Campus Curricula Committee Meeting Agenda
October 3, 2017
8:30am - 10:00am, 106 Parker Hall
(For Faculty Senate Meeting of October 19, 2017)

Review of submitted Course Change forms:

File: 1680.5	CER ENG 4220: Mechanical Properties Of Ceramics
File: 174.2	CHEM ENG 4320: Corrosion And Its Prevention
File: 2375.3	COMP ENG 5450: Digital Image Processing
File: 180.4	COMP ENG 5460: Machine Vision
File: 4097.2	COMP SCI 5402: Introduction to Data Mining
File: 1530.1	ELEC ENG 5120: Communication Circuits
File: 958.3	ELEC ENG 5400: Digital Signal Processing II
File: 273.1	ELEC ENG 5420: Communications Systems II
File: 1237.1	ELEC ENG 5430: Wireless Networks
File: 202.1	HISTORY 3762: American Foreign Policy Since 1945
File: 925.5	IS&T 4641: Digital Commerce and the Internet of Things
File: 4364.4	IS&T 5131: Foundations of Computer Architecture
File: 4352.4	IS&T 5423: Foundations of Data Management
File: 961.3	IS&T 6641: Advanced Digital Commerce and the Internet of Things
File: 431.1	MIN ENG 4412: Aggregate Materials Characterization, Sizing and Dimension Stone
File: 805.1	SYS ENG 6213: Deep Learning and Advanced Neural Networks

Review of submitted Experimental Course forms:

File: 4440	CHEM ENG 4001.001: Introduction to Phase Equilibrium
File: 4442	CHEM ENG 5001.003: Introduction to Pharmaceutical Engineering
File: 4475	CHEM ENG 6001.001: Advanced Pharmaceutical Engineering
File: 4473	ENGLISH 3001.005: Language in Society
File: 4477	ENGLISH 3001.006: Sustainable Foods in Latin American Literature
File: 4472	GEO ENG 6001.001: Advanced Engineering Geology & Geotechnics
File: 4447	MATH 6001.002: Finite Difference and Spectral Methods for Partial Differential Equations
File: 4439	PET ENG 4001.003: Safety Systems Management in Drilling
File: 4438	PSYCH 3001.002: Positive Psychology

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: 4408	ENG MGT 6216: Financial Data Analysis
File: 249	PROPOSED : Master of Science in Explosives Technology

Course Inventory Change Request

Date Submitted: 08/29/17 8:04 am

Viewing: **CER ENG 4220 : Mechanical Properties Of Ceramics**

File: 1680.5

Last approved: 06/26/17 3:14 am

Last edit: 08/31/17 12:39 pm

Changes proposed by: smiller

Programs referencing this course

CR ENG-BS: Ceramic Engineering BS

Requested Effective Change Date **Spring 2018** ~~Fall 2017~~

Department

Materials Science & Engineering

Discipline

Ceramic Engineering (CER ENG)

Course Number 4220

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. 08/29/17 8:24 am Greg Hilmas (ghilmas): Approved for RMATSENG Chair
2. 08/29/17 10:01 am Brittany Parnell

(ershenb): Approved for CCC Secretary
3. 09/08/17 2:47 pm sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:27 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Jun 26, 2017 by smiller (1680.1)

Mechanical Properties Of Ceramics

Abbreviated Course Title: Mech Prop Of Ceramics

Catalog Description:

This course will treat the theory and testing practice related to design based on the mechanical properties of ceramics. ~~The course also includes laboratory experiments for the characterization of the mechanical properties of ceramics.~~

Prerequisites:

A grade of "C" or better in Civ Eng 2210.

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:

Deleted the one hour lab component to combine with two other hours to create a required ICME class

Semesters previously offered as an experimental course

Deleted second sentence in course description which indicated labs.

Co-Listed Courses:

Course Reviewer Comments

Key: 1680

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/29/17 9:01 am

Viewing: **CHEM ENG 4320 ~~5315~~ : Corrosion And Its Prevention**

File: 174.2

Last approved: 05/08/17 3:15 am

Last edit: 08/29/17 9:01 am

Changes proposed by: mes

Requested Effective Change Date	Fall 2017
Department	Chemical and Biochemical Engineering
Discipline	Chemical Engineering (CHEM ENG)
Course Number	**4320** ~~5315~~
Title	

In Workflow

1. **RCHEMENG Chair**
2. **CCC Secretary**
3. RMATSENG 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. 08/30/17 9:57 am Muthanna Al-Dahhan (aldahhanm): Approved for RCHEMENG Chair

History

1. May 8, 2017 by lahne (174.1)

Corrosion And Its Prevention	
Abbreviated Course Title	Corrosion & Its Prevent
Catalog Description	A study of the theories of corrosion and its application to corrosion and its prevention.
Prerequisites	A grade of "C" or better in either Chem Eng **2110** ~~3120~~ or Cer Eng 3230.
Field Trip Statement	

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

Required for Majors	No
Elective for Majors	Yes
Justification for change:	Course is being changed to 4000-level to better reflect content; change to a more appropriate prerequisite.
Semesters previously offered as an experimental course	

Co-Listed

Courses:

MET ENG 4230 - Corrosion And Its Prevention

Course Reviewer

Comments

Key: 174

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/28/17 8:26 am

Viewing: **COMP ENG 5450 : Digital Image Processing**

File: 2375.3

Last approved: 09/28/15 3:32 am

Last edit: 09/19/17 11:33 am

Changes proposed by: martins

Programs referencing this course

CP ENG-BS: Computer Engineering BS

Other Courses referencing this course

In The Catalog Description:

ELEC ENG 5450 : Digital Image Processing

Requested Effective Change Date **Spring 2018** ~~Summer 2016~~

Department

Electrical and Computer Engineering

Discipline

Computer Engineering (COMP ENG)

In Workflow

1. **RELECENG 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. 08/28/17 1:02 pm Daryl Beetner (daryl): Approved for RELECENG Chair
2. 08/28/17 2:05 pm Brittany Parnell (ershenb):

Course Number 5450

Title

Approved for CCC Secretary
3. 09/08/17 2:48 pm sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:27 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Apr 28, 2014 by lahne (2375.1)
2. Sep 28, 2015 by martins (2375.2)

Digital Image Processing

Abbreviated Course Title: Digital Image Processing

Catalog Description

Fundamentals of human perception, sampling and quantization, image transforms, enhancement, restoration, channel and source coding.

Prerequisites

~~At least one of the following:~~Elec Eng **3410.** ~~3400, Elec Eng 3410, Elec Eng 3420, or prior exposure to Fourier Transforms and consent of the instructor.~~

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:

The previous rerequisite courses are no longer taught in the department.

Semesters previously offered as an experimental course

Co-Listed Courses:

ELEC ENG 5450 - Digital Image Processing

Course Reviewer Comments

ershenb (08/28/17 2:05 pm): moved co-listed course to "Justifications" section per the EC process in the workflow.

sraper (08/31/17 12:50 pm): Revised justification as former prereq courses are no longer taught.

sraper (08/31/17 12:54 pm): added period at end of prereq.

Course Inventory Change Request

Date Submitted: 08/28/17 8:30 am

Viewing: COMP ENG 5460 : Machine Vision

File: 180.4

Last approved: 09/21/15 3:56 am

Last edit: 09/19/17 11:34 am

Changes proposed by: martins

Programs referencing this course

CP ENG-BS: Computer Engineering BS

Other Courses referencing this course

In The Catalog Description:

ELEC ENG 5460 : Machine Vision

Requested Effective Change Date: Spring **2018** ~~2016~~

Department

Electrical and Computer Engineering

Discipline

Computer Engineering (COMP ENG)

Course Number: 5460

Title

In Workflow

1. **RELECENG 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. 08/28/17 1:02 pm Daryl Beetner (daryl): Approved for RELECENG Chair
2. 08/28/17 2:10 pm Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 09/08/17 2:48 pm sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:28 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Apr 28, 2014 by lahne (180.1)
2. Sep 21, 2015 by martins (180.3)

Machine Vision

Abbreviated Course Title: Machine Vision

Catalog Description

Image information, image filtering, template matching, histogram transformations, edge detection, boundary detection, region growing and pattern recognition. Complementary laboratory exercises are required.

Prerequisites

~~At least one of the following:~~Elec Eng **3410.** ~~3400, Elec Eng 3410, Elec Eng 3420, or prior exposure to Fourier Transforms and consent of the instructor.~~

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:

The previous rerequisite courses are no longer taught in the department.

Semesters previously offered as an experimental course

Co-Listed Courses:

ELEC ENG 5460 - Machine Vision

Course Reviewer Comments

ershenb (08/28/17 2:10 pm): moved co-listed course to "Justifications" section per the EC process in the workflow.

sraper (08/31/17 12:53 pm): added period at end or prereq.

Course Inventory Change Request

Date Submitted: 09/18/17 10:32 am

Viewing: **COMP SCI 5402 : Introduction to Data Mining ~~& Machine Learning~~**

File: 4097.2

Last approved: 11/03/14 3:53 am

Last edit: 09/18/17 12:32 pm

Changes proposed by: tauritzd

Catalog Pages referencing this course

Information Science and Technology

Programs referencing this course

AP MATH-BS: Applied Mathematics BS

Other Courses referencing this course

In The Prerequisites:

COMP SCI 6304 : Cloud Computing and Big Data Management

COMP SCI 6406 : Machine Learning in Computer Vision

Spring 2018 ~~01/13/2015~~

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. 09/18/17 11:40 am George Markowsky (markowskyg): Approved for RCOMPSCI Chair

Requested
Effective Change
Date

Department
Computer Science

Discipline
Computer Science (COMP SCI)

Course Number 5402

Title

2. 09/18/17 12:33 pm
   Brittany Parnell (ershenb): Approved for CCC Secretary
3. 09/19/17 2:23 pm
   sraper: Approved for Engineering DSCC Chair

History

1. Nov 3, 2014 by tauritzd

Introduction to Data Mining ~~& Machine Learning~~

Abbreviated Course Title **Intro to** Data Mining

Catalog Description

The key objectives of this course are two-fold: (1) to teach the fundamental concepts of data mining and (2) to provide extensive hands-on experience in applying the concepts to real-world applications. The core topics to be covered in this course include classification, clustering, association analysis, data preprocessing, and outlier/novelty detection. ~~Classical and modern data mining and machine learning algorithms; data preprocessing/warehousing, mining association rules, classification/prediction methods, clustering techniques, Bayesian networks; unsupervised/supervised/reinforcement learning, learning decision trees, artificial neural networks, support vector machines, and ensemble learning.~~

Prerequisites

A **grade of** "C" or better in **all of** ~~both~~ Comp Sci **2300, Comp Sci 2500,** ~~2300~~ and one **of** ~~of~~ Stat ~~3111, Stat~~ 3113, Stat 3115, Stat **3117 or Stat 5643.** ~~3117.~~

Field Trip Statement

None

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

Justification for change:

The machine learning component of this course has been spun off as a separate course (COMP SCI 5001 – Introduction to Machine Learning) for which an EC form has previously been approved, returning this course to its original form focusing purely on data mining. The topics of data mining and machine learning have both become so important and the bodies of knowledge associated with them so large, that separate courses are warranted. This meets both industry & student demand.

Printing of this course in the SP18 schedule of classes will be suppressed until after Faculty Senate has approved this course in order for it to be non-affecting and qualify to be effective SP18.

Semesters previously offered as an

experimental

course

FS2012, FS2013

Co-Listed

Courses:

Course Reviewer

Comments

Key: 4097

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/17/17 10:59 am

Viewing: **ELEC ENG 5120 : Communication Circuits**

File: 1530.1

Last edit: 08/31/17 8:43 am

Changes proposed by: martins

Requested Effective Change Date	**Spring 2018** ~~Fall 2014~~
Department	Electrical and Computer Engineering
Discipline	Electrical Engineering (ELEC ENG)
Course Number	5120
Title	

In Workflow

1. **RELECENG 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. 08/17/17 8:53 pm Daryl Beetner (daryl): Approved for RELECENG Chair
2. 08/22/17 8:56 pm Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 08/31/17 8:43 am sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:28 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Communication Circuits

Abbreviated Course Title	Communication Circuits
Catalog Description	Analysis and design of circuits used in communication systems. Topics include RF semiconductor devices, low-noise amplifiers, mixers, modulators, crystal oscillators, AGC circuits, highpower RF amplifiers, phase-locked loops, impedence matching, and frequency-selective networks and transformers.
Prerequisites	Elec Eng **3120.** ~~3120, preceded or accompanied by Elec Eng 3420.~~
Field Trip Statement	

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

Required for Majors	No
	Yes ~~No~~

Elective for Majors

Justification for change:

The former prerequisites of "preceded or accompanied by EE 3420", is incorrect because those classes are no longer taught.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

ershenb (08/22/17 8:56 pm): updated effective date to Spring 2018

sraper (08/23/17 9:56 am): Added period at end of prereq.

sraper (08/31/17 8:43 am): checked elective for majors. Reworded justification at suggestion of DSCC committee members.

Key: 1530

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/17/17 11:10 am

Viewing: **ELEC ENG 5400 : Digital Signal Processing II**

File: 958.3

Last approved: 09/21/15 3:56 am

Last edit: 08/31/17 8:44 am

Changes proposed by: martins

Other Courses referencing this course

In The Catalog Description:

ELEC ENG 6400 : Advanced Digital Signal Processing

In The Prerequisites:

ELEC ENG 6400 : Advanced Digital Signal Processing

Requested Effective Change Date: Spring **2018** ~~2016~~

Department: Electrical and Computer Engineering

Discipline: Electrical Engineering (ELEC ENG)

Course Number: 5400

Title

In Workflow

1. **RELECENG 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. 08/17/17 8:53 pm Daryl Beetner (daryl): Approved for RELECENG Chair
2. 08/22/17 8:57 pm Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 08/31/17 8:44 am sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:28 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Sep 21, 2015 by martins (958.1)

Digital Signal Processing II

Abbreviated Course Title: Digital Signl Process II

Catalog Description:

Spectral representations, sampling, quantization, z-transforms, digital filters and discrete transforms including the Fast Fourier transform.

Prerequisites:

Elec Eng **3410.** ~~3410 or Elec Eng 3420.~~

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 former prerequisites of "preceded or accompanied by EE 3420", is incorrect because those classes are no longer taught.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

sraper (08/23/17 10:01 am): added period at end of prereq.

sraper (08/31/17 8:44 am): Checked elective for majors. Reworded justification per the suggestion of DSCC committee members.

Key: 958

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/17/17 11:12 am

Viewing: **ELEC ENG 5420 : Communications Systems II**

File: 273.1

Last edit: 08/31/17 8:45 am

Changes proposed by: martins

Other Courses referencing this course

In The Prerequisites:

ELEC ENG 6400 : Advanced Digital Signal Processing
ELEC ENG 6410 : Information Theory And Coding
ELEC ENG 6420 : Wireless Communications
ELEC ENG 6490 : Advanced Topics In Communications
ELEC ENG 6530 : Power System Reliability

Requested Effective Change Date: **Spring 2018** ~~Fall 2014~~

Department: Electrical and Computer Engineering

Discipline: Electrical Engineering (ELEC ENG)

Course Number: 5420

Title:

In Workflow

1. **RELECENG 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. 08/17/17 8:54 pm Daryl Beetner (daryl): Approved for RELECENG Chair
2. 08/22/17 8:58 pm Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 08/31/17 8:45 am sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:28 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Communications Systems II

Abbreviated Course Title: Communications Syst II

Catalog Description

Random signals and their characterization; noise performance of amplitude, angle and pulse modulation systems; digital data transmission; use of coding for error control.

Prerequisites

Elec Eng **3430.** ~~3420.~~

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 former prerequisites of "preceded or accompanied by EE 3420", is incorrect because those classes are no longer taught.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

sraper (08/23/17 10:04 am): added period at end of prereq

sraper (08/31/17 8:45 am): Checked elective for majors. Reworded justification at the direction of DSCC committee members.

Key: 273

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/17/17 11:16 am

Viewing: **ELEC ENG 5430 : Wireless Networks**

File: 1237.1

Last edit: 08/31/17 8:45 am

Changes proposed by: martins

Other Courses referencing this course

In The Catalog Description:

COMP ENG 5430 : Wireless Networks

SYS ENG 5323 : Wireless Networks

Requested Effective Change Date: **Spring 2018** ~~Fall 2014~~

Department: Electrical and Computer Engineering

Discipline: Electrical Engineering (ELEC ENG)

Course Number: 5430

Title:

In Workflow

1. **RELECENG 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. 08/17/17 8:54 pm Daryl Beetner (daryl): Approved for RELECENG Chair
2. 08/22/17 9:03 pm Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 08/31/17 8:45 am sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:28 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Wireless Networks

Abbreviated Course Title: Wireless Networks

Catalog Description:
Introduction to wireless communications and networking. Topics include transmission fundamentals, wireless channel, coding techniques and error control, satellite and cellular networks, cordless systems, mobile IP and management, multiple access techniques and wireless protocols, wireless LAN, IEEE 802.11, and adhoc and sensor networks.

Prerequisites:
~~Hardware competency,~~ Elec Eng **3430** ~~3420~~ or Comp Eng **3150.** ~~3150 and graduate standing.~~

Field Trip Statement:

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

No

Required for Majors

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

Justification for change:

The former prerequisites of "preceded or accompanied by EE 3420", is incorrect because those classes are no longer taught.

Semesters previously offered as an experimental course

Co-Listed Courses:

COMP ENG 5430 - Wireless Networks

SYS ENG 5323 - Wireless Networks

Course Reviewer Comments

sraper (08/23/17 10:07 am): added period at end of prereqs.

sraper (08/31/17 8:45 am): Checked elective for majors. Reworded justification per the direction of DSCC committee members.

Key: 1237

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/30/17 2:09 pm

Viewing: **HISTORY 3762 : American Foreign Policy ~~Diplomatic History~~ Since 1945 ~~World War II~~**

File: 202.1

Last edit: 08/30/17 2:09 pm

Changes proposed by: dewittp

Programs referencing this course

ECON-BA: Economics BA

MIL SC-MI: Adaptive Leadership Minor

Other Courses referencing this course

In The Catalog Description:

POL SCI 3762 : American Diplomatic History Since World War II

Requested Effective Change Date **Spring 2018** ~~Fall 2014~~

Department

History and Political Science

Discipline

In Workflow

1. **RHISTORY Chair**
2. **CCC Secretary**
3. **Arts & Humanities 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. 08/30/17 2:16 pm sfogg: Approved for RHISTORY Chair
2. 08/30/17 2:25 pm Brittany Parnell (ershenb):

History (HISTORY)

Course Number 3762

Title

3. Approved for CCC Secretary
   08/30/17 2:28 pm
   Petra Dewitt (dewittp): Approved for Arts & Humanities DSCC Chair
4. 09/19/17 11:29 am
   Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

American **Foreign Policy** ~~Diplomatic History~~ Since **1945** ~~World War II~~

Abbreviated Course Title **Am Foreign Policy** ~~Post-WWII~~ ~~Diplomacy~~

Catalog Description

Addresses ~~American Diplomatic History Since World War II will address~~ the major issues in American foreign policy from WWII to the **present with primary focus on problems during the Cold War and the post-Cold War era, including the emergence of the national security state.** ~~present. Its primary focus is on the Cold War and the post-Cold War problems the U.S.has faced.~~

Prerequisites

History 1310 or Pol Sci 1200.

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:

The proposed name change better delineates the beginning of the Cold War from the previous era and the instructor's background in political science instead of history.

Semesters previously offered as an experimental course

Co-Listed Courses:

POL SCI 3762 - American Diplomatic History Since World War II

Course Reviewer Comments

sfogg (05/20/16 1:10 pm): Rollback: Please update the course description. You will also have to submit a request for Pol Sci 3762 since it is cross-listed.

Course Inventory Change Request

Date Submitted: 08/16/17 8:15 am

Viewing: **IS&T 4641 : Digital Commerce ~~Electronic~~ and the Internet of Things ~~Mobile Commerce~~**

File: 925.5

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

Last edit: 08/22/17 9:05 pm

Changes proposed by: barryf

Programs referencing this course

- BUS&MS-BS: Business and Mgmt Systems BS
- CYBERMG-MI: Cybersecurity Management and Information Assurance Minor
- E&S COM-MI: Elect & Social Commerce Minor
- ENTPRNS-MI: Entrepreneurship Minor
- IST-BS: Information Science and Tch BS
- MOBLB&T-MI: Mobile Bus & Tech Minor

Requested Effective Change Date: **Spring 2018** ~~Fall 2014~~

Department: Business and Information Technology

Discipline

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. 08/16/17 4:53 pm siauk: Approved for RINFSCTE Chair
2. 08/22/17 9:05 pm Brittany Parnell (ershenb):

Info Science & Technology (IS&T)

Course Number 4641

Title

Approved for CCC Secretary

3. 08/23/17 7:54 am Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 09/19/17 11:29 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. May 2, 2014 by barryf (925.1)
2. Jun 30, 2014 by lahne (925.4)

Digital Commerce ~~Electronic~~ and **the Internet of Things** ~~Mobile Commerce~~

Abbreviated Course Title **Digital Commerce & IoT** ~~Electronic and Mobile Commerce~~

Catalog Description

Introduction to fundamental concepts of management and application to IT and support of commerce. Examines the use of IT in business processes and **everyday interactions such as IoT.** ~~the management issues of integrating IT into organization~~

~~processes to gain a competitive advantage.~~ **Explores management issues of integrating IT into processes to run businesses better.**

Prerequisites

IS&T 1750 and at least Sophomore standing.

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:

Update course to include advances in the area, especially IoT

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

ershenb (08/22/17 9:05 pm): updated the effective date to Spring 2018

Course Inventory Change Request

Date Submitted: 08/30/17 6:12 pm

Viewing: **IS&T 5131 : Foundations of Computer Architecture**

File: 4364.4

Last approved: 03/20/17 3:14 am

Last edit: 08/30/17 6:12 pm

Changes proposed by: barryf

Requested Effective Change Date	**Spring 2018** ~~Fall 2017~~
Department	Business and Information Technology
Discipline	Info Science & Technology (IS&T)
Course Number	5131
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. 08/31/17 9:46 pm siauk: Approved for RINFSCTE Chair
2. 09/01/17 8:08 am Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 09/07/17 11:53 am
   Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 09/19/17 11:29 am
   Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Mar 20, 2017 by Barry Flachsbart (barryf)

Foundations of Computer Architecture

Abbreviated Course Title: Fndations Computer Arch

Catalog Description:

Design-oriented foundations of computer components and operation. Standard codes; number systems; base conversions; computer arithmetic; boolean algebra; operating system components including memory management, device management; plus related computer architecture topics. Research paper required.

Prerequisites:

Graduate Standing, strong programming knowledge. ~~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: Yes

Justification for change:

Clarify prerequisites. For graduate students, the topics are valuable knowledge, but the numbers of undergraduate courses are not.

Semesters previously offered as an experimental course

None

Co-Listed Courses:

Course Reviewer Comments

Key: 4364

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/30/17 6:12 pm

Viewing: IS&T 5423 : Foundations of Data Management

File: 4352.4

Last approved: 03/14/17 3:15 am

Last edit: 08/30/17 6:12 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. 08/31/17 9:46 pm siauk: Approved for RINFSCTE Chair
2. 09/01/17 8:11 am Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 09/07/17 11:53 am
   Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 09/19/17 11:29 am
   Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Mar 14, 2017 by Barry Flachsbart (barryf)

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, knowledge of MIS, programming ability. ~~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: Yes

Justification for change:

Clarify the prerequisites. Course is only for graduate students, so undergraduate prerequisites are inappropriate.

Semesters previously offered as an experimental course

None

Co-Listed Courses:

Course Reviewer Comments

Key: 4352

Preview Bridge

Course Inventory Change Request

Date Submitted: 08/16/17 8:15 am

Viewing: **IS&T 6641 : Advanced Digital Commerce ~~Electronic~~ and the Internet of Things ~~Mobile Commerce~~**

File: 961.3

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

Last edit: 08/22/17 9:07 pm

Changes proposed by: barryf

Catalog Pages referencing this course

Information Science and Technology

Requested Effective Change Date **Spring 2018** ~~Fall 2014~~

Department

Business and Information Technology

Discipline

Info Science & Technology (IS&T)

Course Number 6641

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. 08/16/17 4:53 pm siauk: Approved for RINFSCTE Chair
2. 08/22/17 9:07 pm Brittany Parnell (ershenb):

Approved for CCC Secretary
3. 08/23/17 7:54 am Barry Flachsbart (barryf): Approved for Social Sciences DSCC Chair
4. 09/19/17 11:29 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

History

1. Jun 30, 2014 by lahne (961.1)

Advanced **Digital Commerce** ~~Electronic~~ and **the Internet of Things** ~~Mobile Commerce~~

Abbreviated Course Title: Adv **Dig Commerc** ~~Elect~~ & **IoT** ~~Mobile Commerce~~

Catalog Description:

Fundamental concepts of management and application to IT and support of commerce. Examines ~~the~~ use of IT in business processes and **everyday interactions such as IoT.** ~~the management issues of integrating IT into organization processes to gain a competitive advantage.~~ **Explores management issues of integrating IT into processes to run businesses better.** Includes a major end-of-semester project.

Prerequisites:

Knowledge of management information systems.

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 include advances in the area, especially IoT

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

ershenb (08/22/17 9:07 pm): updated effective date to Spring 2018.

Key: 961

Preview Bridge

Course Inventory Change Request

Date Submitted: 06/07/17 12:53 pm

Viewing: **MIN ENG 4412 : Aggregate Materials Characterization, Sizing and Dimension Stone ~~Characterization~~**

File: 431.1

Last edit: 06/07/17 12:53 pm

Changes proposed by: ggalecki

Programs referencing this course

MI ENG-BS: Mining Engineering BS

MNRL PR-MI: Mineral Process Eng Minor

Requested Effective Change Date **Spring 2018** ~~Fall 2014~~

Department

Mining & Nuclear Engineering

Discipline

Mining Engineering (MIN ENG)

Course Number 4412

Title

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. lshelton
11. Peoplesoft

Approval Path

1. 06/09/17 9:40 am Braden lusk (blusk): Approved for RMINNUCL Chair
2. 06/12/17 11:09 am Brittany Parnell

(ershenb): Approved for CCC Secretary
3. 07/20/17 11:30 am sraper: Approved for Engineering DSCC Chair
4. 07/20/17 2:31 pm Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Aggregate Materials **Characterization,** Sizing and **Dimension Stone** ~~Characterization~~

Abbreviated Course Title: Aggregate Materials

Catalog Description:
Geological formation of aggregates; aggregate properties and their measurements; aggregates for specific end-user applications; specifications and standards; processing (crushing, screening, classification, and washing); plant design and flow sheet analysis; **dimension stone processing;** quality control and assurance.

Prerequisites:
Min Eng 3412.

Field Trip Statement:
- to enhance the classroom instructions
- to expose the students to industrial practices of safe production

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

Required for Majors	No
Elective for Majors	No

Justification for change:

Industry needs/approval and National Stone, Sand and Gravel Association (NSSGA) acceptance for the course expansion

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

Key: 431

Preview Bridge

Course Inventory Change Request

Date Submitted: 07/28/17 9:53 pm

Viewing: **SYS ENG 6213 : Deep Learning and Advanced Neural Networks**

File: 805.1

Last edit: 08/31/17 1:09 pm

Changes proposed by: dagli

Catalog Pages referencing this course	Systems Engineering
Requested Effective Change Date	**Spring 2018** ~~Fall 2014~~
Department	Engineering Management and Systems Engineering
Discipline	Systems Engineering (SYS ENG)
Course Number	6213
Title	

In Workflow

1. **RENGMNGT 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. lshelton
11. Peoplesoft

Approval Path

1. 07/29/17 8:35 am Suzanna Long (longsuz): Approved for RENGMNGT Chair
2. 07/31/17 8:42 am Brittany Parnell

(ershenb): Approved for CCC Secretary
3. 08/31/17 1:09 pm sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:30 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Deep Learning and Advanced Neural Networks

Abbreviated Course Title: **Deep Learn Neural Nets** ~~Advanced Neural Networks~~

Catalog Description:

Use of deep learning and advance neural networks in the design of cyber physical complex adaptive systems. Machine learning basics, deep feed forward networks, regularization for deep learning, optimization for training deep models, convolutional networks, recurrent and recursive nets, practical , vision and natural language processing applications. ~~Advanced artificial neural network architectures, namely; Radial Basis Function Networks, Support Vector Machines, Committee Machines, Principal Components Analysis, Information-Theoretic Models, Stochastic Machines, Neurodynamic Programming, Temporal Processing are the topics covered.~~

Prerequisites:

Graduate Standing. ~~Sys Eng 5212 or equivalent neural network course.~~

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:

The content and the title of the course is updated to reflect new developments in neural networks, machine learning algorithms and architectures.

Semesters previously offered as an experimental course

Co-Listed Courses:

Course Reviewer Comments

sraper (08/23/17 10:10 am): removed "graduate standing" prereq.

sraper (08/31/17 1:09 pm): Added graduate standing to prereq. Note that this was discussed in Comp Sci and they agreed it is sufficiently different (more systems application based) so as not to overlap with their 5001 deep learning course.

Course Inventory 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: 09/13/17 12:20 pm

Changes proposed by: marlene

Requested Effective Change Date	Spring 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

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

Thermodynamics 1 from outside Missouri S&T 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

This was previously taught in fall 2016, spring 2017, summer 2017 as a special topics course.

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.

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 08/10/17 1:39 pm

Viewing: **CHEM ENG 5001.003 : Introduction to Pharmaceutical Engineering**

File: 4442

Last edit: 09/13/17 12:23 pm

Changes proposed by: baruas

Requested Effective Change Date	Spring 2018
Department	Chemical and Biochemical Engineering
Discipline	Chemical Engineering (CHEM ENG)
Course Number	5001
Topic ID	003
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. CAT entry
8. Registrar

Approval Path

1. 08/11/17 1:17 am Muthanna Al-Dahhan (aldahhanm): Approved for RCHEMENG Chair
2. 08/14/17 11:19 am Brittany Parnell (ershenb): Approved for CCC Secretary

3. 08/30/17 10:38 am
   sraper: Rollback to CCC Secretary for Engineering DSCC Chair
4. 08/30/17 12:20 pm
   Brittany Parnell (ershenb): Rollback to RCHEMENG Chair for CCC Secretary
5. 08/31/17 2:18 pm
   Muthanna Al-Dahhan (aldahhanm): Approved for RCHEMENG Chair
6. 08/31/17 4:36 pm
   Brittany Parnell (ershenb): Approved for CCC Secretary
7. 09/08/17 2:49 pm
   sraper: Approved for Engineering DSCC Chair
8. 09/19/17 11:27 am
   Brittany Parnell (ershenb): Approved for

Pending CCC
Agenda post

Introduction to Pharmaceutical Engineering

Experimental Pharma Eng
Abbreviated
Course Title

Instructors Sutapa Barua

Experimental
Catalog
Description

The objective of studying pharmaceutical engineering is to understand the engineering principles involved in the processing of drugs and pharmaceuticals. With an understanding of basic principles of process engineering, students will be able to develop new pharmaceutical processes and further improve the existing processes.

Prerequisites

Chem 1320; Math 1215 or Math 1221; preceded or accompanied by Physics 1135.

Field Trip
Statement

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

Justification for
new course:

Industrial processing of drugs and pharmaceuticals has gained significant importance in recent years. Students from diverse engineering backgrounds such as Chemical Engineering, Materials, and Mechanical Engineering could contribute significantly learning unit operations in terms of the knowledge of drug discovery-to-shelf process. Such a course is missing in the existing course list. Introducing this new course would benefit a number of senior and graduate level students preparing themselves before joining a biopharmaceutical industry.

Semester(s)
previously taught

Co-Listed
Courses:
Course Reviewer
Comments

sraper (08/23/17 9:59 am): added period at end of prereqs

sraper (08/30/17 10:38 am): Rollback: shred this please as they will submit to separate EC forms. One at 4000 level and one at 5000 level for advanced.

ershenb (08/30/17 12:20 pm): Rollback: edit form to submit only as CHEM ENG 5001

ershenb (08/31/17 4:35 pm): updated course number to 5001, per the request of Sutapa Barua

Key: 4442
Preview Bridge

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 08/30/17 9:32 am

Viewing: **CHEM ENG 6001.001 : Advanced Pharmaceutical Engineering**

File: 4475

Last edit: 09/13/17 12:26 pm

Changes proposed by: baruas

Requested Effective Change Date	Spring 2018
Department	Chemical and Biochemical Engineering
Discipline	Chemical Engineering (CHEM ENG)
Course Number	6001
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. CAT entry
8. Registrar

Approval Path

1. 08/30/17 9:57 am Muthanna Al-Dahhan (aldahhanm): Approved for RCHEMENG Chair
2. 08/30/17 10:56 am Brittany Parnell (ershenb): Approved for CCC Secretary

3. 09/08/17 2:49 pm sraper: Approved for Engineering DSCC Chair
4. 09/19/17 11:27 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Advanced Pharmaceutical Engineering

Experimental Abbreviated Course Title: Adv Pharm Eng

Instructors: Sutapa Barua

Experimental Catalog Description:

The objective of studying pharmaceutical engineering is to apply the in-depth knowledge of engineering principles involved in the processing of drugs and pharmaceuticals. With an application of basic principles of process engineering, students will learn about the use of cutting edge materials and emerging capabilities in pharmaceutical manufacturing.

Prerequisites:

Graduate level standing.

Field Trip Statement:

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

Justification for new course:

Industrial processing of drugs and pharmaceuticals has gained significant importance in recent years. Students from diverse engineering and science backgrounds will learn the principles of process engineering in drug development, drug delivery and therapeutic efficacy. This course will cover five modules on the fundamentals of pharmaceutical engineering, pharmacokinetics and drug delivery, gene technology, instrumental analysis, and modern drug delivery systems. Such a course with an integration of engineering and pharmaceutics is missing in the existing course list. Introducing this new course would benefit a number of graduate students preparing themselves before joining pharmaceutical industries.

Semester(s) previously taught

Co-Listed Courses:

Course Reviewer Comments

sraper (08/31/17 12:45 pm): period placed at end of prereq.

Key: 4475

Preview Bridge

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 08/23/17 8:11 pm

Viewing: **ENGLISH 3001.005 : Language in Society**

File: 4473

Last edit: 09/07/17 9:27 am

Changes proposed by: kswenson

Requested Effective Change Date	Spring 2018
Department	English and Technical Communication
Discipline	English (ENGLISH)
Course Number	3001
Topic ID	005
Experimental Title	

In Workflow

1. **RENGLISH 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. 08/23/17 8:12 pm Kristine Swenson (kswenson): Approved for RENGLISH Chair
2. 08/24/17 4:03 pm Brittany Parnell (ershenb): Approved for CCC Secretary
3. 08/25/17 9:11 am Petra Dewitt

(dewittp): Approved for Arts & Humanities DSCC Chair

4. 09/19/17 11:28 am
   Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Language in Society

Experimental Abbreviated Course Title	Language in Society
Instructors	Sarah Hercula
Experimental Catalog Description	This course takes a sociolinguistic approach to the investigation of language variation and use in society, including: intersections of language and identity, culture, gender, socioeconomic status, and other social factors; language ideologies; multilingualism; language standardization; and language and power.
Prerequisites	English 1120
Field Trip Statement	

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

Total: 3

Justification for new course:

There has been demand among English & TC majors for advanced work in linguistics. This will serve especially English education majors.

Semester(s) previously taught

N/A

Co-Listed Courses:

Course Reviewer Comments

Key: 4473

Preview Bridge

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 09/06/17 3:25 pm

Viewing: **ENGLISH 3001.006 : Sustainable Foods in Latin American Literature**

File: 4477

Last edit: 09/13/17 12:29 pm

Changes proposed by: kswenson

Requested Effective Change Date	Spring 2018
Department	English and Technical Communication
Discipline	English (ENGLISH)
Course Number	3001
Topic ID	006
Experimental Title	

In Workflow

1. **RENGLISH 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. 09/06/17 3:26 pm Kristine Swenson (kswenson): Approved for RENGLISH Chair
2. 09/06/17 3:43 pm Brittany Parnell (ershenb): Approved for CCC Secretary
3. 09/06/17 3:55 pm Petra Dewitt

(dewittp): Approved for Arts & Humanities DSCC Chair

4. 09/19/17 11:29 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Sustainable Foods in Latin American Literature

Experimental Abbreviated Course Title: Foods in Latin America

Instructors: Dolan, Kathryn

Experimental Catalog Description:

The study of food in literature can help us to understand key cultural issues that can be translated into other aspects of our 21st century lives, like race, class, gender, globalization, and sustainability. This interdisciplinary class will specifically study global and regional cultures of Latin America in terms of literature--fiction, non-fiction, poetry.

Prerequisites:

English 1120.

Field Trip Statement:

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

Justification for new course:

This course will be part of the new LASTA minor.

Semester(s) previously taught

N/A

Co-Listed Courses:

Course Reviewer Comments

Key: 4477

Preview Bridge

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 08/17/17 12:40 pm

Viewing: **GEO ENG 6001.001 : Advanced Engineering Geology & Geotechnics**

File: 4472

Last edit: 09/13/17 12:33 pm

Changes proposed by: rogersda

Requested Effective Change Date	Spring 2018
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Geological Engineering (GEO ENG)
Course Number	6001
Topic ID	001
Experimental Title	

In Workflow

1. **RGEOSENG 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. 08/27/17 9:31 am David Borrok (borrokd): Approved for RGEOSENG Chair
2. 08/28/17 10:27 am Brittany Parnell (ershenb): Approved for CCC Secretary
3. 09/08/17 2:48 pm sraper: Approved

for Engineering DSCC Chair
4. 09/19/17 11:29 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Advanced Engineering Geology & Geotechnics

Experimental Abbreviated Course Title: Adv Engr Geol/Geot

Instructors: J. David Rogers

Experimental Catalog Description:

This course introduces students to the problem solving techniques often employed in problems associated with geoengineering, including geotechnical and geological issues, geohydrology, natural hazards, flood control, water resources, mining, and coastal engineering (including sea level rise).

Prerequisites:

Geo Eng 5441.

Field Trip Statement:

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

Total: 3

Justification for new course:

This course used to be on our books as GE 441, which was superseded by Geotechnical Construction Practice (now GE 6441) in 2002, which deals with

excavation and grading issues, geotechnical input for retention structures, and site exploration. The proposed course will be a follow on course to GE 5441 Engineering Geology & Geotechnics, a required senior level course, which is the most popular upper division course in the GE program, taught by Dr. Rogers and Mr. Clark. The propose course will explore the practical aspects of how geologic conditions impact he various sub-disciplines of civil and geotechnical engineering, geological engineering, rock mechanics, surface and subsurface hydrology, coastal engineering, and natural hazards (expansive soils, landslides and debris flows, earthquakes, tsunamis, floods, landslide dams, impacts on groundwater quality and quantity, and sea level rise).

Semester(s)
previously taught

This course has not been taught since 2000.

Co-Listed
Courses:

Course Reviewer
Comments

ershenb (08/28/17 10:27 am): Updated Course number to 6001 (All experimental courses not previously taught must end in 001).

sraper (08/31/17 12:57 pm): Moved prereq into prereq slot. Deleted prereq statement in description.

Key: 4472
Preview Bridge

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 08/11/17 3:25 pm

Viewing: **MATH 6001.002 : Finite Difference and Spectral Methods for Partial Differential Equations**

File: 4447

Last edit: 09/13/17 1:07 pm

Changes proposed by: prunnion

Requested Effective Change Date	Spring 2018
Department	Mathematics & Statistics
Discipline	Mathematics (MATH)
Course Number	6001
Topic ID	002
Experimental Title	

In Workflow

1. **RMATHEMA 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. 08/11/17 3:27 pm sclark: Approved for RMATHEMA Chair
2. 08/14/17 1:25 pm Brittany Parnell (ershenb): Approved for CCC Secretary
3. 08/16/17 10:21 am Katie Shannon

(shannonk): Approved for Sciences DSCC Chair
4. 09/19/17 11:29 am
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Finite Difference and Spectral Methods for Partial Differential Equations

Experimental Abbreviated Course Title	Finite Diff/Spec Methods
Instructors	Yanzhi Zhang
Experimental Catalog Description	Continuation of Math 5604. Derivation, implementation, and theoretical analysis of finite difference and spectral methods for approximating solutions of partial differential equations.
Prerequisites	Math 5604.
Field Trip Statement	

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

Justification for new course:

The topics covered in this course reflect the current research directions of the department.

Semester(s) previously taught

None.

Co-Listed Courses:

Course Reviewer Comments

Key: 4447

Preview Bridge

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 08/07/17 3:01 pm

Viewing: **PET ENG 4001.003 : Safety Systems Management in Drilling**

File: 4439

Last edit: 09/13/17 1:10 pm

Changes proposed by: hendrixrl

Requested Effective Change Date	Spring 2018
Department	Geosciences and Geological and Petroleum Engineering
Discipline	Petroleum Engineering (PET ENG)
Course Number	4001
Topic ID	003
Experimental Title	

In Workflow

1. **RGEOSENG 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. 08/08/17 8:07 am David Borrok (borrokd): Approved for RGEOSENG Chair
2. 08/08/17 1:40 pm Brittany Parnell (ershenb): Approved for CCC Secretary
3. 08/31/17 8:47 am sraper: Approved for Engineering DSCC Chair

4. 09/19/17 11:29 am
   Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Safety Systems Management in Drilling

Experimental Abbreviated Course Title: Safety in Drilling

Instructors: Dr. Rickey Hendrix

Experimental Catalog Description:

A study of safety systems management and processes related to drilling in the petroleum industry. Special emphasis on personnel safety for offshore. Topics include helicopter egress, offshore safety induction, fatalities, safety metrics, PJSM, JSA, TBRA, LOTO, lifting and rigging, behavioral based safety, hand injury, slips trips and falls, and PPE.

Prerequisites:

Pet Eng 4210.

Field Trip Statement:

N/A

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

Total: 3

Justification for new course:

Modernization of the petroleum industry as well as serious injuries have resulted in a focus on safety as the most important metric that energy companies use to

measure their success. The topic most important to the industry is not currently represented in our program curriculum. This course aims to fill that gap.

Semester(s) previously taught

N/A

Co-Listed Courses:

Course Reviewer Comments

sraper (08/23/17 10:09 am): changed effective date, added period at end of prereq.

sraper (08/31/17 8:47 am): Removed "or consent of instructor" from prereq statement.

Key: 4439

Preview Bridge

Course Inventory Change Request

New Experimental Course Proposal

Date Submitted: 08/01/17 4:01 pm

Viewing: **PSYCH 3001.002 : Positive Psychology**

File: 4438

Last edit: 09/13/17 1:16 pm

Changes proposed by: murray

Requested Effective Change Date	Fall 2018
Department	Psychological Science
Discipline	Psychology (PSYCH)
Course Number	3001
Topic ID	002
Experimental Title	

In Workflow

1. **RPSYCHOL Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. Registrar

Approval Path

1. 08/01/17 4:28 pm murray: Approved for RPSYCHOL Chair
2. 08/02/17 8:02 am Brittany Parnell (ershenb): Approved for CCC Secretary
3. 08/02/17 10:37 am Barry Flachsbart (barryf): Approved for

Social Sciences DSCC Chair
4. 09/19/17 11:29 am Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Positive Psychology

Experimental Abbreviated Course Title: Positive Psychology

Instructors: Susan Murray

Experimental Catalog Description:

Positive psychology studies how humans prosper. Its goal is to identify and enhance the human strengths and virtues that make life worth living and allow individuals to thrive. Topics include mindfulness, well-being, flow, spirituality, relationships, and happiness. We will explore the research in these areas and how they can be measured and improved.

Prerequisites:

Psych 1101.

Field Trip Statement:

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

Total: 3

Justification for new course:

Positive psychology is a growing field in psychology. Rather than focusing on illness, it strives to enhance the day-to-day lives of people. The class material has applications in clinical, education, and workplace settings.

Semester(s) previously taught

none

Co-Listed Courses:

Course Reviewer Comments

Key: 4438

Preview Bridge

Course Inventory 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

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. lshelton
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 Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0

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

Key: 942

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.

Preview Bridge

Course Inventory 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

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. lshelton
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 Inventory 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

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. lshelton
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.

Course Inventory Change Request

New Course Proposal

Date Submitted: 03/08/17 10:00 am

Viewing: **ENG MGT 6216 : Financial Data Analysis**

File: 4408

Last edit: 09/14/17 3:39 pm

Changes proposed by: cornss

Requested Effective Change Date	Spring 2018
Department	Engineering Management and Systems Engineering
Discipline	Engineering Management (ENG MGT)
Course Number	6216
Title	

In Workflow

1. **RENGMNGT 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. lshelton
11. Peoplesoft

Approval Path

1. 03/08/17 10:47 am
   Suzanna Long (longsuz): Approved for RENGMNGT Chair

2. 03/08/17 2:35 pm Kristy Giacomelli (kristyg): Approved for CCC Secretary
3. 03/14/17 2:54 pm sraper: Approved for Engineering DSCC Chair
4. 03/15/17 3:27 pm Kristy Giacomelli (kristyg): Rollback to Engineering DSCC Chair for Pending CCC Agenda post
5. 04/10/17 2:57 pm sraper: Approved for Engineering DSCC Chair
6. 04/10/17 3:01 pm Kristy Giacomelli (kristyg): Approved for Pending CCC Agenda post
7. 08/18/17 11:45 am Brittany Parnell (ershenb): Approved for CCC Meeting Agenda

8. 08/18/17 11:46 am
   sraper: Approved for Campus Curricula Committee Chair
9. 09/14/17 3:39 pm
   Brittany Parnell (ershenb): Rollback to CCC Meeting Agenda for FS Meeting Agenda

Financial Data Analysis

Abbreviated Course Title	Financial Data Analysis
Catalog Description	Statistical analysis of financial markets data (e.g., equity prices, exchange rates, and interest rates). The application of exploratory data analysis as well as more formal statistical methods such as regression, time series, principal component analysis (PCA), factor models, and Bayesian data analysis in modeling financial data will be covered.
Prerequisites	An undergraduate calculus based statistics course and one of Eng Mgt 6212, Sys Eng 6612, Eng Mgt 6213, or Sys Eng 6613.
Field Trip Statement	

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

Required for Majors

Elective for Majors: No

Justification for new course:

Course will be added to the Financial Engineering Certificate as a required course.

This course will be co-listed with Sys Eng 6616. Because this has been done in mid-process. We will have to manually add Sys Eng 6616 at end of process because it is not an existing course.

Semesters previously offered as an experimental course

Spring 2016

Co-Listed Courses:

Course Reviewer Comments

kristyg (03/15/17 3:27 pm): Rollback: Rollback per email.

ershenb (09/14/17 3:39 pm): Rollback: Tabled at 8/15 CCC meeting. Requesting approval at 10/3 CCC meeting.

Key: 4408

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 Spring 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. kristyg

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

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.

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.

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.

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.

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

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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

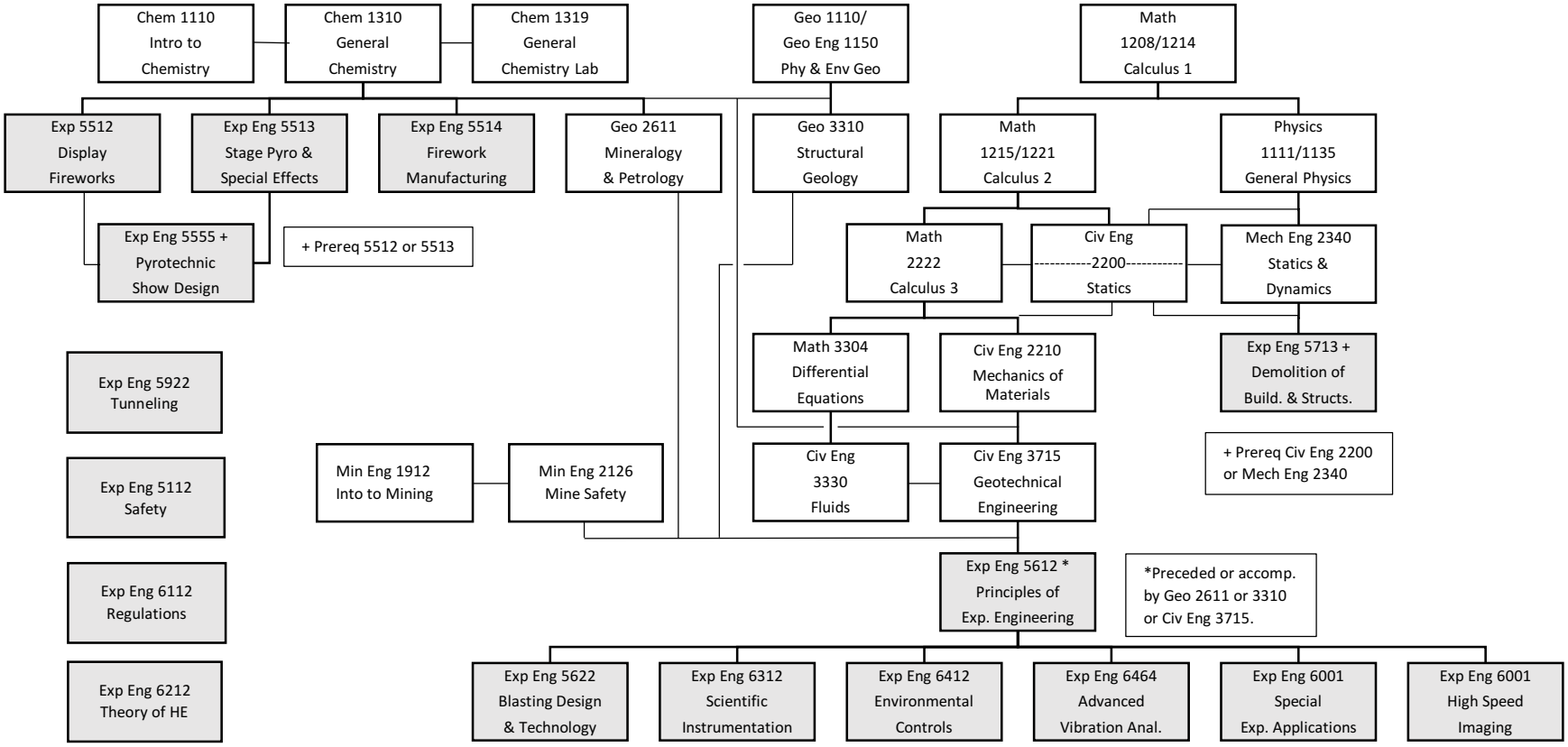
Letters of Support for the MS in Explosives Technology Program

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	-	-	-	-	-	