by: baur

Programs referencing this course

ARC ENG-BS: Architectural Engineering BS

Requested Effective Change Date	Fall **2018** ~~2014~~
Department	Civil, Architectural, and Environmental Engineering
Discipline	Architectural Engineering (ARCH ENG)
Course Number	**4800** ~~5872~~
Title	

In Workflow

1. **RCIVILEN Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Lynn Shelton
11. Peoplesoft

Approval Path

1. 05/11/17 11:36 am
   Joel Burken (burken): Approved for RCIVILEN Chair
2. 05/12/17 9:56 am
   Brittany Parnell (ershenb):

Approved for CCC Secretary

3. 05/22/17 12:30 pm sraper: Approved for Engineering DSCC Chair
4. 06/28/17 4:03 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Principles of HVAC I ~~Environmental Controls~~

Abbreviated Course Title	**Principles of HVAC I** ~~Environmental Controls~~

Catalog Description

Heating, ventilating, and air conditioning ~~Theory and applications of~~ principles **related to the heat loss and heat gain calculations for commercial buildings.** ~~of heating, ventilating, and air conditioning equipment and systems; design problems.~~ **Calculations will be performed manually and using current computer software. Analysis and specification of the building envelope components, with an emphasis on improving energy efficiency by reducing heating and cooling loads** ~~Physiological and psychological factors relating to environmental control.~~

Prerequisites

Mech Eng ~~3521 and accompanied or preceded by Mech Eng 3525; or Mech Eng~~ 2527 and Civ Eng 3330.

Field Trip Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0

Total: 3

Required for Majors	**Yes** ~~No~~
Elective for Majors	No

Justification for change:

The architectural engineering program is realigning the building systems courses to provide a path for a continuous design project. The realignment and renumbering of courses include environmental controls, building lighting systems and building electrical systems. When complete a student project that was initially started in architectural design will be carried through environmental controls and building lighting systems. The same project will be forwarded to building electrical systems course once complete it will have a fully designed building environmental systems in place.

Semesters previously offered as an experimental course

Co-Listed Courses:

~~MECH ENG 5571~~ - ~~Environmental Controls~~

Course Reviewer Comments

lahne (05/05/17 11:57 am): Rollback: .

sraper (05/16/17 9:18 am): Changed effective date to Fall 18 and checked required for majors box. Approval subject to DC form to be submitted.

Key: 942

Preview Bridge

Course Change Request

Date Submitted: 05/01/17 2:42 pm

Viewing: **ARCH ENG 4820 ~~3805~~ : Building Lighting Systems**

File: 2069.5

Last approved: 09/21/15 3:55 am

Last edit: 05/16/17 9:20 am

Changes proposed by: baur

Programs referencing this course

ARC ENG-BS: Architectural Engineering BS

Requested Effective Change Date	**Fall 2018** ~~Spring 2016~~
Department	Civil, Architectural, and Environmental Engineering
Discipline	Architectural Engineering (ARCH ENG)
Course Number	**4820** ~~3805~~
Title	

In Workflow

1. **RCIVILEN Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Lynn Shelton
11. Peoplesoft

Approval Path

1. 05/11/17 11:36 am
   Joel Burken (burken): Approved for RCIVILEN Chair
2. 05/12/17 9:57 am
   Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 05/22/17 12:30 pm
sraper: Approved for Engineering DSCC Chair
4. 06/28/17 4:24 pm
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Sep 21, 2015 by baur (2069.1)

Building Lighting Systems

Abbreviated Course Title: Bldg Light Syst

Catalog Description

Design and specifications for interior and exterior building illumination systems. Work includes study of applicable NFPA 70 (NEC) and related building codes.

Prerequisites

ArchE 3804 and Physics 2135 ~~Arch Eng 3803 and Arch Eng 3804.~~

Field Trip Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0
Total: 3

Required for Majors	Yes
Elective for Majors	No

Justification for change:

The architectural engineering program is realigning the building systems courses to provide a path for a continuous design project. The realignment and renumbering of courses include environmental controls, building lighting systems and building electrical systems. When complete a student project that was initially started in architectural design will be carried through environmental controls and building lighting systems. The same project will be forwarded to building electrical systems course once complete it will have a fully designed building environmental systems in place.

Semesters previously offered as an experimental course

ArchE 3805 typically has an enrollment of 40 students. Student enrollment numbers are expected to be similar.

Co-Listed Courses:

Course Reviewer Comments

sraper (05/16/17 9:20 am): Changed effective date to Fall 2018. Approval subject to DC form submission.

Key: 2069

Preview Bridge

Course Change Request

Date Submitted: 05/01/17 2:34 pm

Viewing: **ARCH ENG 4850 ~~3803~~ : Building Electrical Systems**

File: 4219.5

Last approved: 09/21/15 3:55 am

Last edit: 05/16/17 9:21 am

Changes proposed by: baur

Programs referencing this course

ARC ENG-BS: Architectural Engineering BS

Requested Effective Change Date	**Fall 2018** ~~Spring 2016~~
Department	Civil, Architectural, and Environmental Engineering
Discipline	Architectural Engineering (ARCH ENG)
Course Number	**4850** ~~3803~~
Title	

In Workflow

1. **RCIVILEN Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Lynn Shelton
11. Peoplesoft

Approval Path

1. 05/11/17 11:36 am
   Joel Burken (burken): Approved for RCIVILEN Chair
2. 05/12/17 9:58 am
   Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 05/22/17 12:30 pm
sraper: Approved for Engineering DSCC Chair
4. 06/28/17 4:25 pm
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Sep 21, 2015 by Stuart Baur (baur)

Building Electrical Systems

Abbreviated Course Title: Bldg Elect Syst

Catalog Description

The design of interior and exterior building electrical systems, including power loads, branch circuits and switching. Work includes study of applicable NFPA 70 (NEC) and related building codes.

Prerequisites

ARCH ENG 4800 and ARCH ENG 4820 ~~Math 3304 and Physics 2135.~~

Field Trip Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for Majors	Yes
Elective for Majors	No

Justification for change:

The architectural engineering program is realigning the building systems courses to provide a path for a continuous design project. The realignment and renumbering of courses include environmental controls, building lighting systems and building electrical systems. When complete a student project that was initially started in architectural design will be carried through environmental controls and building lighting systems. The same project will be forwarded to building electrical systems course once complete it will have a fully designed building environmental systems in place.

Semesters previously offered as an experimental course

This ~~will be the new pre-requisite for ArchE 3805, which~~ typically has an enrollment of 40 students. ~~As the pre-requisite for ArchE 3805, student enrollment numbers are expected to be similar.~~

Co-Listed Courses:

Course Reviewer Comments

sraper (05/16/17 9:21 am): Changed effective date to Fall 2018. Approval subject to DC form submission.

Key: 4219

Preview Bridge

Course Change Request

New Experimental Course Proposal

Date Submitted: 08/09/17 10:55 am

Viewing: **CHEM ENG 4001.001 : Introduction to Phase Equilibrium**

File: 4440

Last edit: 10/04/17 9:43 am

Changes proposed by: marlene

Requested Effective Change Date	01/09/2018
Department	Chemical and Biochemical Engineering
Discipline	Chemical Engineering (CHEM ENG)
Course Number	4001
Topic ID	001
Experimental Title	

In Workflow

1. RCHEMENG Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. Registrar

Approval Path

1. 08/10/17 1:46 pm Muthanna Al-Dahhan (aldahhanm): Approved for RCHEMENG Chair
2. 08/15/17 10:05 am Brittany Parnell (ershenb): Rollback to RCHEMENG Chair for CCC Secretary
3. 08/30/17 9:57 am Muthanna

Al-Dahhan (aldahhanm): Approved for RCHEMENG Chair
4. 08/30/17 10:13 am
Brittany Parnell (ershenb): Approved for CCC Secretary
5. 09/08/17 2:48 pm
sraper: Approved for Engineering DSCC Chair
6. 09/19/17 11:27 am
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post
7. 10/04/17 9:28 am
Brittany Parnell (ershenb): Rollback to Engineering DSCC Chair for CCC Meeting Agenda
8. 10/04/17 9:43 am
sraper: Approved for Engineering DSCC Chair
9. 10/12/17 1:22 pm
Brittany Parnell (ershenb):

Approved for
Pending CCC
Agenda post

Introduction to Phase Equilibrium

Experimental Abbreviated Course Title: Phase Equilibrium

Instructors: Dr. Christi Luks

Experimental Catalog Description:

This course is intended as a supplement to a mechanical Thermodynamics 1 course to prepare students for Thermodynamics 2. Review of the first and second law of thermodynamics for pure substances with emphasis on finding data for pure substances via fundamental relations and equations of state; phase equilibrium and fugacity of pure substances.

Prerequisites:

ME 2519 and Math 2222.

Field Trip Statement:

Credit Hours: LEC: 1 LAB: 0 IND: 0 RSD: 0
Total: 1

Justification for new course:

We have found that students transferring Mechanical Engineering Thermodynamics do not have the necessary foundation in phase equilibria to be successful in our second thermodynamics course (Phase Equilibrium for multicomponents)

Semester(s) previously taught:

Co-Listed
Courses:

Course Reviewer
Comments

ershenb (08/15/17 10:05 am): Rollback: Missed the EC Submission for Fall 2017 deadline. Please adjust to Spring 2018.

ershenb (08/30/17 10:13 am): updated the effective date to Spring 2018.

ershenb (10/04/17 9:28 am): Rollback: Rollback for edits,per the request of Dr. Raper

sraper (10/04/17 9:43 am): Changed prereq. Removed "taught in previous..." statement.

Key: 4440

Preview Bridge

Program Change Request

New Program Proposal

Date Submitted: 03/06/17 6:34 pm

Viewing: PROPOSED : Master of Science in Explosives Technology

File: 249

Last edit: 05/15/17 4:10 pm

Changes proposed by: kapqh4

Start Term	01/09/2018
Program Code	PROPOSED
Department	Mining & Nuclear Engineering
Title	

Master of Science in Explosives Technology

In Workflow

1. **RMINNUCL Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 03/08/17 10:13 am Braden lusk (blusk): Approved for RMINNUCL Chair
2. 03/08/17 11:13 am Kristy Giacomelli (kristyg): Approved for CCC Secretary
3. 05/15/17 4:10 pm sraper: Approved for Engineering DSCC Chair
4. 06/30/17 9:38 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Program Requirements and Description

Justification for request

We are applying for an M.S. degree in Explosives Technology. Building on our Masters of Explosives Engineering degree, the Masters of Explosives Technology degree has high potential for attracting students from our online certificate program, particularly from the military and government.

The ATF, which currently sends 30-40 agents per year through our Explosives Technology Certificate program, has requested that we make changes to the Certificate program (currently in progress) to accommodate an extra 30-40 agents a year and also develop a Masters of Explosives Technology degree.

We receive a constant stream of inquires about our current program. However prospective students without an engineering or physical science degree are currently limited in their options. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. However, in order to continue on to the M.S. in Explosives Engineering, a series of makeup/prerequisite courses are required for most of these students. An M.S. in Explosives Technology would allow these students (who are mostly military) to continue on.

The ATF has requested that we develop the degree so that their agents can continue on to an M.S. degree. Currently only a handful of the agents that have received the Explosives Technology Graduate Certificate have had engineering or physical science

degrees. They are wanting to double the number of agents they send through this program and to encourage their agents to continue on to an M.S. degree, and have requested that we develop the M.S. in Explosives Technology degree. In addition it would cater to the demand from military EOD and other students.
There will continue to be growing opportunities for graduates with explosives qualifications in the defense, consulting and explosives manufacturing industries and in government. It is expected that the overwhelming majority of our online students will already have a job in industry, the military or a government agency and will be using the M.S. to advance their career, but we would also like to be able to offer the degree on campus so that students can complete the degree in a shorter time frame and move on to a new career. We have already had army officers come to campus and complete their M.S. degree in Explosives Engineering upon their separation from the army

Supporting Documents

Explosives Technology MS Proposal 3-06-17.pdf
FinancialProjections - MS Explosives Technology.xlsx

Course Reviewer Comments

sraper (05/15/17 4:10 pm): There were no objections from the DSCC to this new program.

Key: 249

NEW DEGREE PROGRAM PROPOSAL

Sponsoring Campus: Missouri University of Science and Technology

College or School: College of Engineering and Computing

Department: Mining and Nuclear Engineering

Program Title: Explosives Technology

Degree: Master of Science (M.S.) in Explosives Technology

Options (emphasis areas): No options (N/A)

Delivery Site(s): Missouri University of Science and Technology

CIP Classification: 142101

Implementation Date: Fall 2018

Expected Date of First Graduation: May 2020

Authors of Proposal: Dr. Kyle Perry & Dr. Gillian Worsey

Name and Phone Number of Person to Contact for More Information:

Perry: 573-341-4549 Worsey: 573-341-4753

Individual(s) Responsible for Success of Program:

Paul Worsey, Associate Chair of Explosives Engineering

Braden Lusk, MNE Department Chair

Table of Contents

Executive Summary

Building on our M.S. in Explosives Engineering degree, the M.S. in Explosives Technology has high potential for attracting students from our online certificate program, particularly from the military and government. Since the M.S. in Explosives Engineering was approved in 2010, there have been 60 graduates (as of January 2017). The ATF, which currently sends 30-40 agents per year through our Explosives Technology Certificate program, has requested that we make changes to the Certificate program to accommodate an extra 30-40 agents a year and also develop a M.S. in Explosives Technology degree.

The explosives program receives a constant stream of enquires about our current programs. However, prospective students without an engineering or physical science degree are currently limited in their options. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. However, in order to continue on to the M.S. in Explosives Engineering, a series of makeup/prerequisite courses are required for most of these students. An M.S. in Explosives Technology would allow these students (who are mostly military and ATF agents) to continue on.

The ATF has requested that we develop the degree so that their agents can continue on to an M.S. degree. Currently, only a handful of the agents who have received the Explosives Technology Graduate Certificate hold engineering or physical science degrees. They are wanting to double the number of agents they send through this program and to encourage their agents to continue on to an M.S. degree. In addition to ATF agents, it would also cater to the demand from military EOD and other students.

There will continue to be growing opportunities for graduates with explosives qualifications in the defense, consulting and explosives manufacturing industries, and in government. It is expected that the overwhelming majority of our online students will already have a job in industry, the military, or a government agency and will be using the M.S. to advance their career, but we would also like to be able to offer the degree on campus so that students can complete the degree in a shorter time frame and move on to a new career. We have already had army officers come to campus and complete their M.S. degree in Explosives Engineering upon their separation from the army.

Dr. Braden Lusk, Chair of the Mining and Nuclear Engineering Department, specifically requested that a proposal for a M.S. in Explosives Technology be submitted after being contacted by the ATF. This degree also falls within the Missouri S&T strategic plan by targeting several themes. Specifically, themes 2.5 (using technology to enhance student learning and increase faculty productivity), 3.2 (improve service to existing corporate partners), and 4.1 (comprehensive distance and online education strategy).

As with our current graduate degrees, all costs will be paid by student fees. With the addition of a third full time explosives faculty member since the existing M.S. proposal, as well as Dr. Lusk, we feel that we have sufficient staffing levels to implement the program, and additional costs will be limited to supervising and materials for the extra students and more GTA appointments. In the past two years the ATF contract for the Explosives Technology Certificate has totaled nearly $480,000 and $467,000 respectively and they are wanting to double the number of students in this program and estimate about five students per year going on to the MS in Explosives Technology. In addition, we estimate an additional two students per year will come from a military background. The existing MS degree has exceeded all expectations and these are probably conservative numbers, as we think there is even more potential for attracting technology students

1. Introduction

- Explosives technology refers to the application of explosives in scientific endeavors, and the science and technology of explosives, including their formulation, physics, effects and use. The United States is the largest consumer of explosives in the world, with US civilian sales estimated at 3.1 million metric tons in 2014. (1) This is principally because the United States also has the largest mining industry in the world.

  The major use of explosives is in the civilian sector. Of this, an estimated 88% is used in the mining industry (for extraction of metals, minerals, fuels and construction materials). 66% of total explosives consumption is used in coal mining to remove rock from above coal seams, principally in the western United States (coal mined using explosives is responsible for over 30% of US electrical power generation). Of the remaining explosives consumption, 9% is used in metal mining. Missouri is the number one producer of lead in the nation (2), (over half of the vehicle batteries in the US use lead from Missouri) and Doe Run, the major mining company in Missouri, estimates that 10% of its current total mining costs come from drilling and blasting. An estimated 11% is used in the civil construction industry for road cuts, tunnels, trenches for utilities, structure basements and grading for large industrial, distribution and retail complexes. 11% is also used for quarrying crushed stone.

  Missouri ranks as number eight in the nation in explosives consumption at 91,600 metric tons. This is principally because of crushed stone production, where Missouri ranks number three in production in the nation (3), and lead mining (Missouri has five of the ten lead mines in the nation). All other civilian uses of explosives combined account for 3%, including forestry, oil and gas exploration and production, explosive welding, demolition, etc. Another important segment of explosives use is government, which includes the Department of Energy (DOE), the Department of Homeland Security (DHS), the Department of Defense (DOD) and the National Laboratories.

- The history of explosives at Missouri S&T goes back to its inception as the Missouri School of Mines (MSM). The use of explosives since the invention of dynamite by Alfred Nobel (of Nobel Prize fame) has been a fundamental cornerstone of the mining and civil excavation industries for the excavation of rock. Over the years, MSM/University of Missouri-Rolla/Missouri S&T has been one of the principal universities both in teaching explosives classes and performing explosives research. Over the last decade, it has emerged as the number one university for explosives education at the undergraduate level in the nation. In 1997 it was the first to have an undergraduate explosives engineering emphasis, followed in 2005 by an explosives minor for both undergraduate and graduate degrees, and in 2007 by an explosives engineering certificate and in 2012 by an explosives

technology certificate. A master's degree in explosives engineering, which was approved in 2010, was the natural progression and the phenomenal success of the M.S. program and the demand of its graduates for a Ph.D. in explosives engineering led to a Ph.D. degree being approved in 2014.

The success of the explosives program at S&T has led to an increase in explosives faculty positions. A third faculty member (Dr. Catherine Johnson) was hired in January 2015. Dr. Jason Baird retired in August 2015 and was replaced by Dr. Kyle Perry in August 2016. With the addition of Dr. Braden Lusk as chair of the Department of Mining and Nuclear Engineering in August 2016, there is now a core number of four full time explosives faculty positions supplemented by two adjunct professors and several specialty instructors.

The success of the current graduate programs has led to a request to implement this proposal. The ATF, which currently sends 30-40 agents per year through our Explosives Technology Certificate program has requested that we develop a Masters of Explosives Technology degree. Most of the ATF agents do not have the engineering or physical science degree required for an MS in Explosives Engineering. The existing explosives courses offered by Missouri S&T will fit the proposed program, along with three new courses that have been requested by the ATF and have recently been approved by the S&T campus.

The new program will open up opportunities for graduate students with majors other than engineering and physical science disciplines and will increase the diversification of majors compared to our present situation. We receive a constant stream of enquires about our current program but options are still limited for prospective students without an engineering or physical science degree. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. However, in order to continue on to the M.S. in Explosives Engineering, a series of prerequisite courses are required for most of these students. An M.S. in Explosives Technology would allow such students (who are mostly military) and ATF students to continue on.

- This will be the first M.S. in Explosives Technology in North America, and because of this, there are no statistics on the employment of graduates. As far as we know, nearly all of the graduates from the Explosives Engineering M.S. program, apart from the five that went on to full-time Ph.D. study, have immediately obtained jobs on graduation. In some cases, companies were prepared to wait a year after the job offer and in others the students started work and switched to part-time study to finish their M.S. Table 1 shows where the M.S. graduates found employment. It is anticipated that the Explosives Technology graduates will follow a similar employment pattern, with less graduates going into mining and construction.

Table 1: Employment of M.S. in Explosives Engineering Graduates

Consulting Company	**2**
Explosives Company	**11**
Armed Services	**11**
Mining Industry	**11**
Construction Company	**4**
Research Company	**2**
Government / Lab.	**8**
Ph.D.	**5**
Own Company	**3**

- Dr. Paul N. Worsey, the current Associate Chair of Explosives Engineering in the Department of Mining and Nuclear Engineering at Missouri S&T, with the assistance of Dr. Kyle Perry will be responsible for the M.S. in Explosives Technology program along with the M.S. in Explosives Engineering, Ph.D. and various minors and certificates. No additional administrative position costs are anticipated.

2. Fit With University Mission and Other Academic Programs

2.A. Alignment With Mission and Goals

- Mission Statement: "Missouri S&T integrates education, research and application to create and convey knowledge that serves our state and helps solve the world's greatest challenges." A M.S. in Explosives Technology will serve S&T's Mission Statement well. The faculty and supporting instructors will be able to convey their wealth of explosives knowledge with students not only from our state, but also our nation. Since a large percentage of students enrolled in this program are expected to be from the ATF, we will be training those agents who are in the field every day battling illegal activities and terrorism.

- A Master's Degree in Explosives Technology falls within the Missouri S&T strategic plan by targeting several themes. Theme 2.5 (using technology to enhance student learning and increase faculty productivity) is addressed by the fact that nearly all the courses will be offered online with video recordings of lectures. These recorded lectures can be used for subsequent offerings which will allow each professor to offer multiple courses each semester without the time demands of lecturing for each course. This

greatly improves the productivity of the faculty member. Theme 3.2 (improve service to existing corporate partners) is the primary purpose of this proposal. The ATF, a current government partner, desires a M.S. degree in Explosives Technology. Finally, Theme 4.1 (comprehensive distance and online education strategy) is addressed through the development of additional explosives technology classes which will all be offered online. Newly developed courses, as well as existing ones, will be offered online which will yield a broad list of offerings available to distance students.

- The explosives engineering program has recently submitted revisions for the Undergraduate and Graduate Explosives Technology Certificate. Each one was systematically approved up through the Provost. This gives our program confidence that the support of the campus, college, and department is present. Dr. Braden Lusk, Chair of the Mining and Nuclear Engineering Department, requested that a proposal for a M.S. in Explosives Technology be submitted.

2.B. Duplication and Collaboration Within Campus and Across System

- No duplication exists at the UM System, state or national level. As far as we know there is no other M.S. in Explosives Technology in the world. The Mechanical Engineering Department at New Mexico Institute of Technology has an M.S. in Mechanical Engineering with Specialization in Explosives Engineering. One of their graduates, who is in the military, is now in our Ph.D. program and stated that it was very theoretically based and extremely difficult for him to follow some of the classes. Cranfield Institute of Technology in the UK has an M.S. in Explosives Ordnance Engineering and some other military orientated degrees but these would require relocation to the United Kingdom, as there are no online courses.

- The M.S. degree in Explosives Technology does not involve collaboration with any external institution or organization, except for the transfer of course work from universities outside the University of Missouri. There is the possibility of cooperation with the Civil Engineering Departments at S&T and the University of Missouri – Columbia on a course or two on the blast resistance of structures, and again we will be looking at cooperation with other institutions and former academics now in industry for further courses in specialized explosives chemistry and other areas not currently covered. Several courses from New Mexico Institute of Technology are approved for transfer and Dr. Vilem Petr has been teaching specialty courses for us at the Colorado School of Mines explosives lab.

3. Business-Related Criteria and Justification

3.A. Market Analysis

3.A.1. Need for Program

- We receive a constant stream of enquires about our current programs. However prospective students without an engineering or physical science degree are currently limited in their options. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. In addition, the ATF currently sends 30-40 agents per year through the Explosives Technology Certificate program. The ATF has recently requested that we make some changes to the Certificate program to accommodate an extra 30-40 agents a year, and also develop a Masters of Explosives Technology degree.

  In order to continue on to the current M.S. in Explosives Engineering, a series of makeup/prerequisite courses are required for most of these students. An M.S. in Explosives Technology degree would allow these students (who are mostly military) to continue on. Currently only a handful of the ATF agents that have received the Explosives Technology Certificate have had an engineering or physical science degree for example.

  A similar situation exists in many explosives companies as in the mining industry. With the Korean and Vietnam wars, the defense industry was saturated with engineers, many of whom were in the same age group. The majority of those engineers have now retired, leaving a substantial gap in expertise, especially in the area of explosives. The Department of Mining and Nuclear Engineering at Missouri S&T, having recognized national expertise in the areas of explosives education, training and research, is becoming increasingly approached by defense contractors, DOD installations (such as the U.S. Navy's facility at China Lake, CA) and National Laboratories (such as the Idaho National Laboratory and Lawrence Livermore) for explosives workers. Several of our current M.S. graduates have gone to work at these institutions after graduating.

  The U.S. Department of Labor shows 8,100 explosives workers, ordnance handling experts and blasters were employed in 2014. (4) From our experience this is probably a conservative number. These workers were employed by the federal government (19.4%), support activities for mining (19.0%), mining (7.1%). engineering services (6.5%), chemical and allied product merchant wholesalers (manufacturers) (5.9%), specialty trade contractors (4.6%), aerospace product and parts manufacturing (3.1%), agriculture, construction and mining machinery manufacturing (2.1%), management, scientific and technical consulting services (2.0%), management of companies and enterprises (1.2%) and research and development (0.7%) for example. The Bureau of Labor

Statistics estimates that although demand in the federal government, mining and aerospace sectors will decrease by 2024, the overall demand for explosives workers, ordnance handling experts and blasters will increase by 3.9%. Notable increases of 16.1% in support activities for mining, 11.7% in engineering services, 9.1% in specialty trade contractors, 27.5% in management, scientific and technical consulting services and 6.9 % in research and development are all areas where graduates of the program would find employment.

- Missouri S&T is located about 30 miles from Fort Leonard Wood, and has a Memorandum of Understanding with the US Army Engineer School there for military officers to complete an M.S. degree in conjunction with their Engineer Captain Career Course. This MOU is in the process of being amended to include an explosives certificate program that will allow commissioned officers and enlisted personnel stationed at Fort Leonard Wood the opportunity to complete a certificate in explosives engineering or explosives technology. Many of the enquires we receive for the current M.S. program are from military personnel stationed at Fort Leonard Wood and are ineligible due to their non-engineering background. The M.S. in Explosives Technology will fulfill their need.

  Mr. Steve Tupper, the S&T Fort Leonard Wood Liaison Officer, has written the following comment concerning Fort Leonard Wood (the major army training base in Missouri and the home of the Army Engineer Center and Maneuver Support Center).

  "Fort Leonard Wood is the training base for the Corps of Engineers whose missions include military demolitions. Each year 450 officers, all with fresh bachelor degrees from various ROTC programs and the Military Academy, are trained in basic explosives use, handling, safety, including hands-on application. Annually, 25,000 newly enlisted soldiers are also trained on the same explosives basics, but since they have high-school degrees are not ready candidates for graduate studies. This training is done by a training cadre mix of officers and enlisted who are interested in more advanced explosive theory, practice and design. This last group is currently inquiring with Missouri S&T for in-depth training and certification making them a market-sector for the explosives master program."

- Our proposed M.S. in Explosives Technology would make the program more accessible to the military. It has strong support from a wide spectrum of our field. The support from our constituents illustrates the need for qualified professionals within the various applications of explosives, the uniqueness of our proposed program, the endorsement of our ability to successfully implement the program, the quality of education that we currently provide, and the keen interest in our program by prospective candidates. Multiple letters of support from each of our

constituencies are provided in Appendix A.

3.A.2. Student Demand for Program

- The MS in Explosives Engineering degree, which was approved in 2010, has been extremely successful. The first year of the program was actually 2010-2011 rather than the originally projected 2009-2010, but as can be seen from Tables 3.A.2.1. and 3.A.2.2, student numbers have far exceeded the projected numbers.

Table 3.A.2.1: Expected Enrollment Potential from Year 1 through Year 5 - from MS in Explosives Engineering Proposal

Year (A/C)	1 (09-10)	2 (10-11)	3 (11-12)	4 (12-13)	5 (13-14)
Full Time	5	6	8	10	12
Part Time	-	5	8	12	15
Total	5	11	16	22	27

Table 3.A.2.2: Actual MS in Explosives Engineering Enrollment from Year 1 through Year 5

Year (A/C)	1 (10-11)	2 (11-12)	3 (12-13)	4 (13-14)	5 (14-15)
Full Time	14	13	15	14	14
Part Time	8	14	12	14	14
Total	22	27	27	28	28

The projected student numbers for year four of the program were actually reached in the first year, and the projected numbers for year five were reached in year two and sustained in year three and subsequent years. In addition, the expected rate of graduation of five students per year was reached in the second year of the program, as can be seen from Table 3.A.2.3. The full- and part-time division we have found to vary. We have students lured to top paying industry jobs who have switched to part time and part-time students who have switched to full time.

Table 3.A.2.3: Actual MS in Explosives Engineering Graduates from Year 1 to Year 6

Year (A/C)	1 (10-11)	2 (11-12)	3 (12-13)	4 (13-14)	5 (14-15)	6 (15-16)
Full Time	4	4	4	10	7	13
Part Time	-	1	1	3	4	3
Total	4	5	5	13	11	16

We expect that the M.S. in Explosives Technology will be just as successful. The enrollment forecasts are considered to be conservative.

Table 3.A.2.4 Student Enrollment Projections (anticipated total number of students enrolled in program during the fall semester of given year).

Year	1	2	3	4	5
Full-Time	0	2	5	6	7
Part-Time	5	10	15	20	20
Total	5	12	20	26	27

Table 3.A.2.4 contains the expected enrollment forecasts from year 1 (2018-2019) to year 5 (2022-2023). These projections are based on the ATF, which has indicated that they would have five students joining the program per year, plus additional students joining the program as they find out about it. For this reason, the program is anticipated to have more part-time (distance) students than full time (on campus) students. The current M.S. in Explosives Engineering caters for most full-time students, the predicted full time students are expected to come from the Engineer Captain's Career Course at Fort Leonard Wood. The predictions include a maximum of 20 part-time students.

Table 3.A.2.5. Student Enrollment Projections (anticipated number of students enrolled during the fall semester of given year who were new to campus).

Year	1	2	3	4	5
Full-Time	0	2	5	6	7
Part-Time	5	10	15	20	20
Total	5	12	20	26	27

Because the current M.S. in Explosives Engineering caters for most full-time students and many part-time students, it is anticipated that practically all of the M.S. in Explosives Technology students will be new to campus. The degree will not take students away from the current M.S. or from other departments.

Table 3.A.2.6 shows the expected number of M.S. in Explosives Technology graduates per year for the first ten years of the program. Based on the projected enrollment, it is expected that this number will ramp up to ten in year five and remain relatively constant after that. Again, this is a conservative estimate.

Table 3.A.2.6. Projected Number of Degrees Awarded

Year	1	2	3	4	5	6	7	8	9	10
# of Degrees Awarded	-	2	5	8	10	10	10	10	10	10

3.B. Financial Projections

3.B.1. Additional Resources Needed

- The majority of resources to complete development and implementation of the new M.S. program already exist at S&T. The Mining and Nuclear Engineering Department already offers all of the needed courses and existing faculty members have the training, experience and skills required. The infrastructure is already in place for the mining program to accommodate the increase in enrollment (including one GO administrative assistant and two soft-money secretaries). Therefore, the initial implementation of the program will be at minimal cost. By cooperating with other institutions and through the use of adjunct instructors we feel that this M.S. program will be viable with the current staffing levels (that now include four tenured/tenure track faculty (one of which is Chair of the MNE dept.), two adjunct faculty and three M.S.-graduate instructors), and additional costs will actually be limited to supervising and materials for the extra students (materials are currently donated and we expect this to continue).

- Some extra faculty time will obviously be tied up and we intend to trade this out by assigning more duties to GTAs to relieve teaching and grading responsibilities of faculty. As a result, we are budgeting for a 50% GTA appointment ($24,638 in Year 1) as well as a build up to 15% of three faculty members beginning in year three (5% Year 3, 10% Year 4, 15% Year 5). In years one and two, with the anticipation of a gradual build-up of students in the program, the additional 5 students in year one and 12 students in year two should be manageable and not require any additional sections of courses. The first two years will bolster and fill already offered courses and help reach the course capacity. In subsequent years, the addition of a new faculty member in year three will be necessary.

- Because of the high numbers of students already taking some of the explosives engineering courses and the anticipated enrollment of additional M.S. students from this program, it is anticipated that one 1.0 FTE GTA position (broken down into 4 x 25% positions) will be required to assist faculty members with the explosives course load from the beginning. Fifty percent of this position was assigned to the M.S. in Explosives Technology budget, the other 50% would be applied to other students (mining undergraduates, other graduate students and students in other

departments) taking the same courses. From Year 2, $10,000 has been included for mining program expenditures for support of the extra M.S. student numbers (for example, secretarial, printing, advertising, communications, supplies, etc.).

- Once student enrollment has increased to the level anticipated by the third year projections, the current faculty members will be unable to cope with the course load and will need to be augmented. Lab courses are difficult to teach with more than 15 students per lab and we already teach three lab sections of Exp Eng 5612 and two lab sections of Exp Eng 5622. At this point, it is anticipated that an additional faculty member at the assistant or associate professor level will be required at an estimated cost of $80,000 per year plus benefits (at current levels)[1]. The faculty member is budgeted for 50% effort in Year 3, and 75% in Years 4 and 5. A one-time expenditure of $60,000 is set aside in Year 2 for a start-up package for this faculty member.

- Blank values ($0 values) in expenses are for several items. No new spaces, equipment, library needs, nor consultants are necessary to implement the program. The program already has access to McNutt hall and the experimental mine which has office space, laboratories, and equipment readily available or can be made available for the new faculty member in year 3.

3.B.2. Revenue

- All revenue will come from student fees. The projected budget **includes** the 52% out-of-state graduate student discount rate as found in the Financial Projection Spreadsheet. The budgeted revenues are based on full time students taking 12 hours a semester and 6 hours in the summer and out of state students paying out of state tuition. This would allow the military (or companies) to send employees for one year for them to complete their master's degree. Part time students such as the ATF usually take two courses per year and pay the distance course fees. The ATF has negotiated a slightly lower rate for their student fees with S&T. The budget is based on these assumptions and the Summer 2016 and Spring 2017 tuition rates, the most current at submittal of this proposal.

3.B.3. Net Revenue

- The expected revenue is anticipated to exceed expenses in each of the first five years, including the first year. By just including the five distance

[1] All financial information is based on 16-17 costs. All revenue and expenditures are based on figures for this year.

students which the ATF has already committed to send and limited expenses to accommodate those five students, the first year results in a positive revenue value of $8,688. As additional students join the program, tuition/fee revenue increases drastically over expenses in year two. This will allow for a large sum of money to be set aside as the start-up package for the anticipated faculty member add in year three. Net revenue decreases in year three with the addition of a new faculty member, yet is still positive. As the program reaches the anticipated enrollment, we expect an annual positive revenue of approximately $110,000.

- The revenue break-even point occurs in year one and cumulative revenue over 5 years is $342,637, even with the addition of an $80,000/year faculty member, including benefits and a $60,000 startup account.

3.B.4. Financial and Academic Viability

- To be financially viable, 11 part-time and 5 full-time students will be necessary. This assumes that a new faculty member has been hired (at 75% effort) and the other three full time faculty members are committing 15% of their time to the program.
- To be academically viable, one student is required. Since this Explosives Technology program will run in parallel with the established, strong Explosives Engineering program, the courses required will already be offered. Therefore, if we can add even one student to the explosives student population, that student will be served and additional revenue will be seen by S&T.

Table 2. Financial Projections for Proposed Program for Years 1 Through 5.

	Year 1	Year 2	Year 3	Year 4	Year 5
1. Expenses per year					
A. One-time					
New/Renovated Space					
Equipment					
Library					
Consultants					
Other (new faculty startup)		$60,000			
Other (Mining E&E)		$10,000	$10,000	$10,000	$10,000
Total one-time	$0	$70,000	$10,000	$10,000	$10,000
B. Recurring					
Faculty			$54,752	$91,295	$108,469
Staff	$24,638	$24,884	$25,133	$25,385	$25,638
Benefits			$19,400	$32,300	$38,400
Equipment					
Library					
Other					
Total recurring	$24,638	$24,884	$99,285	$148,980	$172,507
Total Expenses (A+B)	$24,638	$94,884	$109,285	$158,980	$182,507
2. Revenue per year					
Tuition/Fees	$33,326	$109,632	$209,574	$267,456	$292,945
Institutional Resources					
State Aid--CBHE					
State Aid--Other					
Total revenue	$33,326	$109,632	$209,574	$267,456	$292,945
3. Net revenue (loss) per year	$8,688	$14,748	$100,289	$108,476	$110,438
4. Cumulative revenue (loss)	$8,688	$23,435	$123,723	$232,200	$342,637

Table 3. Enrollment at the End of Year 5 for the Program to Be Financially and Academically Viable.

Enrollment Status	Full-Time	Part-Time	Total
Financially # of Students	5	11	16
Academically # of students	0	1	1

3.C. Business and Marketing Plan: Recruiting and Retaining Students

- Target recruitment audiences for the Explosives Technology M.S. will include professionals currently employed in industry, the military and other government agencies, especially the ATF. The overarching recruitment goal is to obtain a highly-qualified student body that is diverse across traditional/non-traditional student categories, discipline area, age, gender, and ethnicity. Recruitment methods will serve to educate the students about the field, but also challenge students to cross interdisciplinary fields and gain interdisciplinary exposure. The current system for recruiting for the mining B.S., explosives minor, M.S. and Ph.D. and mining distance education will be utilized. The mining program support staff, Shirley Hall and Judy Russell, will provide the pertinent informative literature on the Explosives Technology M.S. and the department at S&T. They will channel inquires to the appropriate faculty member.

  The recruitment methods for both traditional students and non-traditional industry graduates will include:

- Replies to e-mail correspondence (the majority of current enquiries are e-mail)
- Direct mail involving invitations and brochures of the program to interested individuals
- Include explosive program information on mining program literature
- Degree-specific website that includes web-based services
- Paragraphs about and links to the explosives program on collaborating academic units' websites
- A continuation of broad-based media exposure - newspapers, TV and new media
- Referrals from the International Society of Explosives Engineers

  A military demolition course has been developed in conjunction with Fort Leonard Wood. Together with the Fort Leonard Wood MOU, this will add significant (military) value to their existing army course and provide an attractive enticement for army officers without engineering or physical science degrees to come in to the M.S. in Explosives Technology program.

These officers represent a significant pool for quality graduate students for the university in the form of distance classes as well as on site classes. It is the intention in the long run to recruit M.S. students from the lieutenant class and for them to take a large proportion of their classes distance before returning for the Captain's Career Course, as well as taking classes in conjunction with their Captain's Career Course at the Fort.

- The demand for the program is expected to increase after the recruitment plan is implemented, as student and industry awareness of the program increases. Based on our experience in recruiting students for the M.S. in Explosives Engineering program, the recruitment plan will be comprehensive and use multiple proven methods to reach both traditional and non- traditional students.

- Marketing costs will be shared with the costs of marketing the M.S. in Explosives Engineering and other explosives programs. To date there have been very little marketing costs beyond the printing of brochures, as everything else has been by word of mouth.

- Student retention is already a priority in the department and each student is assigned an academic advisor who tracks their progress, with considerable assistance from the support staff. The faculty advisors will guide students through course selection, monitor their progress towards completing graduation requirements, and provide information and advice on post-graduation employment. Students will also be advised and encouraged to utilize the many academic and career support services offered by both the department and Career Opportunities and Employee Relations at S&T. The resources available at S&T and individual faculty member advising already attracts and retains students and we plan to continue utilizing these to ensure program enrollment outcomes are achieved.

4. Institutional Capacity

- Missouri S&T is particularly well suited and equipped to support an M.S. degree program in Explosives Technology to be offered by the Department of Mining and Nuclear Engineering. Key factors include the strength of the Department of Mining and Nuclear Engineering, the nature of Missouri S&T as a technological research university and opportunities for research, internships, and co-ops.

  Department of Mining and Nuclear Engineering

  The degree will be an integral part of the Department of Mining and Nuclear Engineering at Missouri S&T but the students will be counted as explosives program graduate students. The strengths of both mining and

explosives are augmented using this symbiotic relationship. The department has several years of experience developing and teaching courses in explosives as part of its minor, certificate and M.S. in Explosives Engineering. It has capitalized on this long history of teaching and research in the explosives field in recent years, increasing its course offerings and rebuilding its faculty in this area such that a core program is now possible. Because Missouri S&T is a research university, the faculty have a strong tradition of research, teaching and service.

Missouri S&T as Missouri's Technological University

Missouri S&T's strong reputation as the state's technological research university and as one of the top providers of M.S. and Ph.D. graduates in engineering and science in the country, and its reputation and tradition in this field make it the logical home for an explosives program. There are now eighteen separate explosives related courses totaling 54 credit hours available (excluding research, and special problems courses): Exp Eng 5112, Exp Eng 5512, Exp Eng 5513, Exp Eng 5514, Exp Eng 5555, Exp Eng 5612, Exp Eng 5622, Exp Eng 5713, Exp Eng 5922, Exp Eng 6001 (two separate new classes), Exp Eng 6070/6080, Exp Eng 6112, Exp Eng 6212, Exp Eng 6312, Exp Eng 6412, Exp Eng 6464, Exp Eng 6292. In addition, three new classes are being developed for the Certificate in Explosives Technology, as requested by the ATF, and new courses will be developed as opportunity presents. Three courses are currently only taught on campus, all other courses are taught distance concurrently with the on-campus classes. The mining program has a bulk thumb drive copier to facilitate the distribution of course material for distance courses.

The current facilities can accommodate the explosives courses, the main need for the new program being extra personnel in the form of adjunct instructors and graduate student assistants. Since the implementation of the M.S. in Explosives Engineering a couple of courses have been taught by GTAs under faculty supervision to lighten the load on current faculty and the availability of Ph.D. students (since 2014) should allow this to increase. In conjunction with industry instructors we have now reached a sustainable level where students can obtain a degree in explosives with a degree of flexibility of course selection within the explosives classes offered at Missouri S&T.

Facilities and Space Needs

Current facilities will accommodate the Explosives Technology M.S. students. These facilities include modern lecture facilities at McNutt Hall equipped with an instructor station (which includes a computer and a ceiling–mounted LCD projector) linked to the campus network through a

high–speed data network, the Missouri S&T experimental mine and the energetic materials research facility.

Underground Mine Facility: The Missouri S&T Experimental Mine is one of only a few such facilities available on a university campus for mining engineering education. The facility is used primarily by the students and faculty of Missouri S&T for instruction and research in mining and geological engineering practices. The Experimental Mine is located on Bridge School Road, just west of Rolla, 1-1/2 miles from the Missouri S&T Campus. It consists of two underground mines, two small quarries, explosives magazines, a classroom and office facility, a shop building, and a garage on a 19-acre site. A brand new, 15,000 square feet classroom building will open in 2017 on the mine site. In addition to offices for faculty and graduate students, this building has three classrooms equipped with instructor podiums and ceiling-mounted projectors linked to the campus network through a building-wide high-speed data network, a computer lab, a conference room, two labs, a dirty classroom for instruction of practical classes, changing facilities and a mine rescue station. The three classrooms open up into one large facility. The underground mine facility is already extensively used for explosives classes and research and the addition of the new building will ease the strain on the current classroom and office space.

Surface Quarry Facility: The Missouri S&T Experimental Mine also includes two small surface quarries used for teaching and research by mining engineering faculty and students. These quarries are already extensively used - for explosives classes, research and demonstrations, as well as explosives camp in the summer.

Energetic Materials Research Facility: A brand new Energetic Materials Research Facility (Explosives Research Lab) laboratory is housed in a purpose-built building at the Rock Mechanics and Explosives Research Center. The laboratory contains two blasting chambers (rated for 1 kg and 4 kg of explosives, respectively), a shop, a computing workstation running Autodyn 3D© software (an industry standard for performing closely-coupled computational fluid dynamics/computational structural dynamics calculations), high-speed film (up to 1.25 M frames per second) and video cameras (up to 90k frames per second), gated ICCD camera (up to 55 nanosecond exposure), flash x-ray system, 16-channel digital data acquisition system, three high-energy pulsers, two delay generators, two initiation systems for exploding bridgewire detonators, and explosive magazines. The laboratory is currently used for teaching Exp Eng 6312, the instrumentation course. The 11 ft diameter large scale blast chamber was acquired from the Army Chemical Demilitarization Command in Tooele, Utah. This chamber is 84 tons and represents a major upgrade to the facility, raising the facility to the realm of world-class capabilities.

- *Facilities at Industry Operations:* Field trips to operating mines have been used intensively to demonstrate real-world mining facilities, especially for rock blasting, the major use of explosives. In the past, many explosive research projects have involved industry participation for both funded faculty, undergraduate and graduate research. It is expected that these links will continue.

5. Program Characteristics

5.A. Program Outcomes

- Learning outcomes for the program include the following specific skills:
  - Understanding and application of the functioning of explosives and initiation systems.
  - Understanding and application of explosion effects.
  - Understanding and application of safety as applied to explosives in field use, testing and demonstration environments.
  - Experience with the safe handling of energetic materials.
  - Understanding of the application of explosives for fragmenting rock and other materials.
  - Expertise in focused professional areas such as demolition, blast resistance, rock breakage or weapons systems design, loading and production.
  - Understanding of the challenges of using explosives and environmental impact.

- Graduates will have training in explosives technology from a program that is unique the world. Graduates will be able to go into management for companies with the knowledge and background to be successful. Existing management and financial personnel (accountants) from various industries (commercial, industrial, government, etc.) will find the Explosives Technology M.S. useful when making decisions that may affect explosives use or purchasing.

5.B. Structure

- The proposed M.S. degree in Explosive Technology will meet or exceed the general requirements listed in the Missouri S&T Graduate Catalogue. The individual candidate's program will vary according to their interests. With guidance from their advisor, each candidate will complete a plan of study to satisfy their interests and their advisor, plus requirements for the Master of Science degree, as described in the Missouri S&T Graduate Catalog. 30

credit hours will be required for graduation with 12 hours or 4 courses specific to the degree, selected from a list of core courses. The remaining 18 hours will be technical electives chosen from Exp Eng courses and related out of department courses. Whilst a thesis is not required, a candidate may choose to take six hours of research and complete a thesis.

PROGRAM STRUCTURE

1. Total credits required for graduation: 30 hours

2. Residency requirements, if any: none

3. General education – N/A

Total credits for general education courses:

Courses (specific course or distribution area and credit hours):

Course	Hrs	Course	Hrs	Course	Hrs

4. Major requirements

Total credits specific to degree: 12 hours – 4 of the following core classes:

Courses (specific course or distribution area and credit hours):

Course	Hrs	Course	Hrs	Course	Hrs
Exp Eng 5612	3	Exp Eng 5922	3		
Exp Eng 5622	3	Exp Eng 6112	3		
Exp Eng 5711	3				
Exp Eng 5713	3				
Exp Eng 5721	3				
Exp Eng 5914	3				

5. Technical elective credits
Total technical elective credits: 18 hours of technical electives chosen from Explosives Engineering courses and related out of department courses.
The sum of hours required for general education, major requirements and free electives should equal the total credits required for graduation.

6. Requirement for thesis, internship or other capstone experience:
Candidates may choose to include 6 hours of research with thesis in their free elective credits but this is not required.

7. Any unique features such as interdepartmental cooperation:
New Courses: There are currently 18 explosives engineering classes available plus research and an agreement with New Mexico Institute of Technology to allow three of their online explosives classes (up to 9 credit hours) to be transferred in for

credit. Oklahoma State University offers a certificate in Forensic Science which can be transferred in to count for up to 9 credit hours upon approval by the Explosives Engineering Associate Chair. In addition, three new classes are being developed for the Certificate in Explosives Technology as requested by the ATF and new courses will be developed as opportunity presents.

5.C. Program Design and Content

- The M.S. in Explosive Technology has been designed to complement the existing M.S. in Explosives Engineering, to allow graduates without a B.S. degree in Engineering or Physical Science with an interest in explosives to obtain an M.S. degree. Most of the ATF agents currently enrolled for the Graduate Certificate in Explosives Technology, for example, fit this population.

- The sequence of explosive courses is included in Appendix B. Appendix C contains the Graduate Catalog Description of the explosives engineering program at Missouri S&T, including course syllabi descriptions and learning outcomes.

5.D. Program Goals and Assessment

- Learning outcomes will be assessed by the GPA of the students and , when applicable, the passing rate of blasting license exams.
- The only applicable tests are state explosives licensing tests. More than 80% of the students are expected to score above the 50^{th} percentile on these tests. (Based on past performance of students. Source: Dr. Worsey, state certification program examiner 1990-2008.)

- The goal for retention and graduation rates is that 80% of the students who begin in the program are retained and graduate. This is based on past experience of distance students. We lose a few that begin, mainly due to work and family commitments.

- Number of graduates per annum at three years after implementation: 5

  Number of graduates per annum at five years after implementation: 10

- Graduates will become members of the International Society of Explosives Engineers and other professional organizations, as appropriate. At present there are no professional groups licensing graduates from explosives programs. All licensing is at the state level, which comprises a) blaster's licensing (which may be at multiple levels depending on the state, b) display fireworks operator licensing and c) pyrotechnician and special effects licensing. It is anticipated that the majority of graduates will obtain licensing in at least one of these areas.

- There will continue to be growing opportunities for explosives technology graduates in the defense, mining and civil construction industries and in government institutions. Since the majority are expected to be distance students with jobs in these fields, we expect 100% of our graduates to be employed.

5.E. Student Preparation

- Students will be required to meet the standard graduate school admission requirements for the M.S. degree at the Missouri University of Science and Technology and hold a bachelor's degree.

- U.S. law requires citizenship or permanent residence and in addition has several prohibited categories for explosives handling (see Section 6).

5.F. Faculty and Administration

- Dr. Paul N. Worsey, Associate Chair of Explosives Engineering, in the Department of Mining and Nuclear Engineering at Missouri S&T will be responsible for this program along with the existing M.S. in Explosives Engineering, Ph.D. and the various minors and certificates. He will be assisted by Dr. Kyle Perry, who will take over from Dr. Worsey when he retires in a few years. It is anticipated that 15% of their time will be dedicated to the degree after five years.

- Faculty involved in the program are based around existing faculty from the Department of Mining and Nuclear Engineering at Missouri S&T and instructors from industry currently employed on a flat rate to co-teach explosives classes. Faculty from New Mexico Institute of Technology currently teach courses approved to transfer in to S&T and faculty from Colorado School of Mines teach distance classes at their explosives laboratory.

Faculty Currently Teaching Courses

Professor

Paul Worsey, Ph.D., University of Newcastle upon Tyne (S&T) (15%)

Braden Lusk, Ph.D., University of Missouri Rolla (S&T) (S&T) (5%)

Associate Professor

Jason Baird, Ph.D., University of Missouri Rolla (Emeritus) (Missouri S&T) (5%)

Vilem Petr, Ph.D., Colorado School of Mines (CSM) (CSM) (5%)

Assistant Professor

Kyle Perry, Ph.D., University of Kentucky (Missouri S&T) (15%)

Catherine Johnson, Ph.D., University of Kentucky (Missouri S&T) (15%)

Gillian Worsey, Ph.D., University of Missouri-Rolla (Adj) (Missouri S&T) (10%)

Soekbin Lim, Ph.D., University of Missouri-Rolla (S&T) (NMIT) (5%)

Adjunct Industry Instructors Currently Teaching Courses at Missouri S&T

Matt Suttcliffe	(Premier Pyrotechnics) (5%)
Matthew Coy, M.S., Missouri S&T	(Missouri S&T) (5%)
Stephen Hall, M.S., Missouri S&T	Hercules (Retired) (5%)
Jerry Vail, M.S., Missouri S&T	(Missouri S&T) (10%)

We hope to broaden the scope of the program to involve professors from other disciplines on campus as the offering of courses expands. Some examples would be explosives chemistry, history of explosives, and shock wave physics, in addition to cooperation with the civil engineering department on blast resistance.

- This program will be supported with a combination of existing Missouri S&T regular faculty and adjunct industry instructors who will have a background and experience in explosives relevant to the subject matter being taught, and bring specialized and practical experience to the courses they will teach. Faculty from other academic institutions may also teach additional courses. This would leverage what we have and allow us to provide more complete and varied course offerings. The academic faculty are expected to hold a Ph.D. or its equivalent in their area of specialty.

- The estimated percentage of credit hours that will be assigned to full-time faculty: 80%.

- Faculty at Missouri S&T are expected to participate in teaching, research, service and outreach activities. Annual reviews, promotion and tenure, continuing membership on the graduate faculty and annual salary adjustments ensure the quality of faculty activities. The faculty of the explosives engineering program will be located in the Department of Mining and Nuclear Engineering. The name of the department will remain to reflect its undergraduate offerings. The tenure and promotion of the explosives faculty will continue to reside for the foreseeable future with the mining engineering program.

5.G. Alumni and Employer Survey

- Missouri S&T will develop an assessment and evaluation plan for the curriculum in explosives technology based on the ABET-accredited B.S.

program in mining engineering. This will be developed after the M.S. in Explosives Technology is approved. We expect a 90% satisfaction rate of the alumni of the program (based on experience from our mining graduates.) Surveys will be performed annually and given to those who earned their degree in that respective academic year. The surveys will be web based.

- Graduates will be tracked and Missouri S&T will develop an assessment and evaluation plan for gathering information by surveying the employers of the graduates after the program has graduated at least 5 persons. We expect 90% satisfaction from the employers. (Based on experience from mining program surveys.) Surveys will be performed annually and sent to the supervisor of the graduate who earned their degree in that respective academic year. The surveys will be web based.

5.H. Program Accreditation

- There is no accreditation for graduate programs in the explosives field. It is expected that the students will have bachelor's degrees from already accredited programs.

6. Security Considerations

The importance of explosives education is vital to civilian industry, government and the defense industry, yet explosives knowledge, like that from the majority of other technical disciplines, can also be used against society. Since the terrorist attacks on September 11, 2001, U.S. academic institutions have come under increasing scrutiny. The Safe Explosives Act of 2003 expanded the number of categories of persons banned from possessing explosives to include non-U.S. residents, those with dishonorable discharges from the military and those who have renounced their citizenship. This is in addition to felons, fugitives from justice and those who have been declared mentally defective. Not only is it illegal for these groups of people to have access to explosives but it is illegal for institutions to provide such persons with explosives without first obtaining a waiver from the U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives.

The Safe Explosives Act requires background checks for users of explosives and so each prospective student will require a completed background check. Proof of an existing background check, such as holding a state blaster's license or CDL with Hazmat endorsement, being a current member of law enforcement, military, appropriate government agency or national lab or holding a security clearance will be accepted. Otherwise a prospective student will have to pay for and undergo a highway patrol background check. This needs to be done before acceptance into the program as an entrance requirement.

Global Learning, strongly supports the teaching of explosives courses by distance to bona fide individuals and organizations, realizing that a degree of determination of the authenticity of these groups is necessary. Distance education is becoming increasingly important, especially to degreed professionals already entrenched in the work environment who are unable because of work or family commitments and/or financial consequences to pursue conventional higher education in specialist fields. Note: in order to actually handle explosives a student would need to study on campus. In addition distance students are vetted so that not just anyone would be enrolled in the program; they would have to be admitted by the registrar first.

7. References

1. Apodaca, L.E. "Explosives" USGS 2014 Minerals Yearbook, U.S. Department of the Interior, May 2016, pp 23.1-23.5.
2. Guberman, D.E. "Lead" USGS 2014 Minerals Yearbook, U.S. Department of the Interior, November 2016, pp 42.1-42.9.
3. Willett, J.C. "Stone, Crushed" USGS 2014 Minerals Yearbook, U.S. Department of the Interior, April 2016, pp 71.1-71.8.
4. Bureau of Labor Statistics "Explosives worker, ordnance handling experts, and blasters" National Employment Matrix 47-5031, U.S. Department of Labor, 2014.

Appendices

Appendix A – Letters of Support for the MS in Explosives Technology Program

Appendix B – Sequence of Current Explosives Engineering Courses at Missouri S&T

Appendix C – Graduate Catalogue Description of Program and Courses

Appendix D – MOU Between UM System and National Defense University

Appendix A

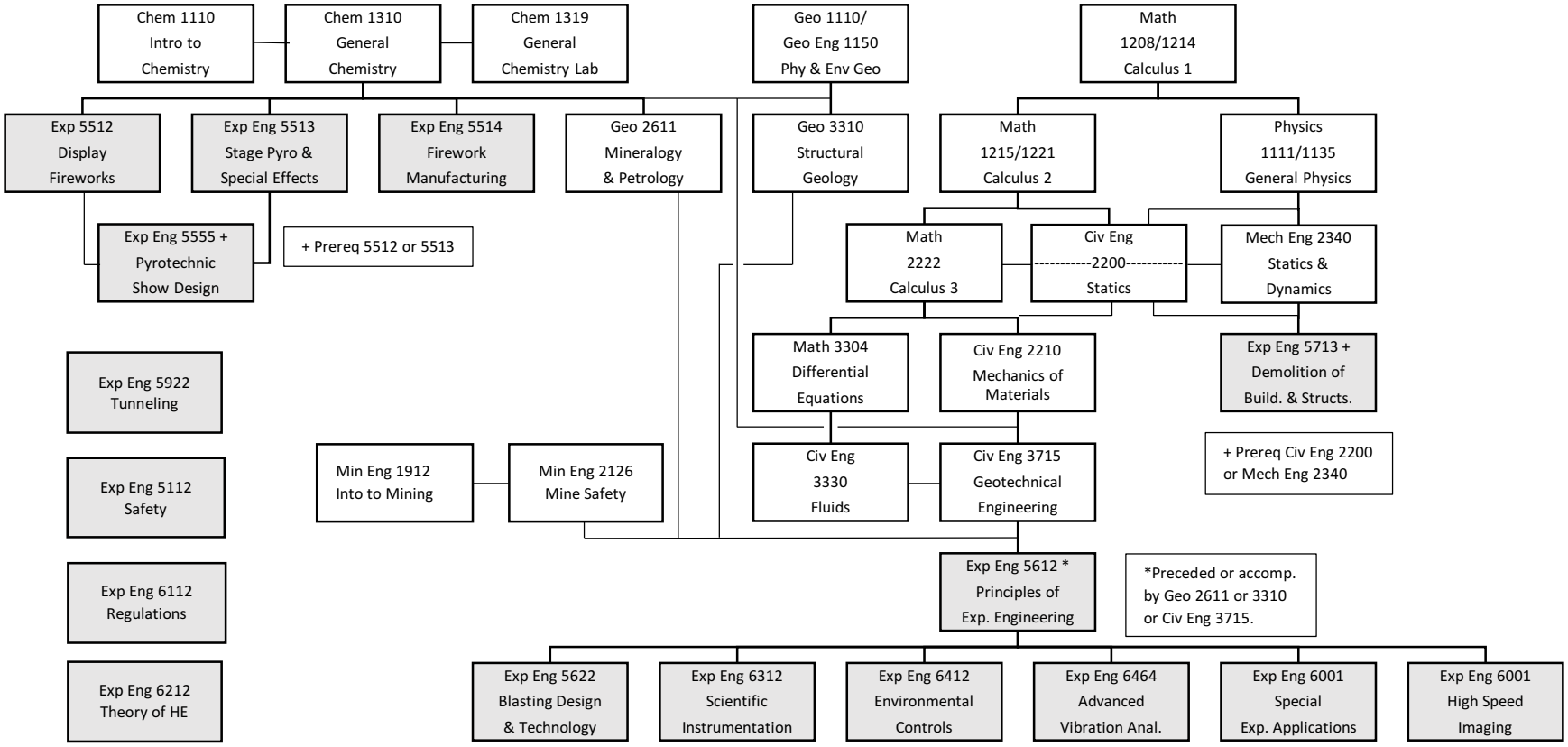
Letters of Support for the MS in Explosives Technology Program

Letters have been solicited and will be available by the end of April 2017

Appendix B

Sequence of Current Explosives Engineering Courses at Missouri S&T

Sequence of Current Explosives Courses at Missouri S&T



Appendix C

Graduate Catalogue Description of Program and Courses

Appendix C

Graduate Catalog Description

Explosives Engineering

The explosives engineering program in the department of mining and nuclear engineering offers the master of science (M.S.) and doctor of philosophy (Ph.D.) degrees and a minor and certificate in explosives engineering for students with bachelor's degrees in engineering, science or technology. It also offers an explosives technology certificate and master of science (MS) for those with other bachelor's degrees. Due to the age profile of the explosives industry and attrition of personnel, as well as the rapid change in technology within this field, there is an immediate and growing need for highly trained explosives professionals in both the civilian explosive, mining and civil excavating fields and government and the defense industry. Employers are looking for engineers and scientists with sophisticated skills in the integration of explosives technology into complex systems in a wide range of applications. Employers are also seeking M.S. and Ph.D. graduates because they can move quickly into managerial positions.

Faculty involved in a variety of explosives related research programs teach and direct the program in conjunction with instruction by industry specialists in a wide range of applications. Students will have opportunities to assist the faculty, both in research and teaching, as well as working alongside faculty and graduate students in other engineering and science fields such as civil, architectural, mechanical, chemical, aerospace, electrical, geological and materials engineering and geology, geophysics, chemistry and physics. The explosives engineering faculty and students will be active in the leading professional societies such as the International Society for Explosives Engineers and those in a wide range of associated areas. A security background check is required for all students in the program.

Masters

The M.S. program requires a minimum of 30 hours of graduate credit. A core of four courses is required of all students, and a module of allied courses in departments outside of explosives engineering is encouraged.

Degree Requirements

M.S. with thesis: The M.S. degree with thesis requires the completion of 24 hours of graduate course work and six hours of research (Exp Eng 6099), and the successful

completion and defense of a research thesis.

Four of the following core courses are required of all M.S. students in Explosives Engineering:

Exp Eng 5612	Principles of Explosives Engineering
Exp Eng 5622	Blasting Design and Technology
Exp Eng 5713	Demolition of Buildings and Structures
Exp Eng 5922	Tunneling and Underground Construction Techniques
Exp Eng 6412	Environmental Controls for Blasting
Exp Eng 6312	Scientific Instrumentation for Explosives and Blasting

Four of the following core courses are required of all M.S. students in Explosives Technology:

Exp Eng 5612	Principles of Explosives Engineering
Exp Eng 5622	Blasting Design and Technology
Exp Eng 5711	Explosives in Industry
Exp Eng 5713	Demolition of Buildings and Structures
Exp Eng 5721	Specialty Uses of Energetic Materials
Exp Eng 5914	Explosives Manufacturing
Exp Eng 5922	Tunneling and Underground Construction Techniques
Exp Eng 5711	Environmental Controls for Blasting
Exp Eng 5721	Scientific Instrumentation for Explosives and Blasting
Exp Eng 6112	Explosives Regulations

Students select 12 hours of Exp Eng and other appropriate elective courses. M.S. in explosives engineering and explosives technology candidates are advised to group out-of-department courses into a module that fits their special interest.

M.S. without thesis (by coursework): The M.S. degree without thesis requires the completion of 30 hours of graduate coursework with the same stipulations as above. The six hours of research is replaced by course work which may include an explosives related cooperative work experience (Exp Eng 6070) or industry project (Exp Eng 6080) with an established company or government agency commonly using explosives and an additional explosives course.

Ph.D. Degree Requirements

The Ph.D. degree requires a minimum of 3 years of full-time study beyond the bachelor's degree, including research work for the dissertation. Minimum requirements for Ph.D. candidates include completing 72 credit hours of graduate credit with at least 24 credit hours of dissertation research (Exp Eng 6099) and a minimum of 24 credit hours of coursework, with at least 15 credit hours of course work completed at Missouri S&T.

Students are encouraged to enroll in at least 15 credit hours of 6000-level lecture courses and are required to pass the qualifying, comprehensive and final oral examinations for the Ph.D. research.

Faculty

Faculty involved in the program include existing faculty from the Department of Mining and Nuclear Engineering at Missouri S&T and instructors from industry augmented by faculty from the Department of Civil Engineering at Missouri S&T and faculty from UMC, New Mexico Institute of Technology and Colorado School of Mines.

Professor

Paul Worsey, Ph.D., University of Newcastle upon Tyne	(Missouri S&T)
Braden Lusk, Ph.D., University of Missouri – Rolla	(Missouri S&T)

Associate Professor

Jason Baird, Ph.D., University of Missouri Rolla (Emeritus)	(Missouri S&T)
Vilem Petr, Ph.D., Colorado School of Mines (Adjunct)	(Colorado School of Mines)

Assistant Professor

Soekbin Lim, Ph.D., University of Missouri-Rolla (Adjunct)	(New Mexico Inst. of Technology)
Gillian Worsey, Ph.D., University of Missouri-Rolla (Adjunct)	(Missouri S&T)

Adjunct Industry Instructors Currently Teaching Courses at Missouri S&T

Matt Suttcliffe	Premier Pyrotechnics
Stephen Hall, M.S., Missouri S&T	Hercules (Retired)
Matthew Coy, M.S., Missouri S&T	Missouri S&T
Jerry Vail, M.S., Missouri S&T	Missouri S&T

Catalog Description of Explosives Engineering Courses

EXP ENG 5000 Special Problems **(IND 1.0-3.0)**
Problems or readings on specific subjects or projects in the department. Consent of instructor required.

EXP ENG 5001 Special Topics **(LAB 2.0 and LEC 1.0)**
This course is designed to give the department an opportunity to test a new course. Variable title.

EXP ENG 5112 Explosives Handling and Safety **(LEC 3.0)**
Basic handling & safety for explosives, explosive devices and ordnance related to laboratory handling, testing, manufacturing & storage, for both civil and defense applications. Classroom instruction only. Prerequisites: Junior Standing or above.

EXP ENG 5512 Commercial Pyrotechnics Operations **(LAB 1.0 and LEC 2.0)**
Provide participants with training preparing for Missouri Licensed Display Operator (Outdoor) License and advanced lead pyrotechnic operator training. Class work will be complemented by practical training in laboratory sessions, culminating in a full pyrotechnic show, from start to finish. Prerequisites: Both Chem 1310 and Chem 1319 or their equivalent; US Citizen or permanent resident, Successful background check, resident enrollment at Missouri S&T.

EXP ENG 5513 Stage Pyrotechnics and Special Effects **(LAB 2.0 and LEC 1.0)**
Use of energetic materials in close proximity to audiences. Provide participants with training preparing for Missouri Pyrotechnics Display Operators License. Covers: close proximity indoor and outdoor pyrotechnics and special effects. Working with stage crews and talent, safety and permitting. Prerequisites: Both Chem 1310 and Chem 1319 or their equivalent; US Citizen or permanent resident, Successful background check, resident enrollment at Missouri S&T.

EXP ENG 5514 Display Fireworks Manufacturing **(LAB 2.0 and LEC 1.0)**
Theory and practice of manufacturing display fireworks. Focusing on safety, chemical interaction, color development, basic theory, state and federal law. The lab will include hands on building of ball and canister shells and other pyrotechnic effects. Prerequisites: Chem 1310, Chem 1319, Chem 1100; one of Econ 1100, Econ 1200, Eng Mgt 1210; Successful background check.

EXP ENG 5555 Computer Fired Pyrotechnic Show Design and Firing System Operation **(LAB 2.0 and LEC 1.0)**
Students will learn to use music editing, electronic firing system operation and Fire One pyrotechnic choreography and simulation software to design their own pyromusical show programs. Creation of a musical sound track, selecting the fireworks and choreographing to the musical score. Create, setup, diagnose and fire a pyrotechnic show. Shooting of a choreographed display potentially may be off site. Prerequisites: Exp Eng 5512 or Exp Eng 5513 and successful background check.

EXP ENG 5612 Principles Of Explosives Engineering **(LAB 1.0 and LEC 2.0)**
Theory and application of explosives in the mining industry; explosives, initiating systems, characteristics of explosive reactions and rock breakage, fundamentals of blast design, drilling and blasting, regulatory and safety considerations. Prerequisites: Min Eng 2126; accompanied or

preceded by Civ Eng 3715 or Geology 3310 or Geology 2611; Successful background check. (Co-listed with Min Eng 5612).

EXP ENG 5622 Blasting Design And Technology **(LAB 1.0 and LEC 2.0)**
Advanced theory and application of explosives in excavation; detailed underground blast design; specialized blasting including blast casting, construction and pre-splitting. Introduction to blasting research. Examination of field applications. Prerequisites: Min Eng 5612. Student must be at least 21 years of age. Successful background check. (Co-listed with Min Eng 5622).

EXP ENG 5711 Explosives in Industry **(LEC 3.0)**
Overview of how explosives are applied in various industrial settings. Focus is placed on the general application, identification, and necessity of explosives in industry. Topics include explosive use in surface and underground mining, road development, construction, utility placement, demolition, oil, gas, and underwater.

EXP ENG 5713 Demolition of Buildings and Structures **(LAB 1.0 and LEC 2.0)**
Provide participants with basics and solid grounding in the equipment, techniques and processes required for the demolition and remediation of mine plant and processing equipment sites and non-mining structures such as buildings, factories, bridges, etc. Field trip required. Prerequisites: Preceded or accompanied by Civ Eng 2200 or Mech Eng 2340; US citizen or permanent resident; Successful background check.

EXP ENG 5721 Specialty Uses of Energetic Materials **(LEC 3.0)**
Overview of special, less common uses of energetic materials and how they can be applied as a functional tool. Topics include the use of energetics in aerospace, explosive ordnance, oil field development, welding, pyrotechnics, theatrics, and cinematic special effects.

EXP ENG 5914 Explosives Manufacturing **(LEC 3.0)**
History of industrial explosives from discovery to what is used today. Manufacturing processes for packaged and bulk explosives are explored along with specialty explosives such as detonating cord, cast boosters, detonators, shaped charges, and commercial fireworks. Field manufacturing of explosives by mixing or gassing is also covered.

EXP ENG 6000 Special Problems **(IND 1.0-3.0)**
Problems or readings on specific subjects or projects in the department. Consent of instructor required.

EXP ENG 6001 Special Topics **(LAB 0.0 and LEC 0.0)**
This course is designed to give the department an opportunity to test a new course. Variable title.

EXP ENG 6050 Continuous Registration **(IND 1.0)**
Doctoral candidates who have completed all requirements for the degree except the dissertation and are away from the campus must continue to enroll for at least one hour of credit each registration period until the degree is completed. Failure to do so may invalidate the candidacy. Billing will be automatic as will registration upon payment.

EXP ENG 6070 Graduate Cooperative Experience **(LAB 3.0)**

Students on an approved internship will complete a project designed by the advisor and employer. The project selected must require that student apply critical thinking skills and discipline specific knowledge in the work setting. A major report and a formal presentation are required. Prerequisite: 12 hours Exp Eng coursework.

EXP ENG 6080 Industry Project **(LAB 3.0)**
Students who are currently employed may complete a project in their work setting designed by the advisor and employer. The project selected must require that student apply critical thinking skills and discipline specific knowledge. A major report and a formal presentation are required. Prerequisite: 12 hours Exp Eng coursework.

EXP ENG 6099 Research **(IND 0.0-15)**
Investigations of an advanced nature leading to the preparation of a thesis or dissertation. Prerequisites: Consent of instructor required.

EXP ENG 6112 Explosives Regulations **(LEC 3.0)**
Comprehensive coverage of the federal regulations governing the explosives industry, including those governing storage of explosives (ATF), transportation of explosives (DOT and TSA), the environment (EPA) and use of explosives (OSM, MSHA and OSHA). Prerequisite: Graduate standing.

EXP ENG 6212 Theory Of High Explosives **(LEC 3.0)**
Study of the application of chemical thermodynamics and the hydrodynamic theory to determine the properties of high explosives; application of detonation theory to steady-state detonations in real explosives; application of the above to the blasting action of explosives. Prerequisite: Graduate Standing. (Co-listed with Min Eng 6632).

EXP ENG 6292 Research Methods **(LEC 3.0)**
Foundations, dimensions, and methods for designing and investigating research problems. Focus on fundamentals and applied research, research methods, literature review, experimental design and experimentation, dissertation composition, concepts of originality and intellectual property. Prerequisites: PhD students only. (Co-listed with Min Eng 6992).

EXP ENG 6312 Scientific Instrumentation For Explosives Testing & Blasting **(LAB 2.0 and LEC 1.0)**
Application of scientific principles, equipment description and operation for instrumentation of explosive events including blasting. Topics: Blast chamber design, set up, high-speed photography, motion detection and measurement, explosives sensitivity testing, explosives properties testing, vibration measurement & analysis, destruction & demilitarization. Prerequisite: Exp Eng 5612 and Successful background check.

EXP ENG 6412 Environmental Controls For Blasting **(LAB 1.0 and LEC 2.0)**
Advanced blast mechanics; overbreak control including comprehensive coverage of perimeter and smoothwall specialist blasting techniques and geotechnical factors affecting blast vibration, limits analysis monitoring and control; air blast control including limits, monitoring and atmospheric and topographic effects. Prerequisites: Min Eng 5612, Successful background check. (Co-listed with Min Eng 6622).

University of Missouri, New Program Proposals Financial Projections, Expenditures

Please ONLY add data in the yellow blocks.

	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021

The spreadsheets are designed to collect all financial information associated with starting a new degree program. It will collect information about one time start up costs as well as ongoing costs to run a program. It is tailored for each campus and will calculate items automatically based on specific campus costs or fees. Pay special attention to any notes of explanation. If you have questions about how to complete the cost and revenue section, contact the Office of the Vice President for Academic Affairs at 573-882-3119.

One time Expenditures

This section includes information about one-time start up costs to launch a program. If you need NEW space contact the Office of Academic Affairs for these numbers. If you need SUBSTANTIALLY REMODELED SPACE please complete the "Space Costs" Worksheet and these costs will be added for you based upon your campus rates. If you are using existing facilities these worksheets do not calculate a charge for space. Other one time charges include equipment, library additions, consultants and miscellaneous charges. Please add an estimated charge in the year that one time charge is anticipated. A three year replacement schedule would be considered one time for these worksheets. If you buy a piece of equipment in 2013 and plan to replace it in FY2015 put a charge in both years.

Remodeling Costs	-	-	-	-	-	

Equipment

Equipment is classified into Capital and Non Capital Equipment. To be considered capital a single piece of equipment must exceed $5000. If equipment costs less than $5000 per item it is classified as NON Capital Equipment. Example: If you purchased six $1000 computers these computers would be classified as Non Capital Equipment. If you purchased one $6000 computer this computer would be classified as capital equipment.

Capital Equipment (>$5,000/unit)						
Please List						
Total Capital Equipment	-	-	-	-	-	
Non Capital Equipment (<$5,000/unit)						
Please List						
Total NonCapital Equipment	-	-	-	-	-	
Library						
Consultants						
Other one time charges						
Mining E&E		-	10,000	10,000	10,000	10,000
New Faculty Startup			60,000			
Total Other Charges	-	-	70,000	10,000	10,000	10,000
Total One Time Charges	**-**	**-**	**70,000**	**10,000**	**10,000**	**10,000**

Recurring Expenditures

This section includes information about ongoing or recurring expenses associated with a program. Recurring charges include Salaries & Wages, Staff Benefits, ongoing equipment and replacement costs, library licenses, consultants and miscellaneous charges. Please add an estimated charge to each year of the projection. Note that there are sections for benefit eligible and non-benefit eligible employees. The appropriate staff benefits charges will be automatically calculated for the employees who are benefit eligible.

Benefit Eligible Salaries--All staff are benefit eligible EXCEPT those working less than .75 FTE or are temporary.

	Faculty Position						
1				-	-	-	
2	Paul				5,947	12,131	18,561
3	Kyle				4,682	9,551	14,613
4	Catherine				4,124	8,413	12,871
5	New Faculty				40,000	61,200	62,424
6							
7							
8							
9							
10							
		-	-	-	54,753	91,295	108,469
	Support Staff (List each position and salary)						
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
		-	-	-	-	-	

Salaries are based on a 2% yearly increase

NON Benefit Eligible --Part time (less than .75 FTE) and/or are Temporary

Faculty Position						
1						
2						
3						
4						
5						
	-	-	-	-	-	
Support Staff						
1						
2						
3						
4						
5						
	-	-	-	-	-	
Students (FICA exempt)						
1						
2						
3						
4						
5						
	-	-	-	-	-	
Staff Benefits (Benefit eligible)	-	-	-	19,400	32,300	38,400
Staff Benefits (Benefit non-eligible)	-	-	-	-	-	-
Total Staff Benefits	-	-	-	19,400	32,300	38,400
GTA/GRA Stipends		24,638	24,884	25,133	25,385	25,638
Departmental Operating Expenses						
Number of Employees						
Total Departmental Operating Expenses	-	-	-	-	-	

Recurring Equipment Purchases -- Equipment that will be replaced each year

Equipment is classified into Capital and Non Capital Equipment. To be considered capital a single piece of equipment must exceed $5000. If equipment costs less than $5000 per item it is classified as NONCapital Equipment. Example: If you purchased six $1000 computers these computers would be classified as Non Capital Equipment. If you purchased one $6000 computer this computer would be classified as capital equipment.

Capital Equipment						
Please List						
Total Capital Equipment	-	-	-	-	-	
Non Capital Equipment						
Please List						
Total NonCapital Equipment	-	-	-	-	-	
Library						
Additional Databases Licenses						
Additional Publications						
Additional Other Please List						
Total Library Charges	-	-	-	-	-	
Operating Space Costs	-	-	-	-	-	
Other costs please list						
Travel						
Advertising						
Miscellaneous office						
Total Other Costs	-	-	-	-	-	
Total Recurring Costs	**-**	**24,638**	**24,884**	**99,286**	**148,980**	**172,507**
Total New Program Costs	**-**	**24,638**	**94,884**	**109,286**	**158,980**	**182,507**

Notes						
1 Departmental operating costs associated with employees	3,000	3,000	3,000	3,000	3,000	3,000
2 Projected Flat Staff Benefit Rate	0.2772	0.2772	0.2772	0.2772	0.2772	0.2772
3 FICA	0.0765	0.0765	0.0765	0.0765	0.0765	0.0765

Revenue	-	33,326	109,632	209,574	267,456	292,945
Net revenue	-	8,688	14,747	100,287	108,477	110,438
Cumulative	-	8,688	23,435	123,723	232,200	342,637

University of Missouri, New Program Proposals Financial Projections, Revenues

Revenues	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
State Aid CBHE						
State Aid DESE						

Provide Credit Hours generated within the proposed program

Please place a **1** in front of your campus

	Columbia		Kansas City	1	Rolla		St Louis	

Tuition

Tuition can only be counted to the extent that students entering the program are new students from outside the university. A new program cannot count students who were already at the university but have diverted to this program from another program. In addition a new program may ONLY count the student credit hours directly attributed to the new program's classes taught. For example a new program in Life Sciences may not count a required class not in the new program in it's revenue calculation. If a program has classes that produce a supplemental fee such as engineering, these supplemental fees should be included in the analysis.

												FY15 Rates	FY16 Rates	FY17 Rates	FY18 Rates	FY19 Rates	FY20 Rates	FY21 Rates
													Inflation	1.02	1.02	1.02	1.02	1.02	1.02
In State Undergraduate Credit Hours Generated-MU		-		-		-		-		-		274.0	279.5	285.1	290.8	296.6	302.5	308.6
In State Undergraduate Credit Hours Generated-MST		-		-		-		-		-		274.0	279.5	285.1	290.8	296.6	302.5	308.6
In State Undergraduate Credit Hours Generated-UMKC		-		-		-		-		-		270.1	275.5	281.0	286.6	292.3	298.1	304.1
In State Undergraduate Credit Hours Generated-UMSL		-		-		-		-		-		315.8	322.1	328.6	335.2	341.9	348.7	355.7
Out State Undergraduate Credit Hours Generated-MU		-		-		-		-		-		774.9	790.4	806.2	822.3	838.7	855.5	872.6
Out State Undergraduate Credit Hours Generated-MST		-		-		-		-		-		802.9	819.0	835.3	852.0	869.0	886.4	904.1
Out State Undergraduate Credit Hours Generated-UMKC		-		-		-		-		-		705.4	719.5	733.9	748.6	763.6	778.9	794.5
Out State Undergraduate Credit Hours Generated-UMSL		-		-		-		-		-		826.5	843.0	859.9	877.1	894.6	912.5	930.8
In State Graduate Credit Hours Generated-MU		-		-		-		-		-		347.3	354.2	361.3	368.5	375.9	383.4	391.1
In State Graduate Credit Hours Generated-MST		-		-		-		-		-		375.7	383.2	390.9	398.7	406.7	414.8	423.1
In State Graduate Credit Hours Generated-UMKC		-		-		-		-		-		342.5	349.4	356.3	363.4	370.7	378.1	385.7
In State Graduate Credit Hours Generated-UMSL		-		-		-		-		-		415.2	423.5	432.0	440.6	449.4	458.4	467.6
Out State Graduate Credit Hours Generated-MU		-		-		-		-		-		910.1	928.3	946.9	965.8	985.1	1,004.8	1,024.9
Out State Graduate Credit Hours Generated-MST		-	0	-	60	69,648	150	177,600	180	217,386	210	258,689	1,012.8	1,033.1	1,138.0	1,160.8	1,184.0	1,207.7	1,231.9
Out State Graduate Credit Hours Generated-UMKC		-		-		-		-		-			884.2	901.9	919.9	938.3	957.1	976.2	995.7
Out State Graduate Credit Hours Generated-UMSL		-		-		-		-		-			1,023.6	1,044.1	1,065.0	1,086.3	1,108.0	1,130.2	1,152.8
Subtotal		-		-		69,648		177,600		217,386		258,689							
Educational Fee Discounting		-		-		36,287		92,530		113,258		134,777							
Total Fees (Net)		-		-		33,361		85,070		104,128		123,912							

Supplemental Fees

If your program falls into the following categories, Supplemental fees are charged. Please enter the credit hours generated by the program each year in the yellow blocks.

										FY15 Rates	FY16 Rates	FY17 Rates	FY18 Rates	FY19 Rates	FY20 Rates	
Information Technology Fee - MU	-		-		-		-		-	13.0	13.3	13.5	13.8	14.1	14.4	14.7
College of Ag, Food and Natural Resources Course Fee - MU	-		-		-		-		-	48.7	49.7	50.7	51.7	52.7	53.8	54.9
College of Arts & Science Course Fee - MU	-		-		-		-		-	25.0	25.5	26.0	26.5	27.0	27.5	28.1
Trulaske College of Business Undergraduate Course Fee - MU	-		-		-		-		-	72.4	73.8	75.3	76.8	78.3	79.9	81.5
Trulaske College of Business Graduate Course Fee - MU	-		-		-		-		-	85.0	86.7	88.4	90.2	92.0	93.8	95.7
College of Education Graduate Course Fee - MU	-		-		-		-		-	40.2	41.0	41.8	42.6	43.5	44.4	45.3
College of Education Undergrad Course Fee - MU	-		-		-		-		-	47.6	48.6	49.5	50.5	51.5	52.5	53.6
College of Engineering Course Fee - MU	-		-		-		-		-	79.6	81.2	82.8	84.5	86.2	87.9	89.7
Engineering Excellence Course Fee - Resident - MU	-		-		-		-		-	30.0	30.6	31.2	31.8	32.4	33.0	33.7
Engineering Excellence Course Fee -Non-Resident - MU	-		-		-		-		-	70.0	71.4	72.8	74.3	75.8	77.3	78.8
School of Health Professions Course Fee - MU	-		-		-		-		-	92.4	94.2	96.1	98.0	100.0	102.0	104.0
Health Management and Informatics Course Fee - MU	-		-		-		-		-	30.0	30.6	31.2	31.8	32.4	33.0	33.7
School of Journalism Course Fee - MU	-		-		-		-		-	74.0	75.5	77.0	78.5	80.1	81.7	83.3
Sinclair School of Nursing Clinical Nursing Graduate Fee - MU	-		-		-		-		-	190.0	193.8	197.7	201.7	205.7	209.8	214.0
Sinclair School of Nursing Undergraduate Course Fee - MU	-		-		-		-		-	70.0	71.4	72.8	74.3	75.8	77.3	78.8
College of Human Environmental Sciences Course Fee - MU	-		-		-		-		-	43.5	44.4	45.3	46.2	47.1	48.0	49.0
Truman School Course Fee - MU	-		-		-		-		-	40.0	40.8	41.6	42.4	43.2	44.1	45.0
* Accountancy Program Fee - MU	-		-		-		-		-	400.0	408.0	416.2	424.5	433.0	441.7	450.5
* Medical School Laboratory/Resource Fee - MU	-		-		-		-		-	593.7	605.6	617.7	630.1	642.7	655.6	668.7
* Applied Music Fee - MU	-		-		-		-		-	234.3	239.0	243.8	248.7	253.7	258.8	264.0
Graduate eLearning and Special Program Delivery Tuition Minimum - MU	-		-		-		-		-	347.3	354.2	361.3	368.5	375.9	383.4	391.1
Graduate eLearning and Special Program Delivery Tuition Maximum - MU	-		-		-		-		-	1,500.0	1,530.0	1,560.6	1,591.8	1,623.6	1,656.1	1,689.2
eLearning Vet Med-Deans Certificate Courses in Vet Biomed Tech - MU	-		-		-		-		-	391.6	399.4	407.4	415.5	423.8	432.3	440.9
Undergrad eLearning (distance students only) - Nonresident - MU	-		-		-		-		-	350.0	357.0	364.1	371.4	378.8	386.4	394.1
* Examination Only - Graduate Enrollment - MU	-		-		-		-		-	347.3	354.2	361.3	368.5	375.9	383.4	391.1
CE Instructional Fee - Minimum - MU	-		-		-		-		-	274.0	279.5	285.1	290.8	296.6	302.5	308.6
CE Instructional Fee - Maximum - MU	-		-		-		-		-	1,000.0	1,020.0	1,040.4	1,061.2	1,082.4	1,104.0	1,126.1
Information Technology Fee - UMKC	-		-		-		-		-	13.6	13.9	14.1	14.4	14.7	15.0	15.3
Graduate Cluster 1 Supplemental Fee - UMKC	-		-		-		-		-	37.0	37.7	38.5	39.3	40.1	40.9	41.7
Bloch School Graduate Business Supplemental Fee - UMKC	-		-		-		-		-	84.0	85.7	87.4	89.1	90.9	92.7	94.6
Bloch School Undergraduate Course Fee - UMKC	-		-		-		-		-	38.4	39.2	40.0	40.8	41.6	42.4	43.2
Bloch School Public Administration Graduate Course Fee - UMKC	-		-		-		-		-	30.0	30.6	31.2	31.8	32.4	33.0	33.7
School of Education Course Fee - UMKC	-		-		-		-		-	15.5	15.8	16.1	16.4	16.7	17.0	17.3
Engineering Course Fee (undergrad and engineering grad cluster) - UMKC	-		-		-		-		-	72.2	73.6	75.1	76.6	78.1	79.7	81.3
Studio Arts Fee, UMSL (BFA), & UMKC - UMKC	-		-		-		-		-	28.2	28.8	29.3	29.9	30.5	31.1	31.7
Clinical Nursing Fee, MS (& Pre-Licensure level at UMKC) - UMKC	-		-		-		-		-	185.7	189.4	193.2	197.1	201.0	205.0	209.1
Science Lab Fee, including Geo Science - UMKC	-		-		-		-		-	12.5	12.8	13.0	13.3	13.6	13.9	14.2
Biological Sciences Lab Fee - UMKC	-		-		-		-		-	12.9	13.2	13.4	13.7	14.0	14.3	14.6

University of Missouri, New Program Proposals Financial Projections, Revenues

Revenues	FY2016		FY2017		FY2018		FY2019		FY2020		FY2021								
State Aid CBHE																			
State Aid DESE																			
Provide Credit Hours generated within the proposed program																			
Please place a **1** in front of your campus		Columbia		Kansas City	1	Rolla		St Louis											
Media & Communications Studies Lab/Studio Course Fee - UMKC		-		-		-		-		-			31.1	31.7	32.4	33.0	33.7	34.4	35.1
* Applied Dance Fee - UMKC		-		-		-		-		-			167.0	170.3	173.7	177.2	180.7	184.3	188.0
* Studio Voice Fee - UMKC		-		-		-		-		-			254.0	259.1	264.3	269.6	275.0	280.5	286.1
* Applied Music Fee - UMKC		-		-		-		-		-			231.0	235.6	240.3	245.1	250.0	255.0	260.1
Graduate eLearning and Special Program Delivery Tuition Minimum - UMKC		-		-		-		-		-			342.5	349.4	356.3	363.4	370.7	378.1	385.7
Graduate eLearning and Special Program Delivery Tuition Maximum - UMKC		-		-		-		-		-			884.2	901.9	919.9	938.3	957.1	976.2	995.7
* Examination Only - Graduate Enrollment - UMKC		-		-		-		-		-			342.5	349.4	356.3	363.4	370.7	378.1	385.7
CE Instructional Fee - Minimum - UMKC		-		-		-		-		-			270.1	275.5	281.0	286.6	292.3	298.1	304.1
CE Instructional Fee - Maximum - UMKC		-		-		-		-		-			884.2	901.9	919.9	938.3	957.1	976.2	995.7
Information Technology Fee - MST		-	0	-	60	876	150	2,235	180	2,736	210	3,256	13.8	14.0	14.3	14.6	14.9	15.2	15.5
Engineering Course Fee - MST		-	0	-	60	8,742	150	22,290	180	27,288	210	32,473	90.5	140.0	142.8	145.7	148.6	151.6	154.6
Science Supplemental Fee for Biological Sciences and Chemistry - MST		-		-		-		-		-			88.0	89.8	91.6	93.4	95.3	97.2	99.1
Science Supplemental Fee for Computer Science, Geology, and Geophysics - MST		-		-		-		-		-			86.5	88.2	90.0	91.8	93.6	95.5	97.4
Science Supplemental Fee for Physics - MST		-		-		-		-		-			43.1	44.0	44.8	45.7	46.6	47.5	48.5
Business, IS&T and M&IS Course Fee - MST		-		-		-		-		-			44.0	44.9	45.8	46.7	47.6	48.6	49.6
Graduate eLearning and Special Program Delivery Tuition Minimum - MST		-		-		-		-		-			375.7	383.2	390.9	398.7	406.7	414.8	423.1
Graduate eLearning and Special Program Delivery Tuition Maximum - MST		-	30	33,326	60	66,652	90	99,978	120	133,304	120	133,304	3,000.0	3,060.0	1,110.9	1,110.9	1,110.9	1,110.9	1,110.9
* Examination Only - Graduate Enrollment - MST		-		-		-		-		-			375.7	383.2	390.9	398.7	406.7	414.8	423.1
CE Instructional Fee - Minimum - MST		-		-		-		-		-			274.0	279.5	285.1	290.8	296.6	302.5	308.6
CE Instructional Fee - Maximum - MST		-		-		-		-		-			3,000.0	3,060.0	3,121.2	3,183.6	3,247.3	3,312.2	3,378.4
Graduate Cluster 1 Supplemental Fee - UMSL		-		-		-		-		-			38.3	39.1	39.8	40.6	41.4	42.2	43.0
Graduate Cluster 2 Supplemental Fee - UMSL		-		-		-		-		-			69.2	70.6	72.0	73.4	74.9	76.4	77.9
Business School Undergraduate Course Fee - UMSL		-		-		-		-		-			41.0	41.8	42.7	43.6	44.5	45.4	46.3
Engineering Course Fee - UMSL		-		-		-		-		-			69.2	70.6	72.0	73.4	74.9	76.4	77.9
Studio Arts Fee, UMSL (BFA) - UMSL		-		-		-		-		-			29.1	29.7	30.3	30.9	31.5	32.1	32.7
Clinical Nursing Fee, MS - UMSL		-		-		-		-		-			192.0	195.8	199.8	203.8	207.9	212.1	216.3
Nursing Course Fee, BSN, 4-Year - UMSL		-		-		-		-		-			177.7	181.3	184.9	188.6	192.4	196.2	200.1
Science Lab Fee - UMSL		-		-		-		-		-			12.7	13.0	13.2	13.5	13.8	14.1	14.4
Media & Communications Studies Lab/Studio Course Fee - UMSL		-		-		-		-		-			31.2	31.8	32.5	33.2	33.9	34.6	35.3
Social Work Practicum Supplemental Fee - UMSL		-		-		-		-		-			5.6	5.7	5.8	5.9	6.0	6.1	6.2
Theater and Dance Supplemental Fee - UMSL		-		-		-		-		-			31.2	31.8	32.5	33.2	33.9	34.6	35.3
College of Education Supplemental Fee - UMSL		-		-		-		-		-			5.1	5.2	5.3	5.4	5.5	5.6	5.7
Art History Supplemental Fee - UMSL		-		-		-		-		-			3.3	3.4	3.4	3.5	3.6	3.7	3.8
* Applied Music Fee - UMSL		-		-		-		-		-			238.7	243.5	248.3	253.3	258.4	263.6	268.9
* Optometry Supplemental Fee - New - UMSL		-		-		-		-		-			450.0	459.0	468.2	477.6	487.2	496.9	506.8
Graduate eLearning and Special Program Delivery Tuition Minimum - UMSL		-		-		-		-		-			415.2	423.5	432.0	440.6	449.4	458.4	467.6
Graduate eLearning and Special Program Delivery Tuition Maximum - UMSL		-		-		-		-		-			2,000.0	2,040.0	2,080.8	2,122.4	2,164.8	2,208.1	2,252.3
UMSL Online Supplemental Fee - UMSL		-		-		-		-		-			59.2	60.4	61.6	62.8	64.1	65.4	66.7
Nursing Undergraduate Online Program - UMSL		-		-		-		-		-			451.8	460.8	470.1	479.5	489.1	498.9	508.9
CE Distance Learning Fee - Business - UMSL		-		-		-		-		-			51.1	52.1	53.2	54.3	55.4	56.5	57.6
CE Distance Learning Fee - Education - UMSL		-		-		-		-		-			15.1	15.4	15.7	16.0	16.3	16.6	16.9
CE Distance Learning Fee - Nursing - UMSL		-		-		-		-		-			71.4	72.8	74.3	75.8	77.3	78.8	80.4
CE Distance Learning Fee - (all Other) - UMSL		-		-		-		-		-			10.0	10.2	10.4	10.6	10.8	11.0	11.2
* Examination Only - Graduate Enrollment - UMSL		-		-		-		-		-			415.2	423.5	432.0	440.6	449.4	458.4	467.6
CE Instructional Fee - Minimum - UMSL		-		-		-		-		-			315.8	322.1	328.6	335.2	341.9	348.7	355.7
CE Instructional Fee - Maximum - UMSL		-		-		-		-		-			2,000.0	2,040.0	2,080.8	2,122.4	2,164.8	2,208.1	2,252.3
**Flat Rate*		-		33,326		76,270		124,503		163,328		169,033							
Institutional/Resources																			
It is unlikely there would any funds here unless a new program has a firm commitment for support.																			
Other																			
Examples: Sales of Educational Activities such as Clinic revenue for health related programs																			
Total Revenue Generated by New Program		**-**		**33,326**		**109,632**		**209,574**		**267,456**		**292,945**							

C	In State Undergraduate Discount Rate	0.17	-	0.17	-	0.17	-	0.17	-	0.17	-
C	Out State Undergraduate Discount Rate	0.26	-	0.26	-	0.26	-	0.26	-	0.26	-
C	In State Graduate Discount Rate	0.52	-	0.52	-	0.52	-	0.52	-	0.52	-
C	Out State Graduate Discount Rate	0.80	-	0.80	-	0.80	-	0.80	-	0.80	-
K	In State Undergraduate Discount Rate	0.16	-	0.16	-	0.16	-	0.16	-	0.16	-
K	Out State Undergraduate Discount Rate	0.30	-	0.30	-	0.30	-	0.30	-	0.30	-

University of Missouri, New Program Proposals Financial Projections, Revenues

Revenues		FY2016		FY2017		FY2018		FY2019		FY2020		FY2021	
State Aid CBHE													
State Aid DESE													
Provide Credit Hours generated within the proposed program													
Please place a **1** in front of your campus			Columbia		Kansas City	1	Rolla		St Louis				
K	In State Graduate Discount Rate	0.11	-	0.11	-	0.11	-	0.11	-	0.11	-		
K	Out State Graduate Discount Rate	0.49	-	0.49	-	0.49	-	0.49	-	0.49	-		
R	In State Undergraduate Discount Rate	0.26	-	0.26	-	0.26	-	0.26	-	0.26	-		
R	Out State Undergraduate Discount Rate	0.36	-	0.36	-	0.36	-	0.36	-	0.36	-		
R	In State Graduate Discount Rate	0.43	-	0.43	-	0.43	-	0.43	-	0.43	-		
R	Out State Graduate Discount Rate	0.52	-	0.52	-	0.52	36,287	0.52	92,530	0.52	113,258	0.52	134,777
S	In State Undergraduate Discount Rate	0.16	-	0.16	-	0.16	-	0.16	-	0.16	-		
S	Out State Undergraduate Discount Rate	0.26	-	0.26	-	0.26	-	0.26	-	0.26	-		
S	In State Graduate Discount Rate	0.11	-	0.11	-	0.11	-	0.11	-	0.11	-		
S	Out State Graduate Discount Rate	0.48	-	0.48	-	0.48	-	0.48	-	0.48	-		

Rates are calculated by pulling actual Fee and Aid numbers from the system.

University of Missouri, New Program Proposals Financial Projections, Substantially Modified Space

PLEASE only add data in the yellow blocks

A new program requires a location. Faculty and staff need office space, students need classroom space, and depending upon the program, laboratories, study space, or other miscellaneous space may be needed. Only complete the following section for **SUBSTANTIALLY MODIFIED** space needs. If there are available classrooms/offices/labs etc. not being utilized, your program could use, do not fill out the corresponding section. If there is inadequate capacity in one of these areas new or refurbished space is needed. This section will help account for one time costs such as construction/refurbishing and for recurring costs including: maintenance and repair, heating, cooling, and janitorial.

Is there space available the program could utilize? (yes/no) Yes

Please place a **1** in front of your campus ___ Columbia ___ Kansas City ___ Rolla ___ St Louis

	FY2016	FY2017	FY2018	FY2019	FY2020

Complete ONLY ONE section below. If you know the exact square feet of space you need fill out alternative 1. If you are unsure about how much space you need, fill out alternative 2. Costs will be calculated and transferred to the expenditures worksheet so all costs can be shown together.

Alternative 1

Space Required (enter Square Feet)	Initial Needs	ONLY include Additional Space Needed as Program Grows			
Office Space					
Hi Tech Classroom					
General Classroom					
Lab-Computer					
Lab-Engineering					
Lab-Science					
Lab-Research					
Miscellaneous Space					
Total Space Needed	-	-	-	-	-

Alternative 2

Standard Space Required(enter Square Feet)	Initial Needs	ONLY include Additional Space Needed as Program Grows				Standard space required by square foot	
	Enter the number of offices/classrooms/labs etc in Columns D,F,H,J,L,N						
Offices	-	-	-	-	-	150	(140-160)
HiTech Classrooms							
Classroom (<=25 students)	-	-	-	-	-	625	
Classroom (<=50 students)	-	-	-	-	-	1,250	
Classroom (<=100 students)	-	-	-	-	-	2,500	
Classroom (>100 students)	-	-	-	-	-	3,000	(25 SF/student)
General Classrooms							
Classroom (<=25 students)	-	-	-	-	-	500	
Classroom (<=50 students)	-	-	-	-	-	1,000	
Classroom (<=100 students)	-	-	-	-	-	2,000	
Classroom (>100 students)	-	-	-	-	-	3,000	(20 SF/student)
Lab Space 30 person lab							
Lab-Computer	-	-	-	-	-	1,050	
Lab-Engineering	-	-	-	-	-	1,500	
Lab-Science	-	-	-	-	-	3,750	
Lab-Research	-	-	-	-	-	9,000	(intensive (varies))
Miscellaneous Space	-	-	-	-	-	450	
Total Space Needed	-	-	-	-	-		

Rehabilitation/Construction Costs

						Cost to construct per gross square foot
Office Space	-	-	-	-	-	185
Classroom high tech	-	-	-	-	-	230
Classroom general	-	-	-	-	-	186
Lab-Computer	-	-	-	-	-	186
Lab-Engineering	-	-	-	-	-	195
Lab-Science	-	-	-	-	-	249
Lab-Research	-	-	-	-	-	301
Miscellaneous Space	-	-	-	-	-	151
Total Rehab/Const Cost	-	-	-	-	-	

Recurring Costs

Columbia

Operations, Maint & Repair						5.04
Office Space	-	-	-	-	-	
Classroom High Tech	-	-	-	-	-	
Classroom General	-	-	-	-	-	
Lab-Computer	-	-	-	-	-	
Lab-Engineering	-	-	-	-	-	
Lab-Science	-	-	-	-	-	
Lab-Research	-	-	-	-	-	

Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	
Kansas City						
Operations, Maint & Repair						5.51
Office Space	-	-	-	-	-	
Classroom High Tech	-	-	-	-	-	
Classroom General	-	-	-	-	-	
Lab-Computer	-	-	-	-	-	
Lab-Engineering	-	-	-	-	-	
Lab-Science	-	-	-	-	-	
Lab-Research	-	-	-	-	-	
Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	
Rolla						
Operations, Maint & Repair						5.57
Office Space	-	-	-	-	-	
Classroom High Tech	-	-	-	-	-	
Classroom General	-	-	-	-	-	
Lab-Computer	-	-	-	-	-	
Lab-Engineering	-	-	-	-	-	
Lab-Science	-	-	-	-	-	
Lab-Research	-	-	-	-	-	
Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	
St Louis						
Operations, Maint & Repair						4.44
Office Space	-	-	-	-	-	
Classroom High Tech	-	-	-	-	-	
Classroom General	-	-	-	-	-	
Lab-Computer	-	-	-	-	-	
Lab-Engineering	-	-	-	-	-	
Lab-Science	-	-	-	-	-	
Lab-Research	-	-	-	-	-	
Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	