Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 510 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Design of Digital Systems

Alpha Designator/Number: E E 5 1 0

Title Abbreviation: d e s i g n d i g i t a l s y s t e m s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course provides fundamental understanding of Digital circuits. Students learn the essentials of digital circuit operation, design and simulate digital circuits using the techniques of practicing electrical and computer engineers.

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head [signature]	Date 10/4/16
Registrar [signature] 141001	Date 10-4-16
College Curriculum Chair [signature]	Date 10/17/16
Graduate Council Chair [signature]	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 510

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Use the binary coding to represent decimal numbers
2. Use of main building blocks of digital systems which are the logic gates to build complex systems
3. Build combinational and sequential hardware systems using the logic gates
4. Minimize the complex logic circuits to their canonical form using logic algebra laws
5. Understand and build an arithmetic and logic units in the computer
6. Model the hardware systems using finite state machine/automata
7. Develop the software part of a hardware system using the hardware languages

7. COURSE OUTLINE (May be submitted as a separate document)

Binary Number Systems
Logic Gates and Boolean Algebra
Combinational Logic Circuits
Minimization of Circuits
Design Techniques for Combinational Logic Circuits
Hardware Design Languages
Arithmetic Logic Units
Storage Elements and Memory Components
Finite State Machines
Data Paths and Register Transfer Level
Sequential Computation

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

M. Morris Mano, Digital Design (3rd Ed.), Prentice Hall, 2002. ISBN 0-13-062121-8
R.J. Tocci and Neal S. Widmer, Digital Systems: Principles and Applications, Prentice Hall, 2001. (ISBN 0-13-085634-7)
R.L. Tokheim, Schaum's Outline on Digital Principles (3rd Ed.), McGraw-Hill, 1994. (ISBN 0-07-065050-0)

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Tests, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

M. Morris Mano, Digital Design (3rd Ed.), Prentice Hall, 2002. ISBN 0-13-062121-8
R.J. Tocci and Neal S. Widmer, Digital Systems: Principles and Applications, Prentice Hall, 2001. (ISBN 0-13-085634-7)
R.L. Tokheim, Schaum's Outline on Digital Principles (3rd Ed.), McGraw-Hill, 1994. (ISBN 0-07-065050-0)

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 510 - Design of Digital Systems
Catalog Description: This course provides fundamental understanding of Digital circuits. Students learn the essentials of digital circuit operation, design and simulate digital circuits using the techniques of practicing electrical and computer engineers.
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE-510 – Design of Digital Systems

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE-510 – Design of Digital Systems
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description:

This course provides fundamental understanding of Digital circuits. Students learn the essentials of digital circuit operation, design and simulate digital circuits using the techniques of practicing electrical and computer engineers.

Required Text: Additional Reading and Other Materials

- M. Morris Mano, Digital Design (3rd Ed.), Prentice Hall, 2002. (ISBN 0-13-062121-8) Includes CD with software.

References

- R.J. Tocci and Neal S. Widmer, Digital Systems: Principles and Applications, Prentice Hall, 2001. (ISBN 0-13-085634-7)
- R.L. Tokheim, Schaum's Outline on Digital Principles (3rd Ed.), McGraw-Hill, 1994. (ISBN 0-07-065050-0)

Course Objectives:

1. Use the binary coding to represent decimal numbers
2. Use of main building blocks of digital systems which are the logic gates to build complex systems
3. Build combinational and sequential hardware systems using the logic gates
4. Minimize the complex logic circuits to their canonical form using logic algebra laws
5. Understand and build an arithmetic and logic units in the computer
6. Model the hardware systems using finite state machine/automata
7. Develop the software part of a hardware system using the hardware languages

8. Test and simulate the behavior of a digital systems

Student Learning Outcomes (SO):

1. Student Learning Outcome: use the binary numbers and transform decimal to binary and binary to decimal notation
2. Student Learning Outcome: understand and design simple and complex combinational and sequential logic gates
3. Student Learning Outcome: minimize the complex logic circuits to its canonical form
4. Student Learning Outcome: build the arithmetic and logic units in a digital system
5. Student Learning Outcome: use the storage units to build digital systems with memory
6. Student Learning Outcome: use the finite state machines to model digital systems
7. Student Learning Outcome: build the software part of a hardware system

Course Schedule

No of Weeks	Topic
1	Binary Number Systems
1	Logic Gates and Boolean Algebra
1	Combinational Logic Circuits
1	Minimization of Circuits
1	Design Techniques for Combinational Logic Circuits
1	Hardware Design Languages
1	Arithmetic Logic Units
2	Storage Elements and Memory Components
1	Finite State Machines
2	Data Paths and Register Transfer Level
1	Sequential Computation

Grading:

Grading Basis:	Mid-term I:	20%	A:	90-100%
	Mid-term II	20%	B:	80-90%
	Mid-term III	20%	C:	70-80%
	Assignments:	10%	D:	60-70%
	Quizzes	10%	F:	0-60%
	Final Exam:	20%		

Learning Outcomes:

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
Binary Number Systems	Homework assignment	Homework, Quiz, Tests
Logic Gates and Boolean Algebra	Homework assignment	Homework, Quiz, Tests
Combinational Logic Circuits	Homework assignment	Homework, Quiz, Tests

Minimization of Circuits	Homework assignment	Homework, Quiz, Tests
Design Techniques for Combinational Logic Circuits	Homework assignment	Homework, Quiz, Tests
Hardware Design Languages	Homework assignment	Homework, Quiz, Tests
Arithmetic Logic Units	Homework assignment	Homework, Quiz, Tests
Storage Elements	Homework assignment	Homework, Quiz, Tests
Finite State Machines	Homework assignment	Homework, Quiz, Tests
Data Paths	Homework assignment	Homework, Quiz, Tests
Register Transfer Level	Homework assignment	Homework, Quiz, Tests
Memory Components	Homework assignment	Homework, Quiz, Tests
Sequential Computation	Homework assignment	Homework, Quiz, Tests
Binary Number Systems	Homework assignment	Homework, Quiz, Tests
Logic Gates and Boolean Algebra	Homework assignment	Homework, Quiz, Tests
Combinational Logic Circuits	Homework assignment	Homework, Quiz, Tests

Computer Use: MATLAB

Homework and Academic Dishonesty Policy:

Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE529 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: Linear Systems and Control

Alpha Designator/Number: EE529

Title Abbreviation: Linear Systems & Control

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

The course provides a rigorous introduction to the analysis and control of linear dynamical systems in time domain. The course introduces the fundamentals of linear spaces and linear operator theory.

Co-requisite(s):

First Term to be Offered: Fall 2017

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE529

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The course introduces the fundamental mathematics of linear spaces and linear operator theory, and considers the structural properties of linear systems such as controllability, observability, stability, realizations, and minimality. The course will cover topics such as linear algebra review, solutions of linear differential equations, state space representations, state transition matrix, and time varying systems. Design and synthesis of controllers and state observers for linear systems are discussed. More advanced topics presented in the course include linear quadratic regulator theory and an introduction to robust control.

7. COURSE OUTLINE (May be submitted as a separate document)

- State-Space Representation: Linear Systems State-Space Representation
- Properties of State-Space Models
- Impulse Response and Transfer Functions
- Solution to Linear State-Space Equations
- Jordan Normal Form
- Internal Stability
- Input-Output Stability
- Controllability: Concept and Definition
- Reachability and Controllability Gramians
- State Feedback Stabilization
- Observability: Concept and Definition Observability Gramian
- Kalman Decomposition
- State Observer
- Output Feedback
- Linear Quadratic Regulator
- Loop Transfer Recovery

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

- J. Hespanha, "Linear Systems Theory," Princeton University Press, 2009.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- J. Hespanha, "Linear Systems Theory," Princeton University Press, 2009.
- Antsaklis and Michel, A Linear Systems Primer, Birkhauser, 2007.
- R. W. Brockett, "Finite Dimensional Linear Systems," John Wiley 1970.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE529 Linear Systems and Control
Course Description: The course provides a rigorous introduction to the analysis and control of linear dynamical systems in time domain. The course introduces the fundamentals of linear spaces and linear operator theory.
Prerequisites: None
Fist Term Offered: Fall 2017
Credit Hours: 3

EE529 Linear Systems and Control

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE529 Linear Systems and Control
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

The course provides a rigorous introduction to the analysis and control of linear dynamical systems in time domain. The course introduces the fundamentals of linear spaces and linear operator theory. (3 CH).

Required Text, Additional Reading and Other Materials

- J. Hespanha, "Linear Systems Theory," Princeton University Press, 2009.
- Antsaklis and Michel, A Linear Systems Primer, Birkhauser, 2007.
- R. W. Brockett, "Finite Dimensional Linear Systems," John Wiley 1970.

Course Objectives:

The course introduces the fundamental mathematics of linear spaces and linear operator theory, and considers the structural properties of linear systems such as controllability, observability, stability, realizations, and minimality. The course will cover topics such as linear algebra review, solutions of linear differential equations, state space representations, state transition matrix, and time varying systems. Design and synthesis of controllers and state observers for linear systems are discussed. More advanced

topics presented in the course include linear quadratic regulator theory and an introduction to robust control.

Student Learning Outcomes (SO):

After completing this course the students should be able to understand:

1. Linear dynamical systems.
2. Mathematical tools for analysis of linear systems.
3. The concepts of controllability and observability of linear systems.
4. The methods of controller design in the time domain.

Topics:

- State-Space Representation: Linear Systems State-Space Representation
- Properties of State-Space Models
- Impulse Response and Transfer Functions
- Solution to Linear State-Space Equations
- Jordan Normal Form
- Internal Stability
- Input-Output Stability
- Controllability: Concept and Definition
- Reachability and Controllability Gramians
- State Feedback Stabilization
- Observability: Concept and Definition Observability Gramian
- Kalman Decomposition
- State Observer
- Output Feedback
- Linear Quadratic Regulator
- Loop Transfer Recovery

Grading:

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%
- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to understand basic concepts of Linear dynamical systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand mathematical tools for analysis of linear systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand the concepts of controllability and observability of linear systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand the methods of controller design in the time domain.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE530 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: Cyber-Physical Systems

Alpha Designator/Number: EE530

Title Abbreviation: Cyber-Physical Systems

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course provides an introduction to modeling and analysis of cyber-physical systems. Several models of continuous-time systems and discrete-time systems are introduced.

Co-requisite(s): | First Term to be Offered: Spring 2018

Prerequisite(s): | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 11-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE530

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The goal of the course is to teach students the basics of cyber-physical systems. Cyber-physical systems combine digital and analog devices, interfaces, networks, computer systems, and the like with the natural and man-made physical world. This course introduces students to suitable tools for analysis and design of cyber-physical systems.

7. COURSE OUTLINE (May be submitted as a separate document)

- Introduction to continuous-time systems
- Modeling of physical processes
- Linear time-invariant systems
- Numerical simulation of differential equations
- Introduction to discrete-time systems and return maps
- Finite state machines
- Event triggered systems
- Stateflow
- Timed automata
- Hybrid automata
- Concurrency, Invariants
- Linear temporal logic
- Introduction to verification

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Logical analysis of Hybrid Systems: Proving Theorems for Complex Dynamics, Springer, 2010, ISBN: 978-3-642-14508-7.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

E. A. Lee and S. A. Seshia, Introduction to Embedded Systems - A Cyber-Physical Systems Approach, Lulu.com, First Edition, Jan 2013. Online: http://leeseshia.org/releases/LeeSeshia_DigitalV1_08.pdf
• Logical analysis of Hybrid Systems: Proving Theorems for Complex Dynamics, Springer, 2010, ISBN: 978-3-642-14508-7.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE530 Cyber-Physical Systems
Course Description: This course provides an introduction to modeling and analysis of cyber-physical systems. Several models of continuous-time systems and discrete-time systems are introduced.
Prerequisites: None
Fist Term Offered: Spring 2018
Credit Hours: 3

EE530 Cyber-Physical Systems

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE530 Cyber-Physical Systems
Semester/Year	Spring/2018
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

This course provides an introduction to modeling and analysis of cyber-physical systems. Several models of continuous-time systems and discrete-time systems are introduced. (3 CH).

Required Text: Additional Reading and Other Materials

- E. A. Lee and S. A. Seshia, Introduction to Embedded Systems - A Cyber-Physical Systems Approach, Lulu.com, First Edition, Jan 2013. Online: http://leeseshia.org/releases/LeeSeshia_DigitalV1_08.pdf
- Logical analysis of Hybrid Systems: Proving Theorems for Complex Dynamics, Springer, 2010, ISBN: 978-3-642-14508-7.

Course Objectives:

The goal of the course is to teach students the basics of cyber-physical systems. Cyber-physical systems combine digital and analog devices, interfaces, networks, computer systems, and the like with the natural and man-made physical world. This course introduces students to suitable tools for analysis and design of cyber-physical systems. These tools must allow a combination of physical or continuous dynamics and the

cyber or computational components, as well as handle a variety of types of perturbations, such as exogenous disturbances, time delays, and system failures.

Student Learning Outcomes (SO):

After completing this course the students should be able to understand:

1. Basic concepts and tools for the study of cyber-physical systems.
2. Modeling and analysis tools for continuous-time and discrete-time systems.
3. Finite state machines, stateflow, timed and hybrid automata, concurrency, invariants, linear temporal logic, verification, and numerical simulation.
4. Methods for simulation and encouraged to apply them to several applications.

Topics

- Introduction to continuous-time systems
- Modeling of physical processes
- Linear time-invariant systems
- Numerical simulation of differential equations
- Introduction to discrete-time systems and return maps
- Finite state machines
- Event triggered systems
- Stateflow
- Timed automata
- Hybrid automata
- Concurrency, Invariants
- Linear temporal logic
- Introduction to verification

Grading:

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%
- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to understand basic concepts and tools for the study of cyber-physical systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand modeling and analysis tools for continuous-time and discrete-time systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand basic Finite state machines, stateflow, timed and hybrid automata, concurrency, invariants, linear temporal logic, verification, and numerical simulation.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand students will be able to understand methods for simulation.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 535 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Power System Protection

Alpha Designator/Number: EE 535

Title Abbreviation: power system protection

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers the power system faults and application of relays for power system protection. Symmetrical components as applied fault currents. Introduction to digital filtering, microprocessor, computer simulation for relays

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 535

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Introducing the students to the importance of power protection systems.
2. Having a deep understanding on the concepts of instrument transformers, fundamentals of relaying.
3. Understanding and developing overcurrent protection and coordination,
4. Designing directional overcurrent protection, differential protection, distance protection.
5. Understanding the concept of distributed generation protection.
6. Designing distributed generation protection.
7. Understanding the IEC61850 based substation automation.

7. COURSE OUTLINE (May be submitted as a separate document)

Introduction to power system protection
Review on fault analysis
Relaying: operating principles
Current and voltage transformers and circuit breakers and fuses
Overcurrent protection and its coordination
Directional overcurrent protection
Distance protection
Islanding detection, distributed and renewable power generation protection and load shedding
IEC61850 based substation automation including protection

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

J.L. Blackburn and T.J. Domin: Protective Relaying: Principles and Applications, Fourth Edition. CRC Press, 2014

J.L. Blackburn and T.J. Domin: Protective Relaying: Principles and Applications, Third Edition. CRC Press, 2006 GE Grid Solutions Network Protection and Automation Guide

H.J. Altuve, E. O Schweitzer, III, Modern Solutions for Protection, Control and Monitoring of Electric Power Systems. Schweitzer Engineering Laboratories, Inc., 2010.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Tests, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

J.L. Blackburn and T.J. Domin: Protective Relaying: Principles and Applications, Fourth Edition. CRC Press, 2014

J.L. Blackburn and T.J. Domin: Protective Relaying: Principles and Applications, Third Edition. CRC Press, 2006 GE Grid Solutions Network Protection and Automation Guide

H.J. Altuve, E. O Schweitzer, III, Modern Solutions for Protection, Control and Monitoring of Electric Power Systems. Schweitzer Engineering Laboratories, Inc., 2010.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 535 - Power System Protection
Catalog Description: This course covers the power system faults and application of relays for power system protection. Symmetrical components as applied fault currents. Introduction to digital filtering, microprocessor, computer simulation for relays
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE-535 – Power System Protection
College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE-535 – Power System Protection
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description

This course covers the power system faults and application of relays for power system protection. Symmetrical components as applied fault currents. Introduction to digital filtering, microprocessor, computer simulation for relays

Required Text: Additional Reading and Other Materials

- Required: J.L. Blackburn and T.J. Domin: Protective Relaying: Principles and Applications, Fourth Edition. CRC Press, 2014
- Or: J.L. Blackburn and T.J. Domin: Protective Relaying: Principles and Applications, Third Edition. CRC Press, 2006 GE Grid Solutions Network Protection and Automation Guide
- References
    - H.J. Altuve, E. O Schweitzer, III, Modern Solutions for Protection, Control and Monitoring of Electric Power Systems. Schweitzer Engineering Laboratories, Inc., 2010.
    - P.M. Anderson, Analysis of Faulted Power Systems, IEEE PRESS, 2000.
    - P.M. Anderson, Power System Protection. IEEE PRESS, 1998.

Course Objectives

1. Introducing the students to the importance of power protection systems.
2. Having a deep understanding on the concepts of instrument transformers, fundamentals of relaying.
3. Understanding and developing overcurrent protection and coordination,

4. Designing directional overcurrent protection, differential protection, distance protection.
5. Understanding the concept of distributed generation protection.
6. Designing distributed generation protection.
7. Understanding the IEC61850 based substation automation.

Student Learning Outcomes (SO):

1. Student Learning Outcome: Calculation of both symmetrical and un-symmetrical fault currents
2. Student Learning Outcome: Understanding the fundamentals of electromechanical relays and digital protective
3. relaying
4. Student Learning Outcome: understanding the basic methods of calculating the magnitude and angle of voltage and current for the digital relaying
5. Student Learning Outcome: Understanding the methods to choose suitable current transformer, voltage transformer and circuit breakers for fulfilling power system protection
6. Student Learning Outcome: Design of overcurrent protection and its coordination
7. Student Learning Outcome: Design of directional overcurrent protection
8. Student Learning Outcome: Design of differential protection
9. Student Learning Outcome: Design of distance protection
10. Student Learning Outcome: Understanding the basic concepts of islanding in the operation of microgrid
11. Student Learning Outcome: Understanding of application of IEC61850 communication protocol in the power system protection

Course Schedule

No of Weeks	Topic
1	Introduction to power system protection
1	Review on fault analysis
1	Relaying: operating principles
1	Current and voltage transformers and circuit breakers and fuses
1	Overcurrent protection and its coordination
4	Directional overcurrent protection
2	Distance protection
1	Islanding detection, distributed and renewable power generation protection and load shedding
2	IEC61850 based substation automation including protection

Grading

Grading Basis:	Mid-term I:	20%	A:	90-100%
	Mid-term II	20%	B:	80-90%
	Mid-term III	20%	C:	70-80%
	Assignments:	10%	D:	60-70%
	Quizzes	10%	F:	0-60%
	Final Exam:	20%		

Learning Outcomes

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course

Calculation symmetrical and un-symmetrical fault currents	Homework assignment	Homework, Quiz, Tests
Electromechanical relays and digital protective relaying	Homework assignment	Homework, Quiz, Tests
Calculating the magnitude and angle of voltage and current for the digital relaying	Homework assignment	Homework, Quiz, Tests
Choose suitable current transformer, voltage transformer and circuit breakers for fulfilling power system protection	Homework assignment	Homework, Quiz, Tests
Design of overcurrent protection and its coordination	Homework assignment	Homework, Quiz, Tests
Design of directional overcurrent protection	Homework assignment	Homework, Quiz, Tests
Design of differential protection	Homework assignment	Homework, Quiz, Tests
Design of distance protection	Homework assignment	Homework, Quiz, Tests
Understanding the basic concepts of islanding in the operation of microgrid	Homework assignment	Homework, Quiz, Tests
Application of IEC61850 communication protocol in the power system protection	Homework assignment	Homework, Quiz, Tests
Calculation of both symmetrical and un-symmetrical fault currents	Homework assignment	Homework, Quiz, Tests

Homework and Academic Dishonesty Policy

Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE602 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: Random Signals and Noise

Alpha Designator/Number: EE602

Title Abbreviation: Random Signals & Noise

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course provides an introduction to the fundamentals of random variables, random signals, and simulation of random phenomena.

Co-requisite(s):

First Term to be Offered: Fall 2017

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE602

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The goal of the course is to teach students the basics of probability theory. More specifically, it is to introduce the students to the concepts of random experiments, probability spaces, random variables, and random processes. Exposing the students to application of these concepts to applications in Electrical and Computer Engineering is another important goal.

7. COURSE OUTLINE (May be submitted as a separate document)

- Review of probability theory.
- Basics of Monte Carlo computer simulation in Matlab
- One discrete random variable.
- One continuous random variable
- Mixed random variables
- Two jointly distributed continuous random variables
- N jointly distributed continuous random variables, Limit theorems
- Hands-on experiments with Matlab (simulation and analysis of random variables)
- Basic Random Processes
- Wide Sense Stationary Random Processes
- Linear Systems and Wide Sense Stationary Random Processes
- Hands-on experiments with Matlab (simulation and analysis of random signals)

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

S. M. Kay, Intuitive Probability and Random Processes using Matlab. New York: Springer, 2006.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- S. M. Kay, Intuitive Probability and Random Processes using Matlab. New York: Springer, 2006.
- R. D. Yates and D. J. Goodman, Probability and Stochastic Processes, John Wiley and Sons, Inc., 2014.
- J.G.Proakis & D.G.Manolakis- Digital Signal Processing Principles, Algorithms and Applications, PHI.
- A.V.Oppenheim, A.S.Willsky and S.H.Nawab -Signals & Systems, Pearson.
- E WKamen &BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab- Pearson.
- B.P.Lathi- Signal Processing & Linear Systems- Oxford.
- M.H.Hays- Digital Signal Processing ", Schaum's outlines, TMH.
- Ashok Ambardar, -Analog and Digital Signal Processing- Thomson.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE602 Random Signals and Noise
Course Description: This course provides an introduction to the fundamentals of random variables, random signals, and simulation of random phenomena.
Prerequisites: None
Fist Term Offered: Fall 2017
Credit Hours: 3

EE 602 Random Signals and Noise

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE 602 Random Signals and Noise
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

This course provides an introduction to the fundamentals of random variables, random signals, and simulation of random phenomena. (3 CH).

Required Text: Additional Reading and Other Materials

- S. M. Kay, Intuitive Probability and Random Processes using Matlab. New York: Springer, 2006.
- R. D. Yates and D. J. Goodman, Probability and Stochastic Processes, John Wiley and Sons, Inc., 2014.
- J.G.Proakis & D.G.Manolakis- Digital Signal Processing Principles, Algorithms and Applications, PHI.
- A.V.Oppenheim, A.S.Willsky and S.H.Nawab -Signals & Systems, Pearson.
- E WKamen &BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab-Pearson.
- B.P.Lathi- Signal Processing & Linear Systems- Oxford.
- M.H.Hays- Digital Signal Processing ", Schaum's outlines, TMH.
- Ashok Ambardar, -Analog and Digital Signal Processing- Thomson.

Course Objectives:

The goal of the course is to teach students the basics of probability theory. More specifically, it is to introduce the students to the concepts of random experiments, probability spaces, random variables, and random processes. Exposing the students to application of these concepts to applications in Electrical and Computer Engineering is another important goal.

Student Learning Outcomes (SO):

After completing this course the students should be able to:

1. Apply the fundamental concepts and methods of probability and random signals to develop an awareness of the key models and their interrelationships.
2. Develop problem solving skills and understand how to make the transition from a real world problem to a random/probabilistic model.
3. Design and analyze random discrete-time and continuous-time signals and systems.
4. Perform frequency domain analysis on random signals and systems.
5. Design linear filters operating on random signals.
6. Use measurement data to formulate models for random signals and systems.

Topics

- Review of probability theory.
- Basics of Monte Carlo computer simulation in Matlab
- One discrete random variable.
- One continuous random variable
- Mixed random variables
- Two jointly distributed continuous random variables
- N jointly distributed continuous random variables, Limit theorems
- Hands-on experiments with Matlab (simulation and analysis of random variables)
- Basic Random Processes
- Wide Sense Stationary Random Processes
- Linear Systems and Wide Sense Stationary Random Processes
- Hands-on experiments with Matlab (simulation and analysis of random signals)

Grading:

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%

- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to apply the fundamental concepts and methods of probability and random signals to develop an awareness of the key models and their interrelationships.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to develop problem solving skills and understand how to make the transition from a real world problem to a random/probabilistic model.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to design and analyze random discrete-time and continuous-time signals and systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to perform frequency domain analysis on random signals and systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to design linear filters operating on random signals.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to use measurement data to formulate models for random signals and systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university

academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 606 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Electrical engineering analysis

Alpha Designator/Number: E E 6 0 6

Title Abbreviation: e l e c t r i c a l a n a l y s i s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers Laplace transform for boundary-value problem, applications to control theory, frequency response of ordinary differential equations, linear algebra techniques; eigenvalue analysis of linear systems and in multivariate optimization.

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head [signature]	Date 10/4/16
Registrar [signature] 141001	Date 10/4/16
College Curriculum Chair [signature]	Date 10/17/16
Graduate Council Chair [signature]	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 606

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Review of linear and nonlinear ordinary differential equations and Laplace transforms
2. Extend Laplace transform methods to boundary-value problems
3. Discuss applications to control theory
4. Stress problem solving efficiency
5. Discuss the frequency response of ordinary differential equations
6. Examine applications of linear algebra including the use of eigenvalue analysis in the solution of linear systems and in multivariate optimization.

7. COURSE OUTLINE (May be submitted as a separate document)

Linear and nonlinear ordinary differential equations and Laplace transforms
Laplace transform methods to boundary-value problems, singularity functions, the inverse transform
Applications to control theory
Problem solving efficiency
Frequency response of ordinary differential equations
Applications of linear algebra, matrices, determinants, eigenvalue analysis in the solution of linear systems and in multivariate optimization.
Fourier analysis techniques

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Kreyszig's Engineering Mathematics-2 ISBN 13 : 9788126521371. Kreyszig Erwin. 2011
Electrical Engineer's Reference Book: Edition 14, ISBN: 9781483102634. M.A. Laughton. 2003
ELECTRICAL POWER SYSTEMS: Concept, Theory and Practice, Edition 2, ISBN 9788120349513. Subir Ray. 2014

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Tests, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Kreyszig's Engineering Mathematics-2 ISBN 13 : 9788126521371. Kreyszig Erwin. 2011
Electrical Engineer's Reference Book: Edition 14, ISBN: 9781483102634. M.A. Laughton. 2003
ELECTRICAL POWER SYSTEMS: Concept, Theory and Practice, Edition 2, ISBN 9788120349513. Subir Ray. 2014

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: MSEE 606 - Electrical engineering analysis
Catalog Description: This course covers Laplace transform for boundary-value problem, applications to control theory, frequency response of ordinary differential equations, linear algebra techniques; eigenvalue analysis of linear systems and in multivariate optimization.
Prerequisites: N/A
First Term Offered: Fall 2016
Credit Hours: 3

EE – 606 Electrical engineering analysis
College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE Electrical engineering analysis
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description: From Catalog

This course covers Laplace transform for boundary-value problem, applications to control theory, frequency response of ordinary differential equations, linear algebra techniques; eigenvalue analysis of linear systems and in multivariate optimization.

Required Text: Additional Reading and Other Materials

Kreyszig's Engineering Mathematics-2 ISBN 13 : 9788126521371

References

- Electrical Engineer's Reference Book: Edition 14, ISBN: 9781483102634
- ELECTRICAL POWER SYSTEMS: Concept, Theory and Practice, Edition 2, ISBN 9788120349513

Course Objectives:

1. Review of linear and nonlinear ordinary differential equations and Laplace transforms
2. Extend Laplace transform methods to boundary-value problems
3. Discuss applications to control theory
4. Stress problem solving efficiency
5. Discuss the frequency response of ordinary differential equations

6. Examine applications of linear algebra including the use of eigenvalue analysis in the solution of linear systems and in multivariate optimization.
7. Provide an introduction to Fourier analysis.

Student Learning Outcomes (SO):

1. Student Learning Outcome: practice linear and nonlinear ordinary differential equations and Laplace transforms
2. Student Learning Outcome: use Laplace transform methods to boundary-value problems
3. Student Learning Outcome: apply the control theory
4. Student Learning Outcome: analyze systems using the frequency response of ordinary differential equations
5. Student Learning Outcome: apply linear algebra techniques to solve problems of linear systems and in multivariate optimization.
6. Student Learning Outcome: use Fourier analysis

Course Schedule

No of Weeks	Topic
2	Linear and nonlinear ordinary differential equations and Laplace transforms
2	Laplace transform methods to boundary-value problems, singularity functions, the inverse transform
2	Applications to control theory
2	Problem solving efficiency
3	Frequency response of ordinary differential equations
2	Applications of linear algebra, matrices, determinants, eigenvalue analysis in the solution of linear systems and in multivariate optimization.
2	Fourier analysis techniques

Grading:

Grading Basis:	Mid-term I:	20%	A:	90-100%
	Mid-term II	20%	B:	80-90%
	Mid-term III	20%	C:	70-80%
	Assignments:	10%	D:	60-70%
	Quizzes	10%	F:	0-60%
	Final Exam:	20%		

Learning Outcomes:

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
practice linear and nonlinear ordinary differential equations and Laplace transforms	Homework assignment	Homework, Quiz, Tests
use Laplace transform methods to boundary-value problems	Homework assignment	Homework, Quiz, Tests

apply the control theory	Homework assignment	Homework, Quiz, Tests
analyze systems using the frequency response of ordinary differential equations	Homework assignment	Homework, Quiz, Tests
apply linear algebra techniques to solve problems of linear systems and in multivariate optimization.	Homework assignment	Homework, Quiz, Tests
use Fourier analysis	Homework assignment	Homework, Quiz, Tests

Homework and Academic Dishonesty Policy:

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. **Incoming homework assignments will be screened for inappropriate collaboration.**

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 607 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Advanced Electrical engineering analysis

Alpha Designator/Number: E E 6 0 7

Title Abbreviation: a d v e l e c t r i c a l e n g r

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers complex functions, complex integration, vectors, matrices, functions of matrices, Cayley-Hamilton theorem, state-space modeling, optimization techniques, ~~it also~~ least squares technique, total least squares, and numerical techniques.

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10/4/16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 607

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Provide the foundations for complex functions, vector calculus and advanced linear algebra
2. Examine applications in analyzing problems in control, circuit analysis, communication, and signal/image processing.
3. Discuss special matrices, vector spaces and subspaces, the nullspace
4. Examine applications in projection and subspaces, matrix factorization, eigenvalues and eigenvectors.
5. Explain matrix diagonalization, singular value decomposition (SVD), functions of matrices, matrix polynomials
6. Prove Cayley-Hamilton theorem
7. Examine state-space modeling, optimization techniques, and numerical techniques.

7. COURSE OUTLINE (May be submitted as a separate document)

vector calculus and advanced linear algebra, matrices, vectors, dot product, cross product
circuit analysis, communication, and signal/image processing.
special matrices, vector spaces and subspaces, the nullspace
projection and subspaces, matrix factorization, eigenvalues and eigenvectors.
matrix diagonalization, singular value decomposition (SVD), functions of matrices, matrix polynomials
cayley-Hamilton theorem
state-space modeling, optimization techniques, and numerical techniques.
least squares technique, total least squares, and numerical techniques. Electrical engineering applications.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Kreyszig's Engineering Mathematics-2 ISBN 13 : 9788126521371 2011
Electrical Engineer's Reference Book: Edition 14, ISBN: 9781483102634 2003
ELECTRICAL POWER SYSTEMS: Concept, Theory and Practice, Edition 2, ISBN 9788120349513 2003

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Tests, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Kreyszig's Engineering Mathematics-2 ISBN 13 : 9788126521371 2011
Electrical Engineer's Reference Book: Edition 14, ISBN: 9781483102634 2003
ELECTRICAL POWER SYSTEMS: Concept, Theory and Practice, Edition 2, ISBN 9788120349513 2003

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 607 - Advanced Electrical engineering analysis
Catalog Description: This course covers complex functions, complex integration, vectors, matrices, functions of matrices, Cayley-Hamilton theorem, state-space modeling, optimization techniques, least squares technique, total least squares, and numerical techniques.
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE – 607 Advanced Electrical engineering analysis
College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE 607 Advanced Electrical engineering analysis
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description: From Catalog

This course covers complex functions, complex integration, vectors, matrices, functions of matrices, Cayley-Hamilton theorem, state-space modeling, optimization techniques, it also least squares technique, total least squares, and numerical techniques.

Required Text: Additional Reading and Other Materials

Kreyszig's Engineering Mathematics-2 ISBN 13 : 9788126521371

References

- Electrical Engineer's Reference Book: Edition 14, ISBN: 9781483102634
- ELECTRICAL POWER SYSTEMS: Concept, Theory and Practice, Edition 2, ISBN 9788120349513

Course Objectives:

1. Provide the foundations for complex functions, vector calculus and advanced linear algebra
2. Examine applications in analyzing problems in control, circuit analysis, communication, and signal/image processing.
3. Discuss special matrices, vector spaces and subspaces, the nullspace

4. Examine applications in projection and subspaces, matrix factorization, eigenvalues and eigenvectors.
5. Explain matrix diagonalization, singular value decomposition (SVD), functions of matrices, matrix polynomials
6. Prove Cayley-Hamilton theorem
7. Examine state-space modeling, optimization techniques, and numerical techniques.

Student Learning Outcomes (SO):

1. Student Learning Outcome: understand complex functions, vector calculus and advanced linear algebra
2. Student Learning Outcome: Apply analyzing to circuit and control problems
3. Student Learning Outcome: examine signal processing
4. Student Learning Outcome: use matrices, vector spaces and subspaces, the nullspace to analyze linear systems
5. Student Learning Outcome: Apply projection and subspaces, matrix factorization, eigenvalues and eigenvectors to analyze linear systems.
6. Student Learning Outcome: Use matrix diagonalization, singular value decomposition (SVD), functions of matrices, matrix polynomials
7. Student Learning Outcome: use Cayley-Hamilton theorem
8. Student Learning Outcome: use state-space modeling, optimization techniques, and numerical techniques.

Course Schedule

No of Weeks	Topic
1	vector calculus and advanced linear algebra, matrices, vectors, dot product, cross product
2	circuit analysis, communication, and signal/image processing.
1	special matrices, vector spaces and subspaces, the nullspace
2	projection and subspaces, matrix factorization, eigenvalues and eigenvectors.
2	matrix diagonalization, singular value decomposition (SVD), functions of matrices, matrix polynomials
1	cayley-Hamilton theorem
2	state-space modeling, optimization techniques, and numerical techniques.
2	least squares technique, total least squares, and numerical techniques. Electrical engineering applications.

Grading:

Grading Basis:	Mid-term I:	20%	A:	90-100%
	Mid-term II	20%	B:	80-90%
	Mid-term III	20%	C:	70-80%
	Assignments:	10%	D:	60-70%
	Quizzes	10%	F:	0-60%
	Final Exam:	20%		

Learning Outcomes:

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
understand complex functions, vector calculus and advanced linear algebra	Homework assignment	Homework, Quiz, Tests

apply analyzing to circuit and control problems	Homework assignment	Homework, Quiz, Tests
examine signal processing	Homework assignment	Homework, Quiz, Tests
use matrices, vector spaces and subspaces, the nullspace to analyze linear systems	Homework assignment	Homework, Quiz, Tests
apply projection and subspaces, matrix factorization, eigenvalues and eigenvectors to analyze linear systems.	Homework assignment	Homework, Quiz, Tests
use matrix diagonalization, singular value decomposition (SVD), functions of matrices, matrix polynomials	Homework assignment	Homework, Quiz, Tests
use Cayley-Hamilton theorem	Homework assignment	Homework, Quiz, Tests
use state-space modeling, optimization techniques, and numerical techniques	Homework assignment	Homework, Quiz, Tests

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Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. **Incoming homework assignments will be screened for inappropriate collaboration.**

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE608 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: EE~~60~~8 Research Methods

Alpha Designator/Number: E E 6 0 8

Title Abbreviation: Research methods

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Overview of research methods in engineering. Research theory, design, ethics and practice. Research plan and proposal. Experimental, numerical and analytical research. Reviewing literatures, collect and analyze data quantitatively and qualitatively.

Co-requisite(s):

First Term to be Offered: Fall 2017

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10/4/16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE608

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

After taking this course, students should be able to
- Understand research methodology.
- Find and review literature
- Plan research and make research proposal
- Understand experimental, numerical and analytical research methods
- Collect and analyze data, present results

7. COURSE OUTLINE (May be submitted as a separate document)

- Research theory, design, ethics and practice.
- Innovation and Creativity
- Research plan and proposal.
- Observation/Hypothesis/Experimentation/Interpretation
- Experimental, numerical and analytical research.
- Finding and reviewing literatures,
- Collect and analyze data quantitatively and qualitatively.
- Present results

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

- Graduate Research: A Guide for Students in the Sciences, Third Edition, Revised and Expanded Paperback, 1998, Robert Smith WUPress.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- Graduate Research: A Guide for Students in the Sciences, Third Edition, Revised and Expanded Paperback, 1998, Robert Smith WUPress.
- Research Method: The Basics, Nicholas William, Routledge, 2011.
- A Research Guide for Students and Teachers, Anna M. Stewart, SUNY-NSF, 2009

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE608 Research Methods
Course Description: Overview of research methods in engineering. Research theory, design, ethics and practice. Research plan and proposal. Experimental, numerical and analytical research. Reviewing literatures, collect and analyze data quantitatively and qualitatively.
Prerequisites: None
Fist Term Offered: Fall 2017
Credit Hours: 3

EE608 Research Methods

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE608 Research Methods
Semester/Year	Fall / 2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description: From Catalog

Overview of research methods in engineering. Research theory, design, ethics and practice. Research plan and proposal. Experimental, numerical and analytical research. Reviewing literatures, collect and analyze data quantitatively and qualitatively. (3 Ch)

Objective:

After taking this course, students should be able to

- Understand research methodology.
- Find and review literature
- Plan research and make research proposal
- Understand experimental, numerical and analytical research methods
- Collect and analyze data, present results

Required Texts, Additional Reading, and Other Materials

- Graduate Research: A Guide for Students in the Sciences, Third Edition, Revised and Expanded Paperback, 1998, Robert Smith WUPress.
- Research Method: The Basics, Nicholas William, Routledge, 2011.
- A Research Guide for Students and Teachers, Anna M. Stewart, SUNY-NSF, 2009

Table: How each student learning outcomes will be practiced and assessed in the course.

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course	Program outcomes
Students will be able to understand the concepts of research methodology, ethics, and creativity.	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2
Students will be able to plan research and make proposal	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2
Students will be able to find and review literature.	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2
Students will be able to understand principles of research, experimental, numerical and analytical research	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2
Students will be able to analyze data and present results	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2

Grading Policy

HW/Projects (one review paper, one plan, one proposal, in class excises)	70%
Midterm Exam	10%
Final Exam	20%
Total	100%

Letter Grade Scale:

90-100--------- A
80- 89 --------- B
70-79 --------- C
60-69 --------- D
0-59 --------- F

Topics

- Research theory, design, ethics and practice.
- Innovation and Creativity
- Research plan and proposal.
- Observation/Hypothesis/Experimentation/Interpretation
- Experimental, numerical and analytical research.
- Finding and reviewing literatures,
- Collect and analyze data quantitatively and qualitatively.
- Present results

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 611 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Digital Integrated Circuits Design

Alpha Designator/Number: E E 6 1 1

Title Abbreviation: d i g i t a l d e s i g n

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers the CMOS circuits. Design approaches with emphasis placed on structured full custom design, MOS device, critical interconnect and gate characteristics. CMOS logic design from transistor to fabrication.

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 611

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Developing expertise in full custom, digital integrated circuit design
2. Learning the fundamentals of digital CMOS VLSI design from the transistor up to the system level
3. Understanding the models for state-of-the-art VLSI components, fabrication steps, hierarchical design flow and semiconductor business economics
4. Application of CMOS VLSI in design examples
5. Familiarizing the students with Cadence VLSI CAD environment and do lab assignments that span the Cadence tool set, including schematic capture, Verilog and SPICE simulations. Parasitic extraction, layout, design rule check.

7. COURSE OUTLINE (May be submitted as a separate document)

Introduction to digital circuits
Fabrication of MOS Circuits
MOS Transistor Theory
Modeling of MOS Transistors using SPICE
MOS Inverters: Static Characteristics
MOS Inverters: Switching Characteristics & Interconnect Effects
Combinational MOS Logic Circuits
Sequential MOS Logic Circuits
Library Based Circuit Design & Design Automation NA 1 10 Dynamic MOS Logic Circuit
Semiconductor Memories
Chip Input and Output (I/O) Circuits
Design for Manufacturability

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

K. Martin, Digital Integrated Circuit Design, Oxford University Press, 2000, ISBN 0-19-512584-3. A. J. Davis, Introduction to Integrated Circuit Design, Layout & Simulation, Laboratory Manual, 2004

CMOS DIGITAL INTEGRATED CIRCUITS ANALYSIS AND DESIGN, Third Edition, By S. M. Kang and Y. Leblebici, McGraw Hill, 2002.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Tests, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

K. Martin, Digital Integrated Circuit Design, Oxford University Press, 2000, ISBN 0-19-512584-3. A. J. Davis, Introduction to Integrated Circuit Design, Layout & Simulation, Laboratory Manual, 2004
CMOS DIGITAL INTEGRATED CIRCUITS ANALYSIS AND DESIGN, Third Edition, By S. M. Kang and Y. Leblebici, McGraw Hill, 2002.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 611 Digital Integrated Circuits Design
Catalog Description: This course covers the CMOS circuits. Design approaches with emphasis placed on structured full custom design, MOS device, critical interconnect and gate characteristics. CMOS logic design from transistor to fabrication.
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE-611 Digital Integrated Circuits Design

College of Information Technology & Engineering

Weisberg Division of Engineering and Computer Science

Course Title/Number	EE-611 Digital Integrated Circuit Design
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description:

This course covers the CMOS circuits. Design approaches with emphasis placed on structured full custom design, MOS device, critical interconnect and gate characteristics. CMOS logic design from transistor to fabrication.

Required Text: Additional Reading and Other Materials

- K. Martin, Digital Integrated Circuit Design, Oxford University Press, 2000, ISBN 0-19-512584-3. A. J. Davis, Introduction to Integrated Circuit Design, Layout & Simulation, Laboratory Manual, 2004

References

- CMOS DIGITAL INTEGRATED CIRCUITS ANALYSIS AND DESIGN, Third Edition, By S. M. Kang and Y. Leblebici, McGraw Hill, 2002.

Course Objectives:

1. Developing expertise in full custom, digital integrated circuit design
2. Learning the fundamentals of digital CMOS VLSI design from the transistor up to the system level
3. Understanding the models for state-of-the-art VLSI components, fabrication steps, hierarchical design flow and semiconductor business economics
4. Application of CMOS VLSI in design examples
5. Familiarizing the students with Cadence VLSI CAD environment and do lab assignments that span the Cadence tool set, including schematic capture, Verilog and SPICE simulations. Parasitic extraction, layout, design rule check.
6. Working in team on Cadence VLSI CAD tools. Realizing a capstone design project that involves much the same design flow students would encounter in a semiconductor design industrial setting.

7. Including the development of detailed behavioral description, a verified transistor level design and a verified silicon layout in all ESE570 projects.
8. Presentation of the capstone project in a formal report due at the end of the semester

Student Learning Outcomes (SO):

1. Student Learning Outcome: understand the concept digital CMOS VLSI
2. Student Learning Outcome: design digital CMOS VLSI starting from transistor up to higher levels
3. Student Learning Outcome: develop CMOS from VLSI components, understand the fabrication process from the modeling step till the marketing step
4. Student Learning Outcome: use efficiently the cadence VLSI CAD framework to design and simulate CMOS VLSI
5. Student Learning Outcome: acquire teamwork skills on a technical project
6. Student Learning Outcome: acquire presentation skills on technical topics

Course Schedule

No of Weeks	Topic
1	Introduction to digital circuits
1	Fabrication of MOS Circuits
1	MOS Transistor Theory
1	Modeling of MOS Transistors using SPICE
1	MOS Inverters: Static Characteristics
1	MOS Inverters: Switching Characteristics & Interconnect Effects
1	Combinational MOS Logic Circuits
2	Sequential MOS Logic Circuits
1	Library Based Circuit Design & Design Automation NA 1 10 Dynamic MOS Logic Circuit
1	Semiconductor Memories
1	Chip Input and Output (I/O) Circuits
1	Design for Manufacturability

Grading:

Grading Basis:	Mid-term I project	20%	A:	90-100%
	Mid-term II project	20%	B:	80-90%
	Mid-term III project	20%	C:	70-80%
	Homework	10%		
	Quiz	10%		
	Final presentation	20%	D:	60-70%
			F:	0-60%

Learning Outcomes:

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
Fabrication of MOS Circuits	Homework assignment	Homework, Quiz
MOS Transistor Theory	Homework assignment	Homework, Quiz

Modeling of MOS Transistors using SPICE	Homework assignment	Homework, Quiz
MOS Inverters: Static Characteristics	Homework assignment	Homework, Quiz
MOS Inverters: Switching Characteristics & Interconnect Effects	Homework assignment	Homework, Quiz
Combinational MOS Logic Circuits	cadence VLSI CAD framework	Project
Sequential MOS Logic Circuits	cadence VLSI CAD framework	Project
Library Based Circuit Design & Design Automation Dynamic MOS Logic Circuit	cadence VLSI CAD framework	Project
Semiconductor Memories	cadence VLSI CAD framework	Project
Chip Input and Output (I/O) Circuits	cadence VLSI CAD framework	Project
Design for Manufacturability	cadence VLSI CAD framework	Project
Fabrication of MOS Circuits	cadence VLSI CAD framework	Project
MOS Transistor Theory	cadence VLSI CAD framework	Project
Modeling of MOS Transistors using SPICE	cadence VLSI CAD framework	Project
MOS Inverters: Static Characteristics	cadence VLSI CAD framework	Project
MOS Inverters: Switching Characteristics & Interconnect Effects	cadence VLSI CAD framework	Project

Computer Use : Cadence VLSI CAD

Homework and Academic Dishonesty Policy:

Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 615 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Real-time and Embedded Systems

Alpha Designator/Number: E E 6 1 5

Title Abbreviation: r e a l t i m e s y s t e m s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course covers the Designing real-time embedded systems from a hardware and software perspective. Communications and signal processing systems. Applications to seismic monitoring, process control, and biomedical systems

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 615

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Introduce the concept of embedded systems, their constraints, applications and compare them to standalone systems
2. Introduce the concept of real-time design including time scales for real-time system
3. Understand the Hardware/software functional partitioning
4. Use real time hardware technologies: Discrete logic, CPLDs, FPGAs, ASICs
5. Use development environments
6. Understand the embedded systems' techniques: Pipelining, interrupt service routines
7. Understand software structures: ISRs, Polling, semaphores

7. COURSE OUTLINE (May be submitted as a separate document)

Concept of embedded systems, constraints, applications vs. standalone systems
Real-time design, time scale concept
Hardware/software functional partitioning and introduction to the techniques
Hardware Techniques: discrete logic, CPLDs, FPGAs, ASICs
Software environments: HLL vs. assembly coding, DSP vs. general purpose computer vs. RISC
Development environments: project environment
Pipelining, interrupt service routines
Software structures: ISRs, Polling, semaphores
Evaluation of system performance: correctness, speed
Performance optimization. Optimizing compilers, Pareto Principle

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

K. Martin, Digital Integrated Circuit Design, Oxford University Press, 2000, ISBN 0-19-512584-3. A. J. Davis, Introduction to Integrated Circuit Design, Layout & Simulation, Laboratory Manual, 2004

CMOS DIGITAL INTEGRATED CIRCUITS ANALYSIS AND DESIGN, Third Edition, By S. M. Kang and Y. Leblebici, McGraw Hill, 2002.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Tests, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

K. Martin, Digital Integrated Circuit Design, Oxford University Press, 2000, ISBN 0-19-512584-3. A. J. Davis, Introduction to Integrated Circuit Design, Layout & Simulation, Laboratory Manual, 2004

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Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 615 Real time and Embedded Systems
Catalog Description: This course covers the Designing real-time embedded systems from a hardware and software perspective. Communications and signal processing systems. Applications to seismic monitoring, process control, and biomedical systems
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE-615 – Real-time and Embedded Systems

College of Information Technology & Engineering

Weisberg Division of Engineering and Computer Science

Course Title/Number	EE-615 – Real-time and Embedded Systems
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description

This course covers the Designing real-time embedded systems from a hardware and software perspective. Communications and signal processing systems. Applications to seismic monitoring, process control, and biomedical systems

Required Text: Additional Reading and Other Materials

- Tammy Norgaard, "Embedded Systems Architecture," Newes, 2005, ISBN 0-7506-7792-9

References

- Concurrent and Real-Time Programming in Ada, 9781139464352
- Distributed Programming in ADA with Protected Objects 9781581120349

Course Objectives

1. Introduce the concept of embedded systems, their constraints, applications and compare them to standalone systems
2. Introduce the concept of real-time design including time scales for real-time system
3. Understand the Hardware/software functional partitioning
4. Use real time hardware technologies: Discrete logic, CPLDs, FPGAs, ASICs
5. Use development environments
6. Understand the embedded systems' techniques: Pipelining, interrupt service routines
7. Understand software structures: ISRs, Polling, semaphores

8. Evaluation of system performance: correctness, speed
9. Optimization of systems' performance

Student Learning Outcomes (SO):

1. Student Learning Outcome: understanding the fundamentals of embedded systems
2. Student Learning Outcome: understand the concept of real time processing
3. Student Learning Outcome: understand the constraints and applications real-time embedded systems
4. Student Learning Outcome: design real-time system models using software environment
5. Student Learning Outcome: simulate the behavior of real-time applications
6. Student Learning Outcome: evaluate the performance of real-time systems with respect to predefined specifications
7. Student Learning Outcome: suggest and realize optimization for real-time evaluated systems

Course Schedule

No of Weeks	Topic
1	Concept of embedded systems, constraints, applications vs. standalone systems
1	Real-time design, time scale concept
1	Hardware/software functional partitioning and introduction to the techniques
2	Hardware Techniques: discrete logic, CPLDs, FPGAs, ASICs
1	Software environments: HLL vs. assembly coding, DSP vs. general purpose computer vs. RISC
1	Development environments: project environment
1	Pipelining, interrupt service routines
2	Software structures: ISRs, Polling, semaphores
2	Evaluation of system performance: correctness, speed
1	Performance optimization. Optimizing compilers, Pareto Principle

Grading

Grading Basis:	Assignments weekly	30%	A:	90-100%
	Quizzes	20%	B:	80-90%
	Project	30%	C:	70-80%
	Presentation	20%	D:	60-70%
			F:	0-60%

Learning Outcomes

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
Fundamentals of embedded systems	Homework assignment	Homework, Quiz
Concept of real time processing	Homework assignment	Homework, Quiz

Constraints and applications real-time embedded systems	Homework assignment	Homework, Quiz
Design real-time system models using software environment	Project	Project presentation
Simulate the behavior of real-time applications	Project	Project presentation
Evaluate the performance of real-time systems with respect to predefined specifications	Project	Project presentation
Optimization for real-time evaluated systems	Project	Project presentation

Homework and Academic Dishonesty Policy

Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

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Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

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Additional Academic Policies

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE618 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: ~~EE6~~18 Data and Communication Networks

Alpha Designator/Number: E E 6 1 8

Title Abbreviation: Data & Comm Networks

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course introduces the underlying concepts behind networking using the Internet and its protocols as examples.

Co-requisite(s):

First Term to be Offered: Fall 2018

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE618

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The objective of the course is to give the students an understanding of how networks, especially the Internet, work, to familiarize them with large scale systems, and teach them network programming.

7. COURSE OUTLINE (May be submitted as a separate document)

- Introduction
- Web, HTTP and FTP
- Email, DNS, and P2P
- Transport intro, multi/demultiplexing, UDP
- Reliable transport principles
- Connection oriented transport: TCP
- Congestion Control
- Network Layer introduction
- Network Layer: IP and ICMP
- Routing algorithms
- Hierarchical routing, RIP, OSPF, BGP
- Data link layer, error detection and correction, multiple access protocols
- Link layer addressing, Ethernet, hubs and switches
- Wireless and mobile network

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

- James Kurose and Keith Ross, Computer Networking: A Top-Down Approach 5th/6th Edition, Addison Wesley, 2010.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- James Kurose and Keith Ross, Computer Networking: A Top-Down Approach 5th/6th Edition, Addison Wesley, 2010.
- Richard Stevens, TCP/IP Illustrated, Volume I: The Protocols Addison Wesley, 1994.
- Larry L. Peterson and Bruce S. Davie, Computer Networks - A Systems Approach Morgan Kaufmann, 2003.
- Richard Stevens, Unix Network Programming - Volume 1 (2003) and Volume 2 (1999) Prentice Hall.
- Richard Stevens, Advanced Programming in the Unix Environment Addison-Wesley, 1992
- The C++ Programming Language, Special Edition Addison-Wesley, 2000.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE618 Data and Communication Networks
Course Description: This course introduces the underlying concepts behind networking using the Internet and its protocols as examples.
Prerequisites: None
Fist Term Offered: Fall 2018
Credit Hours: 3

EE618 Data and Communication Networks

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE618 Data and Communication Networks
Semester/Year	Fall/2018
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

This course introduces the underlying concepts behind networking using the Internet and its protocols as examples. (3 CH).

Required Text, Additional Reading and Other Materials

- James Kurose and Keith Ross, Computer Networking: A Top-Down Approach 5th/6th Edition, Addison Wesley, 2010.
- Richard Stevens, TCP/IP Illustrated, Volume I: The Protocols Addison Wesley, 1994.
- Larry L. Peterson and Bruce S. Davie, Computer Networks - A Systems Approach Morgan Kaufmann, 2003.
- Richard Stevens, Unix Network Programming - Volume 1 (2003) and Volume 2 (1999) Prentice Hall.
- Richard Stevens, Advanced Programming in the Unix Environment Addison-Wesley, 1992
- The C++ Programming Language, Special Edition Addison-Wesley, 2000.

Course Objectives:

The objective of the course is to give the students an understanding of how networks, especially the Internet, work, to familiarize them with large scale systems, and teach them network programming.

Student Learning Outcomes (SO):

After completing this course the students should be able to:

1. Understand the Internet protocols.
2. Build implementations of the Internet protocols.
3. Begin to read and judge research and technical articles on networking.
4. Create simplicity and reliability out of complexity and unreliability.
5. Structure and design software systems to achieve that simplicity and reliability.

Topics:

- Introduction
- Web, HTTP and FTP
- Email, DNS, and P2P
- Transport intro, multi/demultiplexing, UDP
- Reliable transport principles
- Connection oriented transport: TCP
- Congestion Control
- Network Layer introduction
- Network Layer: IP and ICMP
- Routing algorithms
- Hierarchical routing, RIP, OSPF, BGP
- Data link layer, error detection and correction, multiple access protocols
- Link layer addressing, Ethernet, hubs and switches
- Wireless and mobile network

Grading:

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%
- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to Understand the Internet protocols.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand how build implementations of the Internet protocols.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to begin to read and judge research and technical articles on networking.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to create simplicity and reliability out of complexity and unreliability.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to structure and design software systems to achieve that simplicity and reliability.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

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Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
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Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

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2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE624 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: ~~EE624~~ Wireless Communication

Alpha Designator/Number: E E 6 2 4

Title Abbreviation: Wireless Communication

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course introduces fundamental technologies for wireless communication.

Co-requisite(s):

First Term to be Offered: Fall 2018

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE624

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The field of Wireless communications network is one of the fastest growing fields in the engineering world. The purpose of the course is to introduce the students to the fundamentals of wireless communications and the evolution of wireless networks from the first generation to LTE and LTE advanced.

7. COURSE OUTLINE (May be submitted as a separate document)

1. Analog and digital modulation
2. Propagation, shadowing, fading
3. Radio trunking
4. Multiple access schemes: FDMA, TDMA, CDMA
5. Cellular communications
6. Diversity
7. Equalization
8. Channel coding
9. Wireless systems and standards (1G/2G/3G systems)
10. Speech coding
11. OFDM, Multiuser detection, space time coding, smart antenna, software radio

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

T. S. Rappaport, "Wireless Communications: Principles & Practice," 2nd Ed., Prentice-Hall:Upper Saddle River, NJ, 2002, ISBN 0-13-042232-0.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- T. S. Rappaport, "Wireless Communications: Principles & Practice," 2nd Ed., Prentice-Hall:Upper Saddle River, NJ, 2002, ISBN 0-13-042232-0.
- Jon Mark, Weihua Zhuang, "Wireless Communications and Networking," Prentice Hall. ISBN: 0130409057; 2003.
- Harri Holma and Antti Toskala (ed.), ``WCDMA for UMTS : radio access for third generation mobile communications," Chichester ; New York : Wiley, c2000.
- John G. Proakis, ``Digital communications," 4th ed., Boston : McGraw-Hill, 2001.
- J. D. Parsons, "The Mobile Radio Propagation Channel," 2nd Edition, Wiley, 2000.
- G. L. Stueber, ``Principles of mobile communication," 2nd Ed., Norwell, MA: Kluwer, 2001.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE624 Wireless Communication
Course Description: This course introduces fundamental technologies for wireless communication.
Prerequisites: None
Fist Term Offered: Fall 2018
Credit Hours: 3

EE624 Wireless Communication

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE624 Wireless Communication
Semester/Year	Fall/2018
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

This course introduces fundamental technologies for wireless communication. (3 CH).

Required Text, Additional Reading and Other Materials

- T. S. Rappaport, "Wireless Communications: Principles & Practice," 2nd Ed., Prentice-Hall:Upper Saddle River, NJ, 2002, ISBN 0-13-042232-0.
- Jon Mark, Weihua Zhuang, "Wireless Communications and Networking," Prentice Hall. ISBN: 0130409057; 2003.
- Harri Holma and Antti Toskala (ed.), ``WCDMA for UMTS : radio access for third generation mobile communications,'' Chichester ; New York : Wiley, c2000.
- John G. Proakis, ``Digital communications,'' 4th ed., Boston : McGraw-Hill, 2001.
- J. D. Parsons, "The Mobile Radio Propagation Channel," 2nd Edition, Wiley, 2000.
- G. L. Stueber, ``Principles of mobile communication,'' 2nd Ed., Norwell, MA: Kluwer, 2001.

Course Objectives:

The field of Wireless communications network is one of the fastest growing fields in the engineering world. The purpose of the course is to introduce the students to the fundamentals of wireless communications and the evolution of wireless networks from the first generation to LTE and LTE advanced.

Student Learning Outcomes (SO):

After completing this course the students should be able to:

1. distinguish the major cellular communication standards (1G/2G/3G systems).
2. characterize the tradeoffs among frequency reuse, signal-to-interference ratio, capacity, and spectral efficiency.
3. characterize large-scale path loss and shadowing.
4. characterize small-scale fading in terms of Doppler spectrum, coherence time, power delay profile, and coherence bandwidth.
5. analyze the error probabilities for common modulation schemes.
6. analyze the performance of trunked radio systems.
7. describe simple equalization schemes.
8. characterize TDMA, FDMA and CDMA.

Topics:

1. Analog and digital modulation
2. Propagation, shadowing, fading
3. Radio trunking
4. Multiple access schemes: FDMA, TDMA, CDMA
5. Cellular communications
6. Diversity
7. Equalization
8. Channel coding
9. Wireless systems and standards (1G/2G/3G systems)
10. Speech coding
11. OFDM, Multiuser detection, space time coding, smart antenna, software radio

Grading:

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%
- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to distinguish the major cellular communication standards (1G/2G/3G systems).	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to characterize the tradeoffs among frequency reuse, signal-to-interference ratio, capacity, and spectral efficiency.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to characterize large-scale path loss and shadowing.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to characterize small-scale fading in terms of Doppler spectrum, coherence time, power delay profile, and coherence bandwidth.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to analyze the error probabilities for common modulation schemes.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to analyze the performance of trunked radio systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to describe simple equalization schemes.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to characterize TDMA, FDMA and CDMA.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE630 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: EE630 Robust Control

Alpha Designator/Number: E E 6 3 0

Title Abbreviation: Robust Control

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Linear systems, norms for signals and systems, stability and performance, uncertainty and robustness, parameterization of stabilizing controllers, algebraic Riccati equations, H2 control, and H∞ control.

Co-requisite(s):

First Term to be Offered: Fall 2018

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE630

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Introduce analysis and design techniques for multivariable control systems to graduate students and engineers.
2. Prepare graduate students for research and application in robust control.
3. Familiarize graduate students with Robust Control toolbox of MATLAB.

7. COURSE OUTLINE (May be submitted as a separate document)

1. Introduction and linear algebra.
2. Linear systems.
3. H2 and H∞ Spaces.
4. Internal Stability.
5. Performance Specification and Limitations.
6. Balanced Model Reduction.
7. Uncertainty and Robustness.
8. Linear fractional transformation.
9. μ and μ Synthesis.
10. Controller Parameterization.
11. Algebraic Riccati equation.
12. H2 and LQ optimal control.
13. H∞ control.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

K. Zhou with J. C. Doyle, Essentials of Robust Control, Prentice Hall, 1998 (ISBN 0-13-525833-2).

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- K. Zhou with J. C. Doyle, Essentials of Robust Control, Prentice Hall, 1998 (ISBN 0-13-525833-2).
- K. Zhou, J. Doyle, and K. Glover, Robust Optimal Control, Prentice Hall, 1998. (ISBN 0-13-456567-3)
- S. Skogestad and I. Postlethwaite, Multivariable Feedback Control - Analysis and Design, 2nd Edition, Wiley, 2005.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE630 Robust Control
Course Description: Linear systems, norms for signals and systems, stability and performance, uncertainty and robustness, parameterization of stabilizing controllers, algebraic Riccati equations, H2 control, and H∞ control.
Prerequisites: None
Fist Term Offered: Fall 2018
Credit Hours: 3

EE630 Robust control

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE630 Robust Control
Semester/Year	Fall/2018
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

Linear systems, norms for signals and systems, stability and performance, uncertainty and robustness, parameterization of stabilizing controllers, algebraic Riccati equations, H2 control, and H_∞ control. (3 CH).

Required Text, Additional Reading and Other Materials

- K. Zhou with J. C. Doyle, Essentials of Robust Control, Prentice Hall, 1998 (ISBN 0-13-525833-2).
- K. Zhou, J. Doyle, and K. Glover, Robust Optimal Control, Prentice Hall, 1998. (ISBN 0-13-456567-3)
- S. Skogestad and I. Postlethwaite, Multivariable Feedback Control - Analysis and Design, 2nd Edition, Wiley, 2005.

Course Objectives:

1. Introduce analysis and design techniques for multivariable control systems to graduate students and engineers.
2. Prepare graduate students for research and application in robust control.
3. Familiarize graduate students with Robust Control toolbox of MATLAB.

Student Learning Outcomes (SO):

After completing this course the students should be able to:

1. Analyze linear robust systems.
2. Understand H_2 and H_∞ Spaces.
3. Model uncertainty and system dynamics.
4. Design robust control systems.
5. Analyze the stability of linear systems.

Topics:

1. Introduction and linear algebra.
2. Linear systems.
3. H_2 and H_∞ Spaces.
4. Internal Stability.
5. Performance Specification and Limitations.
6. Balanced Model Reduction.
7. Uncertainty and Robustness.
8. Linear fractional transformation.
9. μ and μ Synthesis.
10. Controller Parameterization.
11. Algebraic Riccati equation.
12. H_2 and LQ optimal control.
13. H_∞ control.

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%
- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to analyze linear robust systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand H_2 and H_∞ Spaces.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to model uncertainty and system dynamics.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to design robust control systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to analyze the stability of linear systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

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☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

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Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal,

Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE631 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: EE631 Optimal Control

Alpha Designator/Number: E E 6 3 1

Title Abbreviation: Optimal Control

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
The course introduces the theory of Optimal Control. It covers evaluation methods for control signals that satisfy some physical constraints and minimize or maximize some performance measure.

Co-requisite(s):

First Term to be Offered: Fall 2018

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE631

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The overall goal of the course is to provide an understanding of the main results in calculus of variations and optimal control, and how these results can be used in various applications such as in robotics, finance, economics, and biology.

7. COURSE OUTLINE (May be submitted as a separate document)

1. Review of State Variable Representation of Systems.
2. Calculus of Variations.
3. Necessary Conditions for Optimal Control.
4. Linear Regulator Problem-Continuous and Discrete.
5. Pontryagin's Minimum Principle.
6. Minimum Time Problem.
7. Minimum Control Effort Problem.
8. Dynamic programming.
9. The Optimal Control Law.
10. Hamilton-Jacobi-Bellman Equations.
11. Numerical Determination of Optimal Trajectories.
12. Two Point Boundary Value Problems.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Athans and P.L. Falb, Optimal Control: An Introduction to the Theory and Its Applications, Dover Publications, 2007. ISBN 0-486-45328-6.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- Athans and P.L. Falb, Optimal Control: An Introduction to the Theory and Its Applications, Dover Publications, 2007. ISBN 0-486-45328-6.
- H.P. Geering, Optimal Control with Engineering Applications, Springer, 2007.
- L.C. Evans. An Introduction to Mathematical Optimal Control Theory, Version 0.2, 2008.
- A.E. Bryson and Y.C. Ho, Applied Optimal Control: Optimization, Estimation, And Control, Halsted Press, 1975.
- D.E. Kirk, Optimal Control Theory: An Introduction, Prentice-Hall, 1970.
- J.C. Hsu and A.U. Meyer, Modern Control Principles and Applications, McGraw-Hill, 1968.
- F.L. Lewis and V.L. Syrmos, Optimal Control, 2nd ed, Wiley, 1995.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE631 Optimal Control
Course Description: The course introduces the theory of Optimal Control. It covers evaluation methods for control signals that satisfy some physical constraints and minimize or maximize some performance measure.
Prerequisites: None
Fist Term Offered: Fall 2018
Credit Hours: 3

EE631 Optimal control

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE631 Optimal Control
Semester/Year	Fall/2018
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

The course introduces the theory of Optimal Control. It covers evaluation methods for control signals that satisfy some physical constraints and minimize or maximize some performance measure. (3 CH).

Required Text, Additional Reading and Other Materials

- Athans and P.L. Falb, Optimal Control: An Introduction to the Theory and Its Applications, Dover Publications, 2007. ISBN 0-486-45328-6.
- H.P. Geering, Optimal Control with Engineering Applications, Springer, 2007.
- L.C. Evans. An Introduction to Mathematical Optimal Control Theory, Version 0.2, 2008.
- A.E. Bryson and Y.C. Ho, Applied Optimal Control: Optimization, Estimation, And Control, Halsted Press, 1975.
- D.E. Kirk, Optimal Control Theory: An Introduction, Prentice-Hall, 1970.
- J.C. Hsu and A.U. Meyer, Modern Control Principles and Applications, McGraw-Hill, 1968.
- F.L. Lewis and V.L. Syrmos, Optimal Control, 2nd ed, Wiley, 1995.

Course Objectives:
The overall goal of the course is to provide an understanding of the main results in calculus of variations and optimal control, and how these results can be used in various applications such as in robotics, finance, economics, and biology.

Student Learning Outcomes (SO):

After completing this course the students should be able to:

1. Understand different forms of performance measures as applied to variety of optimal control problems.
2. Model linear regulator problem.
3. Understand Pontryagin's minimum principle.
4. Apply dynamic programming.
5. Apply optimal control law.
6. Apply computational procedure to solve optimal control problems.
7. Understand and apply Hamilton-Jacobi-Bellman equations.

Topics:

1. Review of State Variable Representation of Systems.
2. Calculus of Variations.
3. Necessary Conditions for Optimal Control.
4. Linear Regulator Problem-Continuous and Discrete.
5. Pontryagin's Minimum Principle.
6. Minimum Time Problem.
7. Minimum Control Effort Problem.
8. Dynamic programming.
9. The Optimal Control Law.
10. Hamilton-Jacobi-Bellman Equations.
11. Numerical Determination of Optimal Trajectories.
12. Two Point Boundary Value Problems.

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%
- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to understand different forms of performance measures as applied to variety of optimal control problems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to model linear regulator problem.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand Pontryagin's minimum principle.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to apply dynamic programming.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to apply optimal control law.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to apply computational procedure to solve optimal control problems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand and apply Hamilton-Jacobi-Bellman equations.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 636 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Power system operations and controls

Alpha Designator/Number: E E 6 3 6

Title Abbreviation: p o w e r s y s o p e r a t i o n

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers modern power systems, operational, control problems, solution techniques. State estimation, contingency analysis, load-frequency control and automatic generation control, load flow analysis and external equivalents for steady-state operations.

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 636

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Get a deep understanding of system operation and control
2. Understand and model power-frequency dynamics
3. Design power-frequency controllers
4. Understand and model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.
5. Understand the unit-commitment problem in electrical and economic fields

7. COURSE OUTLINE (May be submitted as a separate document)

System load, reserve requirements, overview of system operation, system control, system voltage control, security control
Real power: fundamentals of speed governing mechanism and modeling: Speed-load, load sharing, concept of control area
Real power: static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems
Reactive power: typical excitation system, modeling, static and dynamic analysis, stability compensation
Voltage control methods
Unit commitment (UC) and economic dispatcher. Constraints in UC: spinning reserve, thermal unit constraints
UC solution methods: Priority-list methods, forward dynamic programming approach
Economic dispatchers: Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method.
Computer control of power systems: Energy control center: Functions – Monitoring, data acquisition and control
System hardware configuration – SCADA and EMS functions
Various operating states: Normal, alert, emergency, inextremis and restorative. State transition diagram

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003
References
D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Project, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003
References
D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 636 Power system operations and controls
Catalog Description: This course covers modern power systems, operational, control problems, solution techniques. State estimation, contingency analysis, load-frequency control and automatic generation control, load flow analysis and external equivalents for steady-state operations.
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE-636 Power system operations and controls

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE-636 Power system operations
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description

This course covers modern power systems, operational, control problems, solution techniques. State estimation, contingency analysis, load-frequency control and automatic generation control, load flow analysis and external equivalents for steady-state operations.

Required Text: Additional Reading and Other Materials

- Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003

References

- 1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
- 2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

Course Objectives

1. Get a deep understanding of system operation and control
2. Understand and model power-frequency dynamics
3. Design power-frequency controllers
4. Understand and model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.
5. Understand the unit-commitment problem in electrical and economic fields

Student Learning Outcomes (SO):

1. Student Learning Outcome: understand power systems' concepts: system load, system voltage, system control
2. Student Learning Outcome: understand real power fundamental
3. Student Learning Outcome: understand reactive power fundamental
4. Student Learning Outcome: learn voltage control methods
5. Student Learning Outcome: understand the unit commitment problem
6. Student Learning Outcome: understand the economic concepts of dispatchers
7. Student Learning Outcome: develop on computers power control systems, monitor and analyze system's performance
8. Student Learning Outcome: use SCADA environment for power control systems

Course Schedule

No of Weeks	Topic
1	System load, reserve requirements, overview of system operation, system control, system voltage control, security control
1	Real power: fundamentals of speed governing mechanism and modeling: Speed-load, load sharing, concept of control area
1	Real power: static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems
2	Reactive power: typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node
1	Voltage control methods: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting
1	Voltage control methods: Tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss
1	Unit commitment (UC) and economic dispatcher. Constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints
1	UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost.
1	Economic dispatchers: Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. Base point and participation factors. Economic dispatch controller added to LFC control
1	Computer control of power systems: Energy control center: Functions – Monitoring, data acquisition and control
1	System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control
1	Various operating states: Normal, alert, emergency, inextremis and restorative. State transition diagram

Grading

Grading Basis:	Assignments	10%	A:	90-100%
	Quizzes	10%	B:	80-90%
	Midterm	20%	C:	70-80%
	Final	20%	D:	60-70%
	Project	20%	F:	0-60%

Learning Outcomes

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be

		assessed in this Course
understand power systems' concepts: system load, system voltage, system control	Homework assignment	Homework, Quiz
understand real power fundamental	Homework assignment	Homework, Quiz
understand reactive power fundamental	Homework assignment	Homework, Quiz
learn voltage control methods	Homework assignment	Homework, Quiz
understand the unit commitment problem	Homework assignment	Homework, Quiz
understand the economic concepts of dispatchers	Homework assignment	Homework, Quiz
develop on computers power control systems, monitor and analyze system's performance	Project	Project work
Use SCADA for power control systems' development	Project	Project work

Homework and Academic Dishonesty Policy

Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. **Incoming homework assignments will be screened for inappropriate collaboration.**

Additional Academic Policies

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE638 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: EE638 Nonlinear Systems and Control

Alpha Designator/Number: E E 6 3 8

Title Abbreviation: Nonlinear Systems & Control

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
The course provides a rigorous introduction to the analysis and control of nonlinear dynamical systems in time domain.

Co-requisite(s):

First Term to be Offered: Fall 2018

Prerequisite(s):

Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE638

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The purpose of the course is to introduce the nature of nonlinearities found in control systems both in the forward path and in the feedback path. Sometimes nonlinearities may be used to adjust the performance of the system. Students are expected to learn why standard methods of analysis and design in linear systems are not applicable in nonlinear system. Methods suitable for nonlinear systems are introduced and their applications are explored.

7. COURSE OUTLINE (May be submitted as a separate document)

- Introduction.
- Second-order Systems.
- Stability of Equilibrium Points.
- Passivity.
- Input-State and Input-Output Stability.
- Special Nonlinear Forms.
- Stabilization.
- Robust Stabilization.
- Tracking.
- Observers.
- Regulation via Integral Control.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

- H. Khalil, Nonlinear Control, Prentice Hall, 2014.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Midterm, Final, Homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- H. Khalil, Nonlinear Control, Prentice Hall, 2014.
- S. Sastry, Nonlinear Systems: Analysis, Stability, and Control, Springer 1999.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE638 Nonlinear Systems and Control
Course Description: The course provides a rigorous introduction to the analysis and control of nonlinear dynamical systems in time domain.
Prerequisites: None
Fist Term Offered: Fall 2018
Credit Hours: 3

EE638 Nonlinear Systems and Control

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE638 Nonlinear Systems and Control
Semester/Year	Fall/2018
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

The course provides a rigorous introduction to the analysis and control of nonlinear dynamical systems in time domain. (3 CH).

Required Text, Additional Reading and Other Materials

- H. Khalil, Nonlinear Control, Prentice Hall, 2014.
- S. Sastry, Nonlinear Systems: Analysis, Stability, and Control, Springer 1999.

Course Objectives:

The purpose of the course is to introduce the nature of nonlinearities found in control systems both in the forward path and in the feedback path. Sometimes nonlinearities may be used to adjust the performance of the system. Students are expected to learn why standard methods of analysis and design in linear systems are not applicable in nonlinear system. Methods suitable for nonlinear systems are introduced and their applications are explored.

Student Learning Outcomes (SO):

After completing this course the students should be able to understand:

1. Nonlinear dynamical systems.
2. Mathematical tools for analysis of nonlinear systems.
3. The concept of stability of equilibrium points.
4. The concept of passivity.
5. The methods of controller design in the time domain.

Topics:

- Introduction.
- Second-order Systems.
- Stability of Equilibrium Points.
- Passivity.
- Input-State and Input-Output Stability.
- Special Nonlinear Forms.
- Stabilization.
- Robust Stabilization.
- Tracking.
- Observers.
- Regulation via Integral Control.

Grading:

Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Outcome Measurement:

- Homework: 40%
- Exam #1: 20%
- Exam #2: 20%
- Exam #3: 20%

Course Student Learning Outcomes

Outcome	Implementation	Evaluation Method
Students will be able to understand basic concepts of nonlinear dynamical systems.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand mathematical tools	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

for analysis of nonlinear systems.		
Students will be able to understand the concepts of stability of equilibrium points.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand the concept of passivity.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems
Students will be able to understand the methods of controller design in the time domain.	In-class discussions & exercises, homework, exams	In-class questions, the evaluations of homework and exam problems

Homework and Academic Dishonesty Policy:
Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

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☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

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Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 639 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Distributed Power Generation Systems-renewable resources

Alpha Designator/Number: E E 6 3 9

Title Abbreviation: d i s t r i b u t e d s y s t e m s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers the fundamentals of energy and sustainability; power efficiency; hydro, wind, solar, fuel systems; Converters and controllers for integration of renewable energy sources; Smart grid, hybrid generation systems.

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 639

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Provide a deep understanding of distributed generation and microgrids elements
2. Explain distributed Generation units.
3. Introduce energy storage concept
4. Explain power electronics interfaces
5. Explain power architectures, stability and protections
6. Provide deep control concepts distributed, autonomous, and centralized systems. Operation

7. COURSE OUTLINE (May be submitted as a separate document)

Distributed generation and microgrids elements
Distributed Generation units. Microturbines, reciprocating engines, wind generators, photovoltaic generators, fuel cells, and other technologies
Energy storage concept – batteries, fly-wheels, ultra-capacitors
Power electronics interfaces: multiple and single input dc-dc converters
Distributed and centralized. Dc and ac distribution systems. Stability and protections
Control concepts distributed, autonomous, and centralized systems. Operation.
Economic concepts: Reliability and availability. Grid interconnection. Issues, planning, advantages and disadvantages both for the grid and the microgrid.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Renewable and Efficient Electric Power Systems, 2nd Edition. Gilbert M. Masters- ISBN: 978-1-118-14062-8 2010
Renewable Energy Focus e-Mega Handbook, Bent Sørensen Paul Breeze Galen J. Suppes Nasir El Bassam. ISBN: 9780123747068 2011
Renewable Energy Conversion, Transmission, and Storage. Bent Sørensen. ISBN 9780080559049 2012

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Project, quizzes, homeworks

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Renewable and Efficient Electric Power Systems, 2nd Edition. Gilbert M. Masters- ISBN: 978-1-118-14062-8 2010
Renewable Energy Focus e-Mega Handbook, Bent Sørensen Paul Breeze Galen J. Suppes Nasir El Bassam. ISBN: 9780123747068 2011
Renewable Energy Conversion, Transmission, and Storage. Bent Sørensen. ISBN 9780080559049 2012

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 639 Distributed Power Generation Systems-renewable resources
Catalog Description: This course covers the fundamentals of energy and sustainability; power efficiency; hydro, wind, solar, fuel systems; Converters and controllers for integration of renewable energy sources; Smart grid, hybrid generation systems.
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE-639 Distributed Power Generation Systems-renewable resources

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE-639 Distributed Power Generation Systems
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description

This course covers the fundamentals of energy and sustainability; power efficiency; hydro, wind, solar, fuel systems; Converters and controllers for integration of renewable energy sources; Smart grid, hybrid generation systems.

Required Text: Additional Reading and Other Materials

- Renewable and Efficient Electric Power Systems, 2nd Edition. Gilbert M. Masters- ISBN: 978-1-118-14062-8

References

- Renewable Energy Focus e-Mega Handbook, Bent Sørensen Paul Breeze Galen J. Suppes Nasir El Bassam. ISBN: 9780123747068
- Renewable Energy Conversion, Transmission, and Storage. Bent Sørensen. ISBN 9780080559049

Course Objectives

1. Provide a deep understanding of distributed generation and microgrids elements
2. Explain distributed Generation units.
3. Introduce energy storage concept
4. Explain power electronics interfaces
5. Explain power architectures, stability and protections
6. Provide deep control concepts distributed, autonomous, and centralized systems. Operation

7. Explain economic concepts: Reliability and availability. Grid interconnection. Issues, planning, advantages and disadvantages both for the grid and the microgrid.

Student Learning Outcomes (SO):

1. Student Learning Outcome: understand the distributed generation and microgrids elements
2. Student Learning Outcome: understand power generation technologies
3. Student Learning Outcome: understand energy storage concept: batteries, fly-wheels, ultra-capacitors
4. Student Learning Outcome: understand power electronics interfaces: multiple and single input dc-dc converters
5. Student Learning Outcome: understand power architectures: distributed and centralized. Dc and ac distribution systems.
6. Student Learning Outcome: learn in details about the control concepts distributed, autonomous, and centralized systems. Operation.
7. Student Learning Outcome: have a knowledge about economic concepts both for the grid and the microgrid.

Course Schedule

No of Weeks	Topic
2	Distributed generation and microgrids elements
2	Distributed Generation units. Microturbines, reciprocating engines, wind generators, photovoltaic generators, fuel cells, and other technologies
2	Energy storage concept – batteries, fly-wheels, ultra-capacitors
2	Power electronics interfaces: multiple and single input dc-dc converters
2	Distributed and centralized. Dc and ac distribution systems. Stability and protections
2	Control concepts distributed, autonomous, and centralized systems. Operation.
1	Economic concepts: Reliability and availability. Grid interconnection. Issues, planning, advantages and disadvantages both for the grid and the microgrid.

Grading

Grading Basis:	Assignments	20%	A:	90-100%
	Quizzes	20%	B:	80-90%
	Midterm	30%	C:	70-80%
	Final	30%	D:	60-70%
			F:	0-60%

Learning Outcomes

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
The distributed generation and microgrids elements	Homework assignment	Homework, Quiz, Test
Power generation technologies	Homework assignment	Homework, Quiz, Test
Energy storage concept: batteries, fly-wheels, ultra-capacitors	Homework assignment	Homework, Quiz, Test

Power electronics interfaces: multiple and single input dc-dc converters	Homework assignment	Homework, Quiz, Test
Power architectures: distributed and centralized. Dc and ac distribution systems.	Homework assignment	Homework, Quiz, Test
Details about the control concepts distributed, autonomous, and centralized systems. Operation.	Homework assignment	Homework, Quiz, Test
Economic concepts both for the grid and the microgrid.	Homework assignment	Homework, Quiz, Test

Homework and Academic Dishonesty Policy

Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE650-653 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: Special Topics

Alpha Designator/Number: E E 6 5 0 - 6 5 3

Title Abbreviation: Special Topics

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Subject matter to be selected from topics of current interest.

Co-requisite(s):

First Term to be Offered: Fall 2018

Prerequisite(s):

Credit Hours: ~~3~~ 1 - 4

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE650-653

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

As specified by instructor and approved by Divisions' Chair.

7. COURSE OUTLINE (May be submitted as a separate document)

As specified by instructor and approved by Divisions' Chair.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

N/A

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

As specified by instructor

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

N/A

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

As specified by instructor and approved by Divisions' Chair.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE650-653 Special Topics
Course Description: Subject matter to be selected from topics of current interest.
Prerequisites: As specified by instructor and approved by Divisions' Chair.
Fist Term Offered: Fall 2018
Credit Hours: 3

EE650-653 Special Topics

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	ME 650-653: Special Topics
Semester/Year	Fall/2018
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description:

Subject matter to be selected from topics of current interest. (3 CH)

Prerequisite: As specified by instructor and approved by Divisions' Chair.

Required Text: N/A

References: N/A

Course Objectives: As specified by instructor and approved by Divisions' Chair.

Outcome Measurement: As specified by instructor and approved by Divisions' Chair.

Grading: Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal,

Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE685-688 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: Independent Studies

Alpha Designator/Number: E E 6 8 5 - 6 8 8

Title Abbreviation: Independent Study

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Independent study in which a student meets regularly with a faculty member to discuss assignments.

Co-requisite(s):

First Term to be Offered: Fall 2017

Prerequisite(s):

Credit Hours: ~~3~~ 1-4

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE685-688

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

Course may include such assignments as intensive reading in a specialized area, writing a synthesis of literature on a specified topic, or writing a literature review of a topic.

7. COURSE OUTLINE (May be submitted as a separate document)

N/A

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

N/A

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

As specified by instructor.

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

N/A

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

N/A

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE685-688
Course Description: Independent study in which a student meets regularly with a faculty member to discuss assignments
Prerequisites: As specified by instructor and approved by Divisions' Chair.
Fist Term Offered: Fall 2017
Credit Hours: 3

EE685-688 Independent Studies

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE685-688 Independent Studies
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to www.marshall.edu/academic-affairs/policies/. Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment.

Course Description: From Catalog

Independent study in which a student meets regularly with a faculty member to discuss assignments. (3 CH).

Prerequisite: As specified by instructor and approved by Divisions' Chair.

Required Text: N/A

References: N/A

Outcome Measurement: As specified by instructor and approved by Divisions' Chair.

Course Objectives:
Course may include such assignments as intensive reading in a specialized area, writing a synthesis of literature on a specified topic, or writing a literature review of a topic.

Grading: Grades are assigned using the following straight scale

Score	90-100%	80-89%	70-79%	60-69%	0-59%
Grade	A	B	C	D	F

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE 698 | (•) Graded ( ) CR/NC

Contact Person: Salam Hajjar | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Design Project

Alpha Designator/Number: E E 6 9 8

Title Abbreviation: d e s i g n p r o j e c t

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

The course introduces the principles of product design: specifications, evaluation of design alternatives, technical reports and oral presentations. Intellectual property, industry standards and conventions, engineering economics, reliability, safety, engineering ethics.

Co-requisite(s): N/A | First Term to be Offered: fall 2017

Prerequisite(s): N/A | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE 698

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Salam Hajjar

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Put the students in team atmosphere.
2. Enhance the students' team player skills.
3. Explain the engineering projects requirements, expectations, realization and evaluations

7. COURSE OUTLINE (May be submitted as a separate document)

concepts of engineering project
teamwork role in projects

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

J. Eric Salt and Robert Rothery, Design for Electrical and Computer Engineers, John Wiley & Sons, 2002, ISBN: 978-0471391463
References 2005
Project Management for Engineering Design. Charles Lessard. ISBN 9781598291759 2006
Engineering Project Management for the Global High Technology Industry. ISBN 9780071815376 2003

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lectures, application work, labs

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Projects

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

J. Eric Salt and Robert Rothery, Design for Electrical and Computer Engineers, John Wiley & Sons, 2002, ISBN: 978-0471391463
References 2005
Project Management for Engineering Design. Charles Lessard. ISBN 9781598291759 2006
Engineering Project Management for the Global High Technology Industry. ISBN 9780071815376 2003

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 698 Design Project
Catalog Description: The course introduces the principles of product design: specifications, evaluation of design alternatives, technical reports and oral presentations. Intellectual property, industry standards and conventions, engineering economics, reliability, safety, engineering ethics.
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

EE-698 Design Project

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	EE-698 Design Project
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description

The course introduces the principles of product design: specifications, evaluation of design alternatives, technical reports and oral presentations. Intellectual property, industry standards and conventions, engineering economics, reliability, safety, engineering ethics.

Required Text: Additional Reading and Other Materials

1. J. Eric Salt and Robert Rothery, Design for Electrical and Computer Engineers, John Wiley & Sons, 2002, ISBN: 978-0471391463

References

- Project Management for Engineering Design. Charles Lessard. ISBN 9781598291759
- Engineering Project Management for the Global High Technology Industry. ISBN 9780071815376

Course Objectives

1. Put the students in team atmosphere.
2. Enhance the students' team player skills.
3. Explain the engineering projects requirements, expectations, realization and evaluations

Student Learning Outcomes (SO):

1. Student Learning Outcome: learn the concepts of engineering projects
2. Student Learning Outcome: play different roles in a project

3. Student Learning Outcome: provide a project report of an electrical engineering topic
4. Student Learning Outcome: present a project and evaluate projects of peers

Course Schedule

Students will form 3-4persons design teams. They will then select a faculty advisor under whose guidance they will work on the design and construction of an electrical/computer engineering project. At the end of the semester each team will write a final project report and make an oral presentation describing their work

Grading

Grading Basis:	Regular meetings work	40%	A:	90-100%
	Project work quality	30%	B:	80-90%
	Presentation	30%	C:	70-80%
			D:	60-70%
			F:	0-60%

Learning Outcomes

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
Concepts of engineering projects	Project plan	Project report – presentation - meetings
Teamwork player	Project participation	Project report – presentation – meetings
Project report of an electrical engineering topic	Project report	Project report – presentation - meetings

Homework and Academic Dishonesty Policy

Homework assignments will be announced in class, and periodic in-class quizzes will be given. Late work is not accepted, except in cases of officially university-excused absences.

Students are expected to adhere to the Marshall University academic dishonesty policy, found in the undergraduate catalog. Academic dishonesty will not be tolerated, and infractions of the university academic dishonesty requirements will lead to sanctions and reporting to the Office of Academic Affairs. Students are particularly encouraged to be careful to avoid cheating, plagiarism, and complicity as related to homework assignments.

Copying homework is not allowed:

Acceptable Behavior	Unacceptable Behavior
☺ Discuss homework problems with others.	☹ Show someone every step of a problem.
☺ Check answers with other students.	☹ Hand your assignment to someone else.
☺ Help other students learn & find mistakes.	☹ Group working problems simultaneously*

* Since everyone works at a different speed, "group work" can degenerate into a slower student copying a faster one, without really understanding what is going on. Quizzes and exams are taken individually, so it is important for students to learn how to solve problems on their own. Incoming homework assignments will be screened for inappropriate collaboration.

Additional Academic Policies

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: EE699 | (•) Graded ( ) CR/NC

Contact Person: Almuatazbellah Boker | Phone: 6-5705

NEW COURSE DATA:

New Course Title: Master's Thesis

Alpha Designator/Number: E E 6 9 9

Title Abbreviation: Thesis

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This represents the course designation for a Master's Degree Research Thesis. Successful completion of a Thesis fulfills the research requirement for the M.S. degree in Electrical Engineering.

Co-requisite(s):

First Term to be Offered: Fall 2017

Prerequisite(s):

Credit Hours: ~~6~~ 1-6

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141001	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: EE699

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Almuatazbellah Boker

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

No

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

No

6. COURSE OBJECTIVES: (May be submitted as a separate document)

In thesis work, students have to show that they are able to treat a scientific or technical subject self-directed within a given period of time and to integrate it into a larger interdisciplinary context. In a final colloquium the subject will be presented and discussed.

7. COURSE OUTLINE (May be submitted as a separate document)

N/A

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

N/A

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

N/A

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

N/A

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

N/A

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering
Course Number and Title: EE699 Master's Thesis
Course Description: This represents the course designation for a Master's Degree Research Thesis. Successful completion of a Thesis fulfills the research requirement for the M.S. degree in Electrical Engineering.
Prerequisites: EE 604, and advisor Approval
Fist Term Offered: Fall 2017
Credit Hours: 6

EE699 Master's Thesis

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	**EE 699: Master's Thesis**
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description:

This represents the course designation for a Master's Degree Research Thesis. Successful completion of a Thesis fulfills the research requirement for the M.S. degree in Electrical Engineering. (6 CH)

Course Objectives:
In thesis work, students have to show that they are able to treat a scientific or technical subject self-directed within a given period of time and to integrate it into a larger interdisciplinary context. In a final colloquium the subject will be presented and discussed.

Student Learning Outcomes (SO):

After completion of this module the students are able to

- Investigate scientific problems in a systematic way.
- Find and use literature.
- Evaluate and describe solutions of scientific problems.
- Apply time management in theoretical and experimental investigations.
- Evaluate and write thesis work including use of references.
- Work under supervision in a self-directed, autonomous way to complete Master Thesis.

Outcome	Implementation	Evaluation Method
Students will be able to investigate scientific problems in a systematic way.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to find and use literature.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able evaluate and describe solutions of scientific problems.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to apply time management in theoretical and experimental investigations.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to evaluate and write thesis work including use of references.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to work under supervision in a self-directed, autonomous way to complete Master Thesis.	Experiments, Report & Oral Presentation	Report & Oral Presentation

Process

Registration of EE 699 credit(s) initiates structured progress toward completion of the Thesis. Before a student registers for the EE 699, he/she should begin thinking about the process that leads to successful completion of this project. Possible Thesis topics should be formulated by the student and discussed with an advisor or the potential Thesis Director. In order to successfully complete the Thesis, several organizational and administrative steps must be completed. The normal order of such steps is presented below:

The student will be expected to perform an initial literature review of one or more potential thesis topics to identify and focus a direction for the research. The student should also review all information at the Thesis website of the Office of Graduate College (go to: http://www.marshall.edu/graduate/files/2013/04/etdguide.pdf)
to download the *Thesis Guidelines* PDF file. This document is required reading for Thesis students.

1. The student, in consultation with an advisor, will select the thesis topic and identify a Thesis Director (must be a member of the Graduate Faculty).
2. The student will complete an extensive literature review related to the selected topic. The significant material resulting from the literature review will eventually be written in a research review format as an initial draft of the Thesis Chapter II - Review of Literature.
3. Following the initial literature review, and in consultation with the Thesis Director, the student will identify a specific research question to pursue.
4. The student will write a formal Thesis Proposal. This Thesis Proposal must include the following components:

a. An initial Introduction will be composed to establish a summary of existing research related to the question, a statement of the problem, and the purpose of the study. This Introduction must be based upon the Literature Review.

b. The student will outline and describe an appropriate research design to test the hypothesis. The details of this process will be written into an initial draft of the Methodology section of the Chapter I (manuscript section) of the Thesis. The student must include a tentative design for statistical analysis of data.

c. A proposed time-line for the study will be included. This time-line must identify the proposed Thesis Defense (see below) date. The Thesis Director will coordinate the proposed defense date with other thesis defense

dates to prevent an overload on faculty members of thesis committees. If a student fails to have the Thesis ready for defense by the proposed date, there may be a delay before a new date may be scheduled.
d. A statement concerning any costs associated with the study, and how such costs will be covered, should be included in the Proposal. The student should discuss potential costs with the Thesis Director prior to writing the proposal.
The Thesis Committee will consist of the student, the Thesis Director, and a minimum of two additional graduate faculty members. See the MU Graduate Bulletin for the Guidelines Regarding Membership of Graduate Advisory and Theses Committees. The formal written Thesis Proposal will be distributed to members of the Committee at least one (1) week prior to a scheduled meeting of the Committee to review and approve the Thesis.
5. The student will schedule a meeting of the Thesis Committee to present the Proposal for approval. This meeting will provide all Committee members an opportunity to discuss the proposed project with the student. The student should be prepared to deliver a 15-minute oral description of the Thesis:
a. Provide a brief review of the literature and identification of the problem or question.
b. Review the planned methodology and data analysis procedures.
c. Summarize the importance of the study.
d. The student may utilize MS PowerPoint slides and/or other helpful visuals during the project description.
Committee members will have an opportunity to ask questions and make comments regarding the project. The Committee will expect the student to respond to questions. Any necessary research design changes will be agreed upon before the Committee approves for the student to begin the project. A Thesis Approval Form is completed, signed by the Committee, and submitted to the Department Head for approval.
6. Once the Thesis is approved by the Committee, the student may proceed with the project under supervision and advisement of the Thesis Director.

Prerequisite: EE 604, and advisor Approval

Required Text: N/A

References: N/A

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: ME 699 | (•) Graded ( ) CR/NC

Contact Person: Asad Salem | Phone: 304-696-5657

NEW COURSE DATA:

New Course Title: Master Thesis

Alpha Designator/Number: M E 6 9 9

Title Abbreviation: ~~M a s t e r~~ T h e s i s

(Limit of 25 characters and spaces)

Course Catalog Description (Limit of 30 words): This course covers the communication problems encountered in researching and writing a thesis: the scientific writing of a research paper, the speaking and presenting skills, and the organization skills

Co-requisite(s): N/A | First Term to be Offered: ~~Fall~~ Spring 2017

Prerequisite(s): N/A | Credit Hours: ~~6~~ 1-4

Course(s) being deleted in place of this addition (*must submit course deletion form*): N/A

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/4/16
Registrar 141961	Date 10-4-16
College Curriculum Chair	Date 10/17/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME 699

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Asad Salem

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

1. Put the students in team atmosphere.
2. Enhance the students' team player skills.
3. Explain the engineering projects requirements, expectations, realization and evaluations

7. COURSE OUTLINE (May be submitted as a separate document)

Recent research topics
Research methods
Writing skills
Presentation skills
Evaluation of peers' work

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Dissertation Research and Writing for Construction Students by S.G. Naoum. Part Number: /62210|0750629886|0415538440/97/12 References 2010
Dissertation Writing for Engineers and Scientists. Mark Breach. ISBN 1405872780, 9781405872782 2009
Intelligent Planning: A Decomposition and Abstraction Based Approach. Qiang Yang. ISBN: 9783642606182 2000

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

lectures

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

thesis

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Dissertation Research and Writing for Construction Students by S.G. Naoum. Part Number: /62210|0750629886|0415538440/97/12
References
Dissertation Writing for Engineers and Scientists. Mark Breach. ISBN 1405872780, 9781405872782
Intelligent Planning: A Decomposition and Abstraction Based Approach. Qiang Yang. ISBN: 9783642606182

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Electrical engineering
Course Number and Title: EE 699 Thesis
Catalog Description: This course covers the communication problems encountered in researching and writing a thesis: the scientific writing of a research paper, the speaking and presenting skills, and the organization skills
Prerequisites: N/A
First Term Offered: Fall 2017
Credit Hours: 3

ME699 Master's Thesis

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	**ME 699: Master's Thesis**
Semester/Year	Fall/2017
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description:

This represents the course designation for a Master's Degree Research Thesis. Successful completion of a Thesis fulfills the research requirement for the M.S. degree in Mechanical Engineering. (6 CH)

Course Objectives:
In thesis work, students have to show that they are able to treat a scientific or technical subject self-directed within a given period of time and to integrate it into a larger interdisciplinary context. In a final colloquium the subject will be presented and discussed.

Student Learning Outcomes (SO):

After completion of this module the students are able to

- Investigate scientific problems in a systematic way.
- Find and use literature.
- Evaluate and describe solutions of scientific problems.
- Apply time management in theoretical and experimental investigations.
- Evaluate and write thesis work including use of references.
- Work under supervision in a self-directed, autonomous way to complete Master Thesis.

Outcome	Implementation	Evaluation Method
Students will be able to investigate scientific problems in a systematic way.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to find and use literature.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able evaluate and describe solutions of scientific problems.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to apply time management in theoretical and experimental investigations.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to evaluate and write thesis work including use of references.	Experiments, Report & Oral Presentation	Report & Oral Presentation
Students will be able to work under supervision in a self-directed, autonomous way to complete Master Thesis.	Experiments, Report & Oral Presentation	Report & Oral Presentation

Process

Registration of ME 699 credit(s) initiates structured progress toward completion of the Thesis. Before a student registers for the ME 699, he/she should begin thinking about the process that leads to successful completion of this project. Possible Thesis topics should be formulated by the student and discussed with an advisor or the potential Thesis Director. In order to successfully complete the Thesis, several organizational and administrative steps must be completed. The normal order of such steps is presented below:

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b. Review the planned methodology and data analysis procedures.
c. Summarize the importance of the study.
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6. Once the Thesis is approved by the Committee, the student may proceed with the project under supervision and advisement of the Thesis Director.

Prerequisite: Advisor Approval
Required Text: N/A

References: N/A

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at:
http://www.marshall.edu/academic-affairs/?page_id=802

Request for Graduate Addition, Deletion, or Change of a Major or Degree

NOTE: Before you submit a request for a new Major or Degree, you must submit an INTENT TO PLAN form. Only after the INTENT TO PLAN goes through the approval process are you ready to submit this request for a new Major or Degree. For detailed information on new programs please see: http://wvhepcdoc.wvnet.edu/resources/133-11.pdf.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy without signatures to the Graduate Council Chair.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE

Dept/Division: The Weisberg of Engineering

Contact Person: Asad Salem

Phone: 304-696-3207

Degree Program: Master of Science in Electrical and Computer Engineering

Check action requested: ☒ Addition ☐ Deletion ☐ Change

Effective Term/Year: Fall 20 17 Spring 20 ☐ Summer 20 ☐

Information on the following pages must be completed before signatures are obtained.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head: Asad A. Salem	Date: 11/2/2016
College Curriculum Chair: [signature]	Date: 11/7/2016
College Dean: [signature]	Date: 11/10/2016
Graduate Council Chair: Christofero	Date: 1-13-17
Provost/VP Academic Affairs:	Date:
Presidential Approval:	Date:
Board of Governors Approval:	Date:

Please provide a rationale for addition, deletion, change: (May attach separate page if needed)

Please refer to the attached document -Pages 4&5

Please describe any changes in curriculum:
List course number, title, credit hours. Note whether each course is required or optional. Enter NONE if no change. (May attach separate page if needed)

N/A

1. ADDITIONAL RESOURCE REQUIREMENTS: If your program requires additional faculty, equipment or specialized materials to ADD or CHANGE this major or degree, attach an estimate of the time and money required to secure these items.
NOTE: Approval of this form does not imply approval for additional resources. Enter NONE if not applicable.

Please refer to the attached document-Page 11

2. NON-DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the request and any response received from them. Enter NONE if not applicable.

This is a new Program. It does not duplicate any existing graduate program.

For catalog changes as a result of the above actions, please fill in the following pages.

3. *Current* Catalog Description

Insert the *Current* Catalog Description and page number from the latest catalog for entries you would like to change. (May attach separate page if needed)

N/A

4. *Edits* to the Current Description

Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 4

5. *New* Catalog Description

Insert a 'clean' copy of your proposed description, i.e., no strikethroughs or highlighting included. This should be what you are proposing for the new description. (May attach separate page if needed)

Please refer to the attached document- Pages 13-17

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 5

Please insert in the text box below your change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Major or Degree:
Type of Change: *(addition, deletion, change)*
Rationale:

Department: The Weisberg Division of Engineering
Major or Degree: MS in Electrical and Computer Engineering (MSEE)
Type of Change: Addition
Rationale: Please refer to the attached document.

Graduate Degree Addition

Master of Science in Electrical and Computer Engineering (MSEE)

Weisberg Division of Engineering

Marshall University

Proposed Implementation Date: Fall 2017

Dr. Asad A. Salem

October 31, 2016

Graduate Degree Addition
Master of Science in Electrical and Computer Engineering (MSEE)
Weisberg Division of Engineering

Brief Program Description:

The Master's of Science in Electrical and Computer Engineering degree (MSEE) is developed by the Weisberg Division of Engineering at the College of Information Technology and Engineering (CITE) to graduate electrical and computer engineers for meeting West Virginia's increasing technological demands. Graduates with this Degree will contribute to West Virginia's economic development, advance its competitive edge globally and contribute to improvement in the quality of life.

A master's degree in electrical and computer engineering (MSEE) provides additional breadth and depth of knowledge, positioning graduates for technical leadership and specialization in industry. Candidates develop skills such as analysis, resourcefulness, ingenuity, responsibility and perseverance through research activities. The proposed MSEE will significantly increase graduate students' enrollment at Marshall University from local, national and international sources. The INTO program recruiters in China and India have indicated that they can recruit large number of students to study MSEE at Marshall University once the program is in place. The MSEE will enable the introduction of an Accelerated Master's Degree (AMD or 4+1) program in BSEE. AMD allows outstanding undergraduate students to complete a traditional four-year Bachelor's degree in Electrical and Computer Engineering and then, with one additional year, earn a Master's degree. AMD will help attract more highly motivated undergraduate students to Marshall University. MSEE degree program is essential to attract and retain qualified faculty members in EE. Also, research is an integral part of a faculty member's career to stay abreast in a rapidly evolving field such as EE. MSEE program is critical to helping faculty members stay current and also contributes to keeping the BSEE program current and relevant.

This proposed MSEE program is to be established on the foundation of the currently under-review BSEE program. Therefore, both programs are to share the same resources. The program will cost approximately $1.12 million during its first five years, of which about $150,000 will be used to develop needed laboratories. The program is expected to generate $1.85-2.49 million in revenues during the first five years. Enrollment is expected to increase over this period; it is expected that, after the first five years, 35 students will have graduated with a MSEE degree and approximately 46 students will be actively pursuing a MSEE degree at MU.

Contents

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1.3 Five-year Enrollment Projection 8

1.4 Expenses and Revenue Projection 10

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2.1 Physical Infrastructure 11

2.2 Research & Students Support 11

2.3 Faculty Resources and Teaching Load Mapping 12

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1. Rationale for the New Degree Program

1.1 Market Demand

The Master's of Science in Electrical and Computer Engineering degree (MSEE) is developed by the Weisberg Division of Engineering at the College of Information Technology and Engineering to prepare electrical and computer engineers for meeting the increasing technological demands for West Virginia and the surrounding region. Graduates of this Program will contribute to the region's economic development, advance its competitive edge globally and contribute to improvement in the quality of life.

Electrical engineering is a field of engineering that generally deals with the study and application of electricity, electronics, and electromagnetism. The fields of electrical and computer engineering cover a wide range of subfields including electronics, power engineering, telecommunications, control systems, radio-frequency engineering, signal processing, instrumentation, microelectronics, digital systems including hardware, software, compilers and operating systems, coding, cryptography, network, mobile and distributed computing system, and cyber physical systems and security. As such, the MSEE program at Marshall University (MU) will prepare graduates with a MSEE with two areas of emphasis: general electrical engineering, and computer engineering. It will, also, emphasize service, systems-based knowledge, and sustainability with an eye toward the interface of traditional electrical and computer engineering with new and emerging fields.

The U.S. Department of Labor, Bureau of Statistics, reported that nationwide, the number of electrical and computer engineers and closely related jobs grew by 11 % between 2006 and 2014 (from 216,000 to 240,000); and it is expected to grow to about 290,000 in year 2022. The U.S. Census Bureau (Field of Bachelor's Degree in the US: 2009; Issued February 2012) reported that there are 4.452 million engineers of 25 years and over in the USA; with 1.410 million in the age bracket of 25-39 and 2.252 million in the age bracket of 40-64. Therefore; the overall job opportunities in engineering are expected to be good because the number of engineering graduates should be in rough balance with the number of job openings between 2010 and 2020. In addition to openings from job growth, many openings will be created by the need to replace current engineers who retire or transfer to management, sales, or other occupations; or leave engineering for other reasons. Therefore, in the next 20-25 years US academic institutions are expected to graduate, on average, about 125,000 engineers per year to keep up with

demands. The American Society of Engineering Education (ASEE), in its annual report (Engineering by the Number-2011; www. asee.org/colleges) reported that in 2010-2011, all US Institutions graduated only 83, 001 engineers of which 6.7% were nonresident aliens.

Employment of engineers is expected to grow about as fast as the average for all occupations over the next decade, but growth will vary by specialty. Electrical and computer engineers are projected to have about 20 percent employment growth over the projected decade, slower than the average for all occupations. But, some new job opportunities will be created due to emerging technologies in biotechnology, smart grid, power systems, cyber systems and security, and mobile technologies. Additional opportunities outside of electrical and computer engineering will exist because the skills acquired through earning a degree in electrical/computer engineering often can be applied in other engineering specialties.

Competitive pressures and advancing technology will force companies to improve and update product designs and to optimize their manufacturing processes. Employers will rely on engineers to increase productivity and expand output of goods and services. New technologies continue to improve the design process, enabling engineers to produce and analyze various product designs much more rapidly than in the past. Unlike some other occupations, however, technological advances are not expected to substantially limit employment opportunities in engineering because engineers will continue to develop new products and processes that increase productivity.

In West Virginia, as reported by many industrial leaders, a substantial percentage of all engineering jobs in the state are filled by graduates of out-of-state or foreign institutions. There are more than thirty large businesses in the Tri-State region that employ electrical or computer engineers. In recent years, many of these companies have had difficulty hiring qualified engineers and also had difficulty retaining them longer than five years. Local leaders assert that a substantial problem for them is the absence of a MSEE in this region of the State to support local industries.

A Master's degree is often necessary to land certain jobs or for career advancement within certain disciplines of electrical and computer engineering. Many careers that require a master's degrees are typically found in sectors such as research and product development. Electrical or computer engineers with a Master's degree often benefit from higher pay and increased job responsibilities. While the technical abilities are essential, employers value Master's holders for their organization, independence,

problem solving, fast learning, commitment, flexibility, leadership, and communication skills.

A Master's degree in electrical or computer engineering provides additional breadth and depth of knowledge, positioning graduates for technical leadership and specialization in industry. Candidates develop skills such as analysis, resourcefulness, ingenuity, responsibility and perseverance through research activities. These skills make employees more successful and give them a greater opportunity to work on more interesting projects. In the longer term, these skills are more important than the specialty, and the better skills of Master's degree holders will serve them well. U.S. data (across all areas of engineering) show that the unemployment rate for Bachelor's degree holders is 4.5% and for Master's degree holders is 3.0%.

The economy of the future will be driven by innovation and knowledge. R&D to fuel innovation is largely conducted by graduate degree holders, yet USA in general and West Virginia in particular lags seriously in producing them. USA ranks 14th in the world for the fraction of its population graduating with a graduate degree (behind almost every other industrialized country a relatively smaller fraction is in engineering than is typical of peer nations). The need to take action for maintaining technological leadership of the United States is progressively becoming more urgent. Developing cutting-edge technology through cultivating innovation is critically important in the global competitive environment. Engineering education is one of the most important aspects of this innovation-cultivating process. Many states are now recognizing a shortage of engineers and are taking actions to address this urgent problem. Enrollment in engineering related Master's degrees grew to about 113,000 in 2013, representing a 6 percent increase above the previous year. In the 2012-13 academic year, there were 19,452 students enrolled in MSEE programs and related fields nationwide (engineering enrollment 2012-13, www.asee.org/college) at a rate of 66 per million capita. The total enrollment in state supported MSEE programs in West Virginia was estimated to be 102 students in Fall 2013 at a rate of 53 per million capita—13 per million lower than the national average.

1.2 Strategic Importance

Given the above backdrop and especially the opportunities presented by renewable energy, distributed power systems, telecommunications, controls, and computers and cyber security, introducing a MSEE degree at Marshall University is of strategic importance for the following reasons:

- There is only one Electrical and Computer Engineering Master's Degree program in the state of West Virginia, which is located at the West Virginia University. Given the high demand for Electrical and Computer Engineering (EE) graduate education and excellent job opportunities, there is a need for an additional master's programs to serve southern West Virginia and the Tri-State region.
- Marshall University Bachelor of Science in Engineering (BSE) recent graduates have gone to other institutions such as the Ohio State University, University of Michigan, Purdue University, and others to pursue graduate studies in engineering. Once West Virginia students leave the state to pursue graduate engineering degrees elsewhere, they are less likely to come back to the state after graduation. The MU MSEE program will help keep more West Virginia EE students in the state and potentially attract outside students to the state.
- Given the rapid advances in the electrical and computer engineering (EE) disciplines, a MSEE degree program is essential for providing BSEE students an educational experience that reflects current advances and practices in the field. MSEE program provides a research-oriented academic environment that helps to attract more students into the BSEE program.
- MSEE will enable the introduction of an Accelerated Master's Degree (AMD or 4+1) program in BSEE. AMD allows outstanding undergraduate students to complete a traditional four-year Bachelor's degree in Electrical and Computer Engineering and then, with one additional year, earn a Master's degree. AMD will help attract more highly motivated undergraduate students to Marshall University.
- MSEE degree will significantly increase graduate student enrollment at Marshall University through both direct and INTO program channels. The INTO program recruiters in China and India have indicated that they can recruit large number of students to study MSEE at Marshall University once the program is in place. This is not surprising given the current and future EE job growth rates in the US and globally.
- MSEE degree program is essential to attract and retain qualified faculty members in EE. Research is an integral part of a faculty member's career to stay abreast in a rapidly evolving field such as EE. MSEE program is critical to helping faculty members stay current and also contributes to keeping the BSEE program current and relevant. MSEE students will be able to serve as research assistants and work on research being conducted by faculty members.

- Even at the current research activity level at Marshall University, MSEE graduate students will be able to help advance collaborative research opportunities for MU faculty by effectively utilizing advanced computational and analytical research tools. Especially faculty of School of Medicine and bio-medical fields. MSEE program will contribute to interdisciplinary research at Marshall University.
- With shrinking state financial support to Marshall University, it is critical that academic departments acquire advanced and specialized laboratory instruments to support instruction through external funding. MSEE degree program will help make proposals more competitive.

1.3 Five-Year Enrollment Projection

Assuming Fall, 2017 start date, the Tables 1 and 2 show the projected MSEE program enrollment growth during the first five years. This is a very conservative estimate. Furthermore, by design, enrollment will be capped at the levels shown in the table so that the program can be offered without additional faculty resources.

Under a typical scenario, it will take four semesters to fulfill the MSEE degree requirements. Students will complete 9 hours of course work during each of the first two semesters, 6 hours of course work and initial thesis work during the third semester, and dedicate the fourth semester to completing thesis research. Students completing the Design Project option would take 9 hours of course work during each of the first three semesters, and complete the Design project during the fourth semester.

In steady state, the program requires offering 9 courses per academic year and maximum enrollment per section will be capped at 24. The lab fee generated through the courses will be used to fund graduate teaching assistants who will help the professors in grading assignments and exams.

If the US Bureau of Labor Statistics projections were to hold true, the program can easily grow to a level where 15-25 students graduate every year. Offering 9 graduate courses per academic year requires 1.25 FTE faculty. The goal is to kick-start the program with only minimal additional faculty resources and providing the university administration the option to grow the program with additional faculty resources.

Table 1. MSEE Program Five-Year Enrollment Projection

	New Students	Attrition	Graduation	Cumulative Head Count	Cumulative FTE
1St year 2017-18	12	0	0	12	12
2nd Year 2018-19	18	3	0	27	27
3rd Year 2019-20	20	5	9	33	33
4th Year 2020-21	25	5	12	40	40
5th Year 2021-22	25	5	14	46	46

Table 2: Five-Year Projection of Program Size^

	First Year 2017	Second Year 2018	Third Year 2019	Fourth Year 2020	Fifth Year 2021
Number of Students Served through Course Offerings of the Program:					
Headcount	12	27	33	40	46
FTE	14	31.50	38.50	46.67	53.68
Number of student Credit hours generated by Courses within the program (entire academic year):	252	567	693	840	966
Number of Majors:					
Headcount	12	27	33	40	46
FTE majors	14	31.50	38.50	46.67	53.68
Number of student Credit hours generated by majors in the program (entire academic year):	252	567	693	840	966
Number of degrees To be granted (annual total):	0	0	9	12	14
^ The average student load is 21 Cr/Academic Year. Graduate FTE is 18 CH/ Academic Year.					

1.4 Expenses and Revenue Projection

No additional faculty will be needed to support this program. The proposed MSEE program as well as the existing BSEE program will share faculty and resources and students as well (in case of the accelerated BSEE/MSEE program). It is neither practical nor possible to accurately assess the financial impact of the MSEE program in the absence of the BSEE program. The listed table shows the MSEE portion:

Table 3: Five-Year Projection of Total Operating Resources

	First Year 2017	Second Year 2018	Third Year 2019	Fourth Year 2020	Fifth Year 2021
A. FTE POSITIONS					
1. Administrators	0.125	0.125	0.125	0.125	0.125
2. Full-time Faculty	0.75	1.25	1.25	1.25	1.25
3. Adjunct Faculty	0	0	0	0	0
4. Graduate Assistants	0	1	2	2	0
5. Other Personnel:					
a. Clerical Workers	0.0	0.0	0.0	0.0	00
b. Professionals	0.0	0.0	0.0	0.0	0.0
B. OPERATING COSTS (Appropriated Funds Only)					
1. Personal Services:					
a. Administrators	$ 19,050	$ 19,622	$ 20,210	$ 20,863	$21,441
b. Full-time Faculty	$88,900	$150,431	$ 154,944	$159,594	$164,381
c. Adjunct Faculty	$0.0	$0.0	$0.0	$0.0	$0.0
d. Graduate Assistants	$0.0	$15,000	$30,000	$30,000	$0.0
e. Non-Academic Personnel:					
Clerical Workers	$0.0	$0.0	$0.0	$0.0	$0.0
Professionals	$0.0	$0.0	$0.0	$0.0	$0.0
Total Salaries	$107,950	$185,053	$205,155	$210,409	$185,822
2. Current Expenses (Recurring)	$14,000	$14,500	$14,500	$14,500	$19,750
3. Repairs and Alterations	$0.0	$0.0	$0.0	$0.0	$0.0
4. Equipment:					
Educational Equip.	$0.0	$25,000	$25,000	$25,000	$5,000
Library Books	$5,000	$5,000	$5,000	$5,500	$6,000
5. Nonrecurring Expenses: See the attached spreadsheet	$12,000	$6,000	$6,000	$5,500	$5,500
Total Costs	$138,950	$235,553	$255,655	$260,909	$222,072
C. Sources					

1. General Fund Appropriations (Based on 50% non-res. Students @ $1042.50/C.R)	$189,000	$425,250	$519,750	$630,000	$724,500
[1] General Fund Appropriations (Based on Pro-forma Attached in Appendix C)	$125,429	$290,921	$382,118	$478,954	$576,497
D. Net Revenue ([1]- total Cost)	**($13,521)**	**$55,368**	**$126,463**	**$218,045**	**$354,425**

2. Additional Resource Requirements

The proposed MSEE program is to be established on the foundation of the currently under-review BSEE program. Therefore, both programs are to share the same resources. However, the MSEE degree program will require some additional resources due to the nature and scope of the proposed program. These additional resources fall into four primary categories: physical infrastructure, research support, student support, and faculty.

2.1 Physical Infrastructure

The approach for building MSEE program has been to leverage MU resources and complement engineering programs of other organizations to meet the State's needs for practicing engineers. All needed space will be accommodated in the Weisberg Family Applied Engineering Complex (WAEC), the Weisberg Engineering Lab (WL), and Gullickson Hall (GH). Adequate resources exist for laboratory and support services. No new needs are anticipated. Space for classrooms is adequate. The proposed program will not require the addition of new space or facilities or the remodeling or renovation of existing space.

2.2 Research & Students Support

The Division has ten laboratories that are associated with the existing engineering program. Most of these facilities can be utilized as associated electrical and computer engineering laboratories with the proper equipment complement. All needed space will be accommodated in the Weisberg Family Applied Engineering Complex, Weisberg Engineering Lab and Gullickson Hall.

The total projected, therefore, for the research labs is $150,000. About $45,000 of the required funds will be in form of start-up support for the new faculty (new faculty member usually receives about $30,000 as start-up fund).

During the infancy phase, the MSEE program requires financial support in terms of graduate assistantships to attract over-achieving students. These assistantships should come in the form of tuition benefits and stipends (20 hours/ Week). Therefore, it is anticipated that the program will be awarded a total of three full graduate assistantships per year for the first three years of the program. The estimated cost of such support is about $29,000 per year.

2.3 Faculty Resources and Teaching Load Mapping

As it was mentioned earlier, this proposed MSEE program is to be established on the foundation of the existing BSEE program. Therefore, no additional faculty will be needed to support this program. The following table shows a typical faculty course load when the program is fully staffed and implanted. While, Table 5 shows the annual course schedule to meet the MSEE requirements.

Table 4. MSEE Core and Support Faculty

Name of Core Faculty and Faculty Rank	Highest Degree	% of time assigned to the Program
Salem, Asad * [Primary responsibility for administering the program]	Ph.D. in Mechanical Engineering	12.5
Hajjar, Salam	Ph.D. in Computer/Electrical Engineering	25
New Faculty (2) in Year 2017-18	PhD in Electrical/ Computer Engineering	25
New Faculty (3) in Year 2017-18	PhD in Electrical Engineering	25
New Faculty (4) in Year 2018-19	PhD in Electrical Engineering	25
New Faculty (5) in Year 2018-19	PhD in Electrical/Computer Engineering	25

The listed tables to provide information about Core and Support faculty. An asterisk (*) indicates the individual who will have direct administrative responsibilities for the program.

Table 5. Annual Course Schedule to Meet MSEE Requirements

	Fall	Spring
Year I	EE- 602 EE- 606 EE-608 Two Elective Courses	EE-607 EE-608 Three Elective Courses
Year II	EE- 602 EE-606 EE-608 Two Elective Courses EE-698** EE- 699**	EE-607 EE-608 Three Elective Courses EE- 698** EE-699**
**EE 698 (Design Project) & EE 699 (Thesis) will be offered based on need and faculty and student interests.		

3. Non-Duplication

The proposed MSEE degree is new. It does not duplicate any existing graduate degree.

4 New Catalog Description

4.1 Program Description

The Master of Science in Electrical and Computer Engineering (MSEE) degree is designed to provide students with the knowledge, skill, and professional practices needed to develop and design electrical or computer engineering related systems. The program also prepares students who desire to pursue further graduate work leading to a Ph.D. degree.

4.2 Admission Requirements

Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: http://www.marshall.edu/graduate/admissionsrequirements.asp. Each applicant for admission to the M.S. in Electrical and Computer Engineering degree program must have an undergraduate engineering degree from either an accredited ABET curriculum or an internationally recognized program and meet *one* of the following (A, B, or C) admission requirement options:

A. Pass the PE exam, or

B. Have an undergraduate cumulative GPA of 3.00 or greater, or

C. Have an undergraduate cumulative GPA of 2.50 or greater, and satisfy at least two of the following:

(1) Pass the FE exam,

(2) verbal GRE score at least 145,

(3) quantitative GRE score at least 150, and/or

(4) analytical writing GRE score at least 3.0.

Additionally, to be considered for admission, international students must have an iBT TOEFL score of at least 85, or a Paper-Based TOEFL score of at least 527.

Students who do not meet admission requirement options A, B, or C are welcome to apply, and their applications will be considered for admission on a case by case basis. The program admission recommendation will be decided by the MSEE degree program coordinator based on a combination of GRE scores and level of performance in undergraduate engineering coursework.

Applicants who do not meet the above criteria but have an undergraduate engineering degree are welcome to apply as non-degree seeking students and take classes toward their MSEE degree. If the student has a minimum cumulative graduate GPA of 3.30 in his or her first 9 credit hours of CITE MSEE courses, that student may re-apply to the university to be considered for admission to the MSEE degree program.

Eligibility to take the PE exam is based primarily on completion of an ABET accredited undergraduate engineering degree in most states. Completion of a MSEE graduate degree at an institution with an ABET-accredited undergraduate degree does not fulfill that requirement to take the PE exam.

4.3 Degree Requirements

The Master of Science in Electrical and Computer Engineering (MSEE) degree is designed to provide students with the knowledge, skill, and professional practices needed to develop and design electrical and computer engineering related systems. The program also prepares students who desire to pursue further graduate work leading to a Ph.D. degree.

Each degree candidate is required to complete at least 30-33 graduate credit hours, depending on the "option" chosen below (thesis, or coursework only), with a cumulative Grade Point Average of 3.0 for the courses included in the student's Plan of Study. At least one-half of the minimum required hours for the degree must be earned in classes numbered 600 or above.

Each degree-seeking student must file an approved "Plan of Study," developed with a faculty advisor, before the student registers for the 12th credit hour. The Academic Regulations portion of the Graduate Catalog may be consulted for additional information. The Plan of Study should define a Focus Area for the individual student that is related to the student's technical and professional development interests. Examples of focus areas include power, signal processing, control and embedded systems, communications, and integrated systems, computer architecture, computer vision and machine intelligence, and network and security. At least three of the Elective Courses (9 CR) must be within the student's Focus Area at the 600-level.

Students may choose to complete either the "thesis option," or the "coursework only option" after consultation with their academic advisor.

4.3.1 Core Courses (12 CR):

All graduate students in the MSEE program are required to complete four required core courses:

1. EE-606 Electrical Engineering Analysis
2. EE-602 Random Signals and Noise
3. EE-607 Adv. Electrical Engineering Analysis
4. EE-608 Research Methods (another 600-level EE course approved by the advisor and department head can be substituted for the coursework-only option).

4.3.2 Focus Courses (9 CR):

All graduate students in the MSEE program must develop a graduate focus area of study, with prior approval from their adviser and the department head. The focus area should consist of at least 9 CR of graduate study in electrical and computer engineering (EE 600 or higher) and be related to the student's technical and professional development interests. Examples of focus areas include power, signal processing, control and embedded systems, communications, and integrated systems, computer architecture, computer vision and machine intelligence, and network and security

4.3.3 Elective Course (3 – 12 CR):

Graduate students pursuing the Thesis Option must complete a minimum of 3 CR of elective courses. Graduate students pursuing the Design Project Option must complete a minimum of 6 CR of elective courses. Graduate students pursuing the Coursework Only Option must complete a minimum of 12 CR of elective courses. The elective courses must be approved by the advisor.

4.3.4 Comprehensive Assessment (3-6 CR)

Thesis Option (6 CR): Prior to completing 12 semester credit hours of graduate work, students should prepare and present a formal thesis proposal to their faculty advisor. An acceptable proposal (including a statement of work, extensive literature search, and proposed timeline), signed by the student and approved by their faculty advisor and department head, is required prior to registering for thesis credits. Students must form a graduate thesis committee in coordination with their advisor and present their proposal to their committee for review and approval during the first semester in which they have registered for thesis credit. Students are required to deliver a successful written and oral presentation of their thesis

4.3.5 Coursework Only Option (NC): The Master of Science degree may be completed without the preparation of a formal research thesis or report. Instead, a student may be permitted to enrol in a no thesis/no report (coursework only) program which involves additional course work. The student must complete at least thirty-three graduate credits of approved courses. During the first semester of the MS program; the student should select an advisor. Each student will have an individual Program of Courses approved by the student's assigned advisor and the division's chair by the end of the first semester of the program. For this option only, the student must satisfactorily complete the comprehensive examination prior to graduation.

4.4 Plan of Study

Students are required to complete a **Plan of Study** form in consultation with their academic advisors by the end of first semester in the program.

<u>Approved Elective Courses</u>

Any ME (Mechanical Engineering) course approved in advance by the student's advisor

Any EM (Engineering Management) course approved in advance by the student's advisor

Any ENGR (Engineering) course approved in advance by the student's advisor

Any CS (Computer Science) course approved in advance by the student's advisor

5. Summary of Courses in MSEE Degree

New Courses (proposals submitted concurrently)

The following course additions have been submitted to the Graduate Council for Approval:

1. EE 602 Random Signals & Noise
2. EE 606 Electrical Engineering Analysis
3. EE 607 Advanced Electrical Engineering Analysis
4. EE 608 Research Methods
5. EE 611 Digital Design
6. EE 615 Real Time Systems
7. EE 618 Data and Communication Networks
8. EE 624 Wireless Communications
9. EE 630 Robust Control
10. EE 631 Optimal Control
11. EE 636 Power Systems Operation
12. EE 638 Nonlinear Systems and Control
13. EE 639 Distributed Power Systems
14. EE 650-653 Special Topics
15. EE 685-688 Independent Study
16. EE 699 Thesis

Chair: Tracy Christofero | **GC#9: Non-Curricular**

Request for Graduate Non-Curricular Changes

PLEASE USE THIS FORM FOR ALL NON-CURRICULAR CHANGE REQUESTS (changes in admission requirements or requirements for graduation, changes in or new policies/procedures, changes in program descriptions in catalog, general language changes in catalog.

SIGNATURES may not be required, depending on the nature of the request and from where it originates. Consult Graduate Council chair.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Business

Dept/Division: Accounting

Contact Person: Dr. Jeff Archambault

Phone: 304-696-2655

Rationale for Request: Due to new government policies that do not allow international students who are provisionally admitted to get an I-20 the LCOB is updating its admission requirements to allow students who need additional foundations courses to be fully admitted to MS in Accountancy program.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.
NOTE: all requests may not require all signatures.

Department/Division Chair Jeffrey J Archambault	Date 10/31/16
Registrar Sonya M Cary 520101	Date 10-31-16
College Curriculum Committee Chair (or Dean if no college curriculum committee)	Date 7 NOV 16
Graduate Council Chair T Christofero	Date 1-13-17

NOTE: please complete information required on the following pages before obtaining signatures above.

Request for Graduate Non-Curricular Changes-Page 2

1. **Current Catalog Description (if applicable):** Please insert the catalog description from the current catalog for entries you would like to change.

Admission Requirements
Applicants should follow the admissions process described in the Graduate Catalog, or at the Graduate Admissions website at www.marshall.edu/graduate/admissions/how-to-apply-for-admission.
Applicants must also:
• Have a business-related bachelor's degree or higher from an AACSB-accredited program with a Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale;
OR
All other applicants may be admitted if they score 500 or better on the Graduate Management Admission Test (GMAT) or if they have an index of at least 1,100 computed by multiplying the undergraduate grade point average by 200 and adding the GMAT score. The minimum acceptable GMAT score is 400 and 15th percentile verbal.
• All applicants must have completed the following accounting foundation courses or equivalents, each with a grade of C or better:

ACC 311 Intermediate Accounting I
ACC 312 Intermediate Accounting II
ACC 318 Cost Accounting
ACC 341 Accounting Information Systems
ACC 348 Federal Taxation
ACC 429 Auditing

2. **Edits to current description:** Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

3. **New Catalog Description**: Provide a "clean" copy of your proposed description without strike throughs or highlighting. This should be what you are proposing for the new description.

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OR
All other applicants may be admitted if they score 500 or better on the Graduate Management Admission Test (GMAT) or if they have an index of at least 1,100 computed by multiplying the undergraduate grade point average by 200 and adding the GMAT score. The minimum acceptable GMAT score is 400 and 15th percentile verbal.
•All students admitted to the program will complete the following undergraduate courses with a C or better. Students who have completed equivalent courses as a part of their undergraduate degree will receive credit for this requirement. Those who have not completed the courses will complete them as a part of the degree requirements.

ACC 311 Intermediate Accounting I
ACC 312 Intermediate Accounting II
ACC 318 Cost Accounting
ACC 341 Accounting Information Systems
ACC 348 Federal Taxation
ACC 429 Auditing

Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Graduate Council
Request for Non-Curricular Changes-Page 4

Please insert in the text box below your proposed change information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Type of change request:
Department:
Degree program:
Effective date *(Fall/Spring/Summer, Year)*

Type of change request: Noncurricular
Department: College of Business
Degree program: Accountancy
Effective date (Fall/Spring/Summer, Year): Fall 2016

Accounting

Admission Requirements

Applicants should follow the admissions process described in the Graduate Catalog, or at the Graduate Admissions website at www.marshall.edu/graduate/admissions/how-to-apply-for-admission. Applicants must also:

• Have a business-related bachelor's degree or higher from an AACSB-accredited program with a Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale;

OR

All other applicants may be admitted if they score 500 or better on the Graduate Management Admission Test (GMAT) or if they have an index of at least 1,100 computed by multiplying the undergraduate grade point average by 200 and adding the GMAT score. The minimum acceptable GMAT score is 400 and 15th percentile verbal.

• ~~All students must have completed the following accounting foundation courses or equivalents, each with a grade of C or better~~. All students admitted to the program will complete the following undergraduate courses with a C or better. Students who have completed equivalent courses as a part of their undergraduate degree will receive credit for this requirement. Those who have not completed the courses will complete them as a part of the degree requirements.

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ACC 312 Intermediate Accounting II
ACC 318 Cost Accounting
ACC 341 Accounting Information Systems
ACC 348 Federal Taxation
ACC 429 Auditing

Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Chair: Tracy Christofero | **GC#9: Non-Curricular**

Request for Graduate Non-Curricular Changes

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2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.

College: Business

Dept/Division: Management

Contact Person: Dr. Margie McInerney

Phone: 304-696-2675

Rationale for Request: Due to new government policies that do not allow international students who are provisionally admitted to get an I-20 the LCOB is updating its admission requirements to allow students who need additional foundations courses to be fully admitted to HCA program.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.
NOTE: all requests may not require all signatures.

Department/Division Chair Doshee Lee	Date 10/31/16
Registrar Sonja G. Cant 52101	Date 10-31-16
College Curriculum Committee Chair (or Dean if no college curriculum committee)	Date 7 NOV 16
Graduate Council Chair Christofero	Date 1-13-17

NOTE: please complete information required on the following pages before obtaining signatures above.

Request for Graduate Non-Curricular Changes-Page 2

1. **Current Catalog Description (if applicable)**: Please insert the catalog description from the current catalog for entries you would like to change.

Admission Requirements

Full Admission
Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.
Applicants must either have:
1. An undergraduate degree from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework.
OR
2. Have a doctoral degree from a regionally accredited institution; and completed all of the required Business Foundation courses or their equivalents within seven years of application.

Provisional Admission

An applicant whose undergraduate GPA is below a 3.0 from a regionally accredited institution and/or is lacking some or all of the foundation requirements may be admitted provisionally until all foundation requirements are completed. Applicants with GPAs below a 3.0 can include letters of recommendation, statement of purpose, resume, or any other material that could make their case to the Admissions Committee. Two reference letters and a resume are the minimum credentials needed. While provisionally admitted, the applicant must maintain a GPA of 3.0 or higher in the required foundations courses. Once all required foundation courses are completed with a 3.0 or higher average, the applicant will be eligible for full admission. Failure to complete the required foundation courses and/or to maintain a 3.0 or higher while provisionally admitted will lead to academic probation or dismissal from the program. Required Business Foundation courses are determined by the M.B.A. Director or the GSM Academic Advisor. Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the H.C.A. program than are accepted each year; therefore, the selection process is competitive.

2. **Edits to current description:** Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

3. **New Catalog Description**: Provide a "clean" copy of your proposed description without strike throughs or highlighting. This should be what you are proposing for the new description.

Admission Requirements
Full Admission
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Applicants must either have:
1. An undergraduate degree from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework.
OR
2. An undergraduate degree from a regionally accredited institution with a minimum undergraduate GPA of 2.5 or higher on a 4.0 scale for all previously completed undergraduate university work, two letters of recommendation, and resume. Applicant may also submit additional documents such as statement of purpose, test scores, etc.
OR
3. Have successfully completed the Management Foundations Certificate program with a 3.0 or higher.
OR
4. Have a doctoral degree from a regionally accredited institution.

Conditional Admission
Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the H.C.A. program than are accepted each year; therefore, the selection process is competitive.

Graduate Council
Request for Non-Curricular Changes-Page 4

Please insert in the text box below your proposed change information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Type of change request:
Department:
Degree program:
Effective date *(Fall/Spring/Summer, Year)*

Type of change request: Noncurricular Department: College of Business Degree program: HCA Effective date (Fall/Spring/Summer, Year): Fall 2016

HCA

Admission Requirements

Full Admission

Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.
Applicants must either have:

1. An undergraduate degree from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework.

OR

2. An undergraduate degree from a regionally accredited institution with a minimum undergraduate GPA of 2.5 or higher on a 4.0 scale for all previously completed undergraduate university work, two letters of recommendation, and resume. Applicant may also submit additional documents such as statement of purpose, test scores, etc.

OR

3. Have successfully completed the Management Foundations Certificate program with a 3.0 or higher.

OR

4. Have a doctoral degree from a regionally accredited institution.

~~Provisional Admission~~

~~An applicant whose undergraduate GPA is below a 3.0 from a regionally accredited institution and/or is lacking some or all of the foundation requirements may be admitted provisionally until all foundation requirements are completed. Applicants with GPAs below a 3.0 can include letters of recommendation, statement of purpose, resume, or any other material that could make their case to the Admissions Committee. Two reference letters and a resume are the minimum credentials needed. While provisionally admitted, the applicant must maintain a GPA of 3.0 or higher in the required foundations courses. Once all required foundation courses are completed with a 3.0 or higher average, the applicant will be eligible for full admission. Failure to complete the required foundation courses and/or to maintain a 3.0 or higher while provisionally admitted will lead to academic probation or dismissal from the program. Required Business Foundation courses are determined by the M.B.A. Director or the GSM Academic Advisor.~~

Conditional Admission

Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the H.C.A. program than are accepted each year; therefore, the selection process is competitive.

Chair: Tracy Christofero | **GC#9: Non-Curricular**

Request for Graduate Non-Curricular Changes

PLEASE USE THIS FORM FOR ALL NON-CURRICULAR CHANGE REQUESTS (changes in admission requirements or requirements for graduation, changes in or new policies/procedures, changes in program descriptions in catalog, general language changes in catalog.

SIGNATURES may not be required, depending on the nature of the request and from where it originates. Consult Graduate Council chair.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Business

Dept/Division: Management

Contact Person: Dr. Margie McInerney

Phone: 304-696-2675

Rationale for Request: Due to new government policies that do not allow international students who are provisionally admitted to get an I-20 the LCOB is updating its admission requirements to allow students who need additional foundations courses to be fully admitted to HRM program.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.
NOTE: all requests may not require all signatures.

Department/Division Chair Doohee Lee	Date 10/31/16
Registrar Sonya M Ca 520101	Date 10-31-16
College Curriculum Committee Chair (or Dean if no college curriculum committee)	Date 7 NOV 16
Graduate Council Chair Christofero	Date 1-13-17

NOTE: please complete information required on the following pages before obtaining signatures above.

Request for Graduate Non-Curricular Changes-Page 2

1. **Current Catalog Description (if applicable)**: Please insert the catalog description from the current catalog for entries you would like to change.

Admission Requirements
Full Admission
Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.
Applicants must either have:
1. An undergraduate degree from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework.
OR
2. Have a doctoral degree from a regionally accredited institution; and completed all of the required Business Foundation courses or their equivalents within seven years of application.

Provisional Admission
An applicant whose undergraduate GPA is below a 3.0 from a regionally accredited institution and/or is lacking some or all of the foundation requirements may be admitted provisionally until all foundation requirements are completed. Applicants with GPAs below a 3.0 can include letters of recommendation, statement of purpose, resume, or any other material that could make their case to the Admissions Committee. Two reference letters and a resume are the minimum credentials needed. While provisionally admitted, the applicant must maintain a GPA of 3.0 or higher in the required Foundation courses. Once all required foundation courses are completed with a 3.0 or higher average, the applicant will be eligible for full admission. Failure to complete the required foundation courses and/or to maintain a 3.0 or higher while provisionally admitted will lead to academic probation or dismissal from the program. Required Business Foundation courses are determined by the M.B.A. Director or the GSM Academic Advisor. Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the HRM program than are accepted each year; therefore, the selection process is competitive.

2. **Edits to current description:** Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

3. **New Catalog Description**: Provide a "clean" copy of your proposed description without strike throughs or highlighting. This should be what you are proposing for the new description.

Admission Requirements

Full Admission
Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.
Applicants must either have:
1. An undergraduate degree from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework.
OR
2. An undergraduate degree from a regionally accredited institution with a minimum undergraduate GPA of 2.5 or higher on a 4.0 scale for all previously completed undergraduate university work, two letters of recommendation, and resume. Applicant may also submit additional documents such as statement of purpose, test scores, etc.
3. Have successfully completed the Management Foundations Certificate program with a 3.0 or higher.
OR
4. Have a doctoral degree from a regionally accredited institution.

Conditional Admission
Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the HRM program than are accepted each year; therefore, the selection process is competitive.

Graduate Council
Request for Non-Curricular Changes-Page 4

Please insert in the text box below your proposed change information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Type of change request:
Department:
Degree program:
Effective date *(Fall/Spring/Summer, Year)*

Type of change request: Noncurricular
Department: College of Business
Degree program: HRM
Effective date (Fall/Spring/Summer, Year): Fall 2016

HRM

Admission Requirements

Full Admission

Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.
Applicants must either have:

1. An undergraduate degree from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework.

OR

2. An undergraduate degree from a regionally accredited institution with a minimum undergraduate GPA of 2.5 or higher on a 4.0 scale for all previously completed undergraduate university work, two letters of recommendation, and resume. Applicant may also submit additional documents such as statement of purpose, test scores, etc.
3. Have successfully completed the Management Foundations Certificate program with a 3.0 or higher.

OR

4. Have a doctoral degree from a regionally accredited institution.

~~Provisional Admission~~

~~An applicant whose undergraduate GPA is below a 3.0 from a regionally accredited institution and/or is lacking some or all of the foundation requirements may be admitted provisionally until all foundation requirements are completed. Applicants with GPAs below a 3.0 can include letters of recommendation, statement of purpose, resume, or any other material that could make their case to the Admissions Committee. Two reference letters and a resume are the minimum credentials needed.~~

~~While provisionally admitted, the applicant must maintain a GPA of 3.0 or higher in the required Foundation courses. Once all required foundation courses are completed with a 3.0 or higher average, the applicant will be eligible for full admission.~~

~~Failure to complete the required foundation courses and/or to maintain a 3.0 or higher while provisionally admitted will lead to academic probation or dismissal from the program.~~

~~Required Business Foundation courses are determined by the M.B.A. Director or the GSM Academic Advisor.~~

Conditional Admission

Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the HRM program than are accepted each year; therefore, the selection process is competitive.

Chair: Tracy Christofero | **GC#9: Non-Curricular**

Request for Graduate Non-Curricular Changes

PLEASE USE THIS FORM FOR ALL NON-CURRICULAR CHANGE REQUESTS (changes in admission requirements or requirements for graduation, changes in or new policies/procedures, changes in program descriptions in catalog, general language changes in catalog.

SIGNATURES may not be required, depending on the nature of the request and from where it originates. Consult Graduate Council chair.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Business

Dept/Division: Management

Contact Person: Dr. Margie McInerney

Phone: 304-696-2675

Rationale for Request: Due to new government policies that do not allow international students who are provisionally admitted to get an I-20 the LCOB is updating its admission requirements to allow students who need additional foundations courses to be fully admitted to MBA program.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.
NOTE: all requests may not require all signatures.

Department/Division Chair Dorlee Lee	Date 10/31/16
Registrar Sonya G. Cantu 520101	Date 10-31-16
College Curriculum Committee Chair (or Dean if no college curriculum committee)	Date 7 NOV 16
Graduate Council Chair T Christofero	Date 1-13-17

NOTE: please complete information required on the following pages before obtaining signatures above.

Request for Graduate Non-Curricular Changes-Page 2

1. **Current Catalog Description (if applicable)**: Please insert the catalog description from the current catalog for entries you would like to change.

Admission Requirements
Full Admission
Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.

Applicants must either have:
1. An undergraduate degree in business from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework; and completed all of the required Business Foundations courses or their equivalents within seven years of application.
OR
2. An undergraduate degree from a regionally accredited institution with a minimum undergraduate GPA of 2.5 or higher on a 4.0 scale for all previously completed undergraduate university work; and completed the GRE or GMAT and submit official scores OR have a doctoral degree from a regionally accredited institution; and completed all of the required Business Foundation courses or their equivalents within previous seven years of receipt of application.

Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the M.B.A. program than are accepted each year; therefore, the selection process is competitive.

Provisional Admission
An applicant whose undergraduate GPA is below a 3.0 from a regionally accredited institution and/or is lacking some or all of the foundation requirements may be admitted provisionally until all foundation requirements are completed. Applicants with GPAs below a 3.0 can include letters of recommendation, statement of purpose, resume, or any other material that could make their case to the Admissions Committee. Two reference letters and a resume are the minimum credentials needed. While provisionally admitted, the applicant must maintain a GPA of 3.0 or higher in the required foundation courses. Once all required foundation courses are completed with a 3.0 or higher average, the applicant will be eligible for full admission. Failure to complete the required foundation courses and/or to maintain a 3.0 or higher while provisionally admitted will lead to academic probation or dismissal from the program. Required Business Foundation courses are determined by the M.B.A. Director or the GSM Academic Advisor. Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the M.B.A. program than are accepted each year; therefore, the selection process is competitive.

2. **Edits to current description:** Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

3. **New Catalog Description**: Provide a "clean" copy of your proposed description without strike throughs or highlighting. This should be what you are proposing for the new description.

Admission Requirements
Full Admission
Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.
Applicants must either have:
1. An undergraduate degree in business from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework.
OR
2. An undergraduate degree from a regionally accredited institution with a minimum undergraduate GPA of 2.5 or higher on a 4.0 scale for all previously completed undergraduate university work, two letters of recommendation, and resume. Applicant may also submit additional documents such as statement of purpose, test scores, etc.
3. Have successfully completed the Management Foundations Certificate program with a 3.0 or higher.
OR
4. Have a doctoral degree from a regionally accredited institution.

Conditional Admission
Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Note: Applicants may be asked to submit additional material if needed before an admission decision is made.
Generally, more students apply to the M.B.A. program than are accepted each year; therefore, the selection process is competitive.

Graduate Council
Request for Non-Curricular Changes-Page 4

Please insert in the text box below your proposed change information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Type of change request:
Department:
Degree program:
Effective date *(Fall/Spring/Summer, Year)*

Type of change request: Noncurricular
Department: College of Business
Degree program: MBA
Effective date (Fall/Spring/Summer, Year): Fall 2016

MBA

Admission Requirements

Full Admission

Applicants should follow the admissions process described in this catalog or at the Graduate Admissions website: www.marshall.edu/graduate/admissions/how-to-apply-for-admission.

Applicants must either have:

1. An undergraduate degree in business from a regionally accredited institution with an undergraduate Grade Point Average (GPA) of 3.0 or higher on a 4.0 scale for all previously completed undergraduate coursework~~; and completed all of the required Business Foundations courses or their equivalents within seven years of application.~~

OR

2. An undergraduate degree from a regionally accredited institution with a minimum undergraduate GPA of 2.5 or higher on a 4.0 scale for all previously completed undergraduate university work, two letters of recommendation, and resume. Applicant may also submit additional documents such as statement of purpose, test scores, etc. ~~and completed the GRE or GMAT and submit official scores OR have a doctoral degree from a regionally accredited institution; and completed all of the required Business Foundation courses or their equivalents within previous seven years of receipt of application.~~

3. Have successfully completed the Management Foundations Certificate program with a 3.0 or higher.

OR

4. Have a doctoral degree from a regionally accredited institution.

Conditional Admission

Conditional Admission can be granted for one term if the applicant meets all program requirements for Admission except they have not officially graduated with their bachelor degree. Once the degree is granted the applicant would need to resubmit their official transcripts for full admission.

Note: Applicants may be asked to submit additional material if needed before an admission decision is made.

Generally, more students apply to the M.B.A. program than are accepted each year; therefore, the selection process is competitive.

~~Provisional Admission~~

~~An applicant whose undergraduate GPA is below a 3.0 from a regionally accredited institution and/or is lacking some or all of the foundation requirements may be admitted provisionally until all foundation requirements are completed. Applicants with GPAs below a 3.0 can include letters of recommendation, statement of purpose, resume, or any other material that could make their case to the Admissions Committee. Two reference letters and a resume are the minimum credentials needed. While provisionally admitted, the applicant must maintain a GPA of 3.0 or higher in the required foundation courses. Once all required foundation courses are completed with a 3.0 or higher average, the applicant will be eligible for full admission. Failure to complete the required foundation courses and/or to maintain a 3.0 or higher while provisionally admitted will lead to academic probation or dismissal from the program. Required Business Foundation courses are determined by the M.B.A. Director or the GSM Academic Advisor. Note: Applicants may be asked to submit additional material if needed before an admission decision is made. Generally, more students apply to the M.B.A. program than are accepted each year; therefore, the selection process is competitive.~~

Chair: Tracy Christofero | **GC#7: Course Change**

Request for Graduate Course Change

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: COHP Dept/Division: SWK Current Alpha Designator/Number: 551

Contact Person: PEGGY PROUDFOOT HARMAN Phone: 304-696-3146

CURRENT COURSE DATA:

Course Title: ~~FIELD EDUCATION~~ Foundations of Field Practicum

Alpha Designator/Number: 551

Title Abbreviation: Field Education

1. Complete this **five** page form in its entirety and route through the departments/committees below for changes to a course involving: course title, alpha designator, course number, course content, credit hours, or catalog description.
2. If this change will affect other departments that require this course, please send a memo to the affected department and include it with this packet, as well as the response received from the affected department.
3. If the changes made to this course will make the course similar in title or content to another department's courses, please send a memo to the affected department and include it with this packet as well as the response received from the affected department.
4. List courses, if any, that will be deleted because of this change (*must submit course deletion form).*
5. If the faculty requirements and/or equipment need to be changed upon approval of this proposal, attach a written estimate of additional needs.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head Peggy Harman	Date 10-18-16
Registrar 440701	Date 10/28/16
College Curriculum Chair	Date 11/2/16
Graduate Council Chair	Date 1-13-17

Request for Graduate Course Change - Page 2

College: COHP | Department/Division: SWK | Alpha Designator/Number: 551

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☐ YES ☒ NO

From (limited to 30 characters and spaces)

To

If Yes, Rationale

Change in COURSE ALPHA DESIGNATOR:

From: To : ☐ YES ☒ NO

If Yes, Rationale

Change in COURSE NUMBER: ☐ YES ☒ NO

From: To:

If Yes, Rationale

Change in COURSE GRADING

From ☐ Grade To ☐ Credit/No Credit

Rationale

Change in CATALOG DESCRIPTION: ☐ YES ☒ NO IF YES, fill in below:

From

To

If Yes
Rationale

Change in COURSE CREDIT HOURS: ☒ YES ☐ NO If YES, fill in below:

NOTE: If credit hours increase/decrease, please provide documentation that specifies the adjusted work requirements.

From

3 hours

To

A range from ~~3~~ 1-9 hrs. 3-9 hours.

Style per P. Harman

Change in COURSE CONTENT: ☐ YES ☒ NO

From

To

Rationale

Request for Graduate Course Change-Page 4

College: COHP

Department: SWK

Course Number/Title SWK 551

1. REQUIRED COURSE: If this course is required by another department(s), identify it/them by name and attach the written notification you sent to them announcing to them the proposed change and any response received. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

2. COURSE DELETION: List any courses that will be deleted because of this change. A *Course Deletion* form is also required. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

3. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials as a result of this change, attach an estimate of the time and cost etc. required to secure these items. (NOTE: approval of this form does not imply approval for additional resources. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

Request for Graduate Course Change - Page 5

Please insert in the text box below your course change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings) based on the appropriate change:

COURSE DESCRIPTION CHANGE	COURSE NUMBER CHANGE	COURSE TITLE CHANGE
Department:	Department:	Department:
Course Number and Title:	Current Course Number/Title:	Current Course Number/Title:
Rationale:	New Course Number:	New Course Title:
Course Description (old)	Rationale:	Rationale:
Course Description: (new)	Catalog Description:	Catalog Description:
Catalog Description:	Credit hours:	

COURSE NUMBER CHANGE
Change credit hours for SWK 551 from 3 hours to a range of ~~3-3~~ 1-9 hours.
N/A

Department:
Social Work

Current Course Number / Title:
SWK 551 Field Education

New Course Number:
N/A

Rationale:
Social Work graduate students are often employed and require flexibility to complete field hours. Having a range of hours for field education provides a design that is more accommodating to their schedules.

Catalog Description:
This is the second of two courses in M.S.W. social work practice in which the purpose continues to be preparation for student for entry professional social work practice. Within this course students continue to apply principles that guide professional practice with particular emphasis placed onthe micro level of practice, working with individuals and families. (PR: SWK 501 and 511).

Credit Hours:
Change from 3 to a range of ~~3-9~~ 1-9

Chair: Tracy Christofero | **GC#7: Course Change**

Request for Graduate Course Change

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: COHP Dept/Division: SWK Current Alpha Designator/Number: 653

Contact Person: PEGGY PROUDFOOT HARMAN Phone: 304-696-3146

CURRENT COURSE DATA:

Course Title: ~~FIELD EDUCATION~~ Adv Field Practicum

Alpha Designator/Number: 653

Title Abbreviation: Field Education

1. Complete this **five** page form in its entirety and route through the departments/committees below for changes to a course involving: course title, alpha designator, course number, course content, credit hours, or catalog description.
2. If this change will affect other departments that require this course, please send a memo to the affected department and include it with this packet, as well as the response received from the affected department.
3. If the changes made to this course will make the course similar in title or content to another department's courses, please send a memo to the affected department and include it with this packet as well as the response received from the affected department.
4. List courses, if any, that will be deleted because of this change (*must submit course deletion form).*
5. If the faculty requirements and/or equipment need to be changed upon approval of this proposal, attach a written estimate of additional needs.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head Peggy Harman	Date 10/17/16
Registrar Sonja D Cart 440701	Date 10/28/16
College Curriculum Chair	Date 11/2/16
Graduate Council Chair J Christofero	Date 1-13-17

Request for Graduate Course Change - Page 2

College: COHP Department/Division: SWK Alpha Designator/Number: 653

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☐ YES ☒ NO

From (limited to 30 characters and spaces)

To

If Yes, Rationale

Change in COURSE ALPHA DESIGNATOR:

From: To : ☐ YES ☒ NO

If Yes, Rationale

Change in COURSE NUMBER: ☐ YES ☒ NO

From: To:

If Yes, Rationale

Change in COURSE GRADING

From ☐ Grade To ☐ Credit/No Credit

Rationale

Change in CATALOG DESCRIPTION: ☐ YES ☒ NO IF YES, fill in below:

From

To

If Yes Rationale

Change in COURSE CREDIT HOURS: ☒ YES ☐ NO If YES, fill in below:

NOTE: If credit hours increase/decrease, please provide documentation that specifies the adjusted work requirements.

From

3 hours

To

A range from ~~3~~ 1 1-9 hrs-9 hours.

See per P. Herman

Change in COURSE CONTENT: ☐ YES ☒ NO

From

To

Rationale

Request for Graduate Course Change-Page 4

College: COHP

Department: SWK

Course Number/Title SWK 653

1. REQUIRED COURSE: If this course is required by another department(s), identify it/them by name and attach the written notification you sent to them announcing to them the proposed change and any response received. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

2. COURSE DELETION: List any courses that will be deleted because of this change. A *Course Deletion* form is also required. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

3. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials as a result of this change, attach an estimate of the time and cost etc. required to secure these items. (NOTE: approval of this form does not imply approval for additional resources. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

Request for Graduate Course Change - Page 5

Please insert in the text box below your course change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings) based on the appropriate change:

COURSE DESCRIPTION CHANGE	COURSE NUMBER CHANGE	COURSE TITLE CHANGE
Department:	Department:	Department:
Course Number and Title:	Current Course Number/Title:	Current Course Number/Title:
Rationale:	New Course Number:	New Course Title:
Course Description (old)	Rationale:	Rationale:
Course Description: (new)	Catalog Description:	Catalog Description:
Catalog Description:	Credit hours:	

COURSE NUMBER CHANGE
Change credit hours for SWK 653 from 3 hours to a range of ~~3~~ 1-9 hours.
N/A

Department:
Social Work

Current Course Number / Title:
SWK 653 Field Education

New Course Number:
N/A

Rationale:
Social Work graduate students are often employed and require flexibility to complete field hours. Having a range of hours for field education provides a design that is more accommodating to their schedules.

Catalog Description:

Provides concentration year second semester agency-based field instruction and classroom seminar for advanced learning and practice opportunities relevant to social work. (Concurrent PR: SWK 633 and SWK 634)

Credit Hours:
Change from 3 to a range of ~~3~~ 1-9

Request for Graduate Addition, Deletion, or Change of a Major or Degree

NOTE: Before you submit a request for a new Major or Degree, you must submit an INTENT TO PLAN form. Only after the INTENT TO PLAN goes through the approval process are you ready to submit this request for a new Major or Degree. For detailed information on new programs please see: http://wvhepcdoc.wvnet.edu/resources/133-11.pdf.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy without signatures to the Graduate Council Chair.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Liberal Arts

Dept/Division: Geography

Contact Person: James Leonard

Phone: 6-4626

Degree Program: Geography MA

Check action requested: ☐ Addition ☐ Deletion ☒ Change

Effective Term/Year: Fall 20 ☐ Spring 20 17 ☒ Summer 20 ☐

Information on the following pages must be completed before signatures are obtained.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head J M Leonard	Date 10/3/16
College Curriculum Chair Crafchu	Date 10/17/16
College Dean R B Bahde	Date 10/17/16
Graduate Council Chair T Christofero	Date 1-13-17
Provost/VP Academic Affairs	Date
Presidential Approval	Date
Board of Governors Approval	Date

Rec'd In COLA Office
Date: 10/5/16

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 2

Please provide a rationale for addition, deletion, change: (May attach separate page if needed)

See attachments.

Please describe any changes in curriculum:
List course number, title, credit hours. Note whether each course is required or optional. Enter NONE if no change. (May attach separate page if needed)
See attachments.

1. ADDITIONAL RESOURCE REQUIREMENTS: If your program requires additional faculty, equipment or specialized materials to ADD or CHANGE this major or degree, attach an estimate of the time and money required to secure these items.
NOTE: Approval of this form does not imply approval for additional resources. Enter NONE if not applicable.

NONE

2. NON-DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the request and any response received from them. Enter NONE if not applicable.

NONE

For catalog changes as a result of the above actions, please fill in the following pages.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 3

3. *Current* Catalog Description

Insert the *Current* Catalog Description and page number from the latest catalog for entries you would like to change. (May attach separate page if needed)

See attachments.

4. *Edits* to the Current Description

Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 4

5. *New* Catalog Description

Insert a 'clean' copy of your proposed description, i.e., no strikethroughs or highlighting included. This should be what you are proposing for the new description. (May attach separate page if needed)

See attachments.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 5

Please insert in the text box below your change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Major or Degree:
Type of Change: *(addition, deletion, change)*
Rationale:

Department: Geography
Major or Degree: MA
Type of Change: change
Rationale: Improve student education; see attachments.

Change of Degree Program

Geography, MA

Rationale for the changes:

1. Increase credit hours required from 30 to 32 for the MA. We feel that students need additional subject matter exposure, knowledge of the discipline, and critical thinking, writing, and research skills. Requiring two more credits and the change to GEO679 (see below) will mean one additional Geography course per student.
2. Change the credits for GEO679 to one credits. We use GEO679 to assign MA students written projects followed by an oral defense. This serves as their comprehensive exam. We feel additional coursework is more valuable than 3 credits for the comprehensive exams for MA students. Students will still receive one credit for GEO679 for their comprehensive exams. (MS students who switch to the MA because they no longer wish to writing a thesis will still retain 3 credits for GEO679, which they take as part of a thesis proposal defense for the MS.)
3. Delete the language in our admission requirements referencing the old GRE scoring system. The scores are only valid for five years and the new GRE scoring system began in 2011.
4. Among the options for the required statistics course, list our GEO540 Spatial Statistics and GIS as the first course with other courses acceptable with permission of the graduate adviser. We feel students should take the department's statistics course where possible because it covers discipline-specific material. We will continue to allow (with permission) another statistics course to substitute to prevent delays in graduation.
5. Change the language about required 600-level courses to more simply reflect the Graduate College requirements.
6. Change the language about the minimum number of hours that must be GEO. The current language permitting electives outside the department exists because sometimes students would delay graduation if they couldn't get enough Geography courses. However, we also believe that students should take Geography courses where possible. By changing the language, students would seek Geography courses first, although we will still allow an elective or two when necessary to avoid delays in graduation or where appropriate for a student's interests or research.
7. Change list of courses based on what has been added or deleted since the last catalog update.

Catalog Entry Changes

Proposed New (October 2016) with changes marked

Program Description

Geography is the systematic study of the spatial aspects of human activity, the natural world, and human-environment interaction. The discipline of geography occupies a unique position as a bridge between the social sciences (Human Geography), natural sciences (Physical Geography), and STEM fields (GIScience). From this interdisciplinary perspective, geography helps us understand and address numerous contemporary challenges ranging from economic development, urban planning, and ethnic conflict to climate change, environmental sustainability, and natural resource management. As a result, geography is a rapidly expanding discipline with diverse career opportunities across the environmental sciences, social sciences, and technological fields in both the public and private sectors. Both the U.S. Department of Labor and the Bureau of Labor Statistics predict that demand for trained geographers will grow much faster than average over the next decade.

The Geography Department prepares students to succeed as professionals in today's job market through an innovative curriculum focusing on building critical thinking, technical, and practical skills across a range of human geography, physical geography, and geospatial information science (GIScience) courses. The curriculum includes a mixture of classroom and lab instruction, hands-on projects, and professional internships experiences that actively engage students in the learning process and provide the skills necessary for lifelong learning. The department maintains state-of-the-art facilities, including technology-enhanced classrooms, a physical geography lab, and a GIScience computer lab, supporting students as they utilize the latest software and hardware. The department provides a supportive learning environment where students work closely with faculty and peers while enjoying numerous opportunities to participate in campus, state, and national professional activities.

Geography alumni have successfully applied their knowledge and practical skills in a variety of career paths in both the public and private sectors, including urban and regional planning, economic development, environment planning, natural resource and energy management, weather forecasting, emergency response and homeland security, GIS analysis, and education. Other alumni have continued with geography studies at the doctoral level.

Students wishing to earn a master's degree in geography have the option of selecting either a Master of Arts (M.A.) or Master of Science (M.S.) degree. Both the M.S. and M.A. degree options prepare the graduate for professional employment or advanced work at the doctoral level. Because M.S. students are required to complete a thesis, the M.S. option is the best choice for students wishing to engage in geographical research projects or in preparation for entrance into a doctoral program.

For more information, please see the departmental website at www.marshall.edu/geography, email geography@marshall.edu, or call (304) 696-4364.

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M.S. applicants should follow the admissions process described in this catalog or at the Graduate Admissions website at www.marshall.edu/graduate/. [changed web address]

In addition, M.S. applicants must:

- Submit GRE (Graduate Record Examination) scores with the graduate application;
- Have a minimum undergraduate GPA of ~~2.9~~ 3.5 or minimum GRE scores (~~for those taking the GRE prior to August 2011 the scores must be: Verbal plus Quantitative greater than or equal to 900 and Writing greater than or equal to 3.5; for those taking the GRE after that date, the scores must be~~ Verbal greater than or equal to 150 and Quantitative greater than or equal to ~~290~~ 150 and Writing greater than or equal to ~~3.5~~ 4.5).

M.S. applicants demonstrating potential but not meeting these criteria may be admitted to the M.S. program with permission from the faculty.

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For more information about other financial support, please see www.marshall.edu/graduate/. [changed web address]

Degree Requirements

Candidates for the master's degree must meet the general requirements for the Graduate College and ~~either~~ complete ~~a thesis with~~ a minimum of 32 total credits ~~(M.S.) or comprehensive exams with a minimum of 30 total credits (M.A.)~~.

Required Courses ~~(M.A.)~~

- GEO 526 Principles of GIS (requirement waived if taken at the undergraduate level)
- ~~Statistics – 3 credit hours;~~ GEO540 Spatial Statistics and GIS; (with permission from a Graduate adviser, a student may substitute one of the following ~~choose from~~: EDF 517, SOC 606, CJ 656, MGT 500, PSC 604;) requirement waived if statistics passed with a grade of C or better at the undergraduate level.
- GEO 615 Geographic Thought and Methods
- GEO 616 Geographical Research
- For the M.A.: GEO 679 Applied Projects (1-3 credits)

- For the M.S.: GEO 679 Applied Projects (3 credits) and GEO 681 Thesis (3 credits)

~~Of the 30 credit hours required for the M.A., at least 15 must be at the 600 level. Of the 30 credit hours, at least 24 must be GEO courses. Some electives from other departments may be taken to complement GEO courses, with permission of the graduate advisor.~~

~~Required Courses (M.S.)~~

- ~~GEO 526 Principles of GIS (requirement waived if taken at the undergraduate level)~~
- ~~Statistics – 3 credit hours; choose from: EDF 517, SOC 606, CJ 656, MGT 500, PSC 604;) requirement waived if statistics passed with a grade of B-C or better at the undergraduate level.~~
- ~~GEO 615 Geographic Thought and Methods~~
- ~~GEO 616 Geographical Research~~
- ~~GEO 681 Thesis (1-6 hours)~~

~~Of the 33 credit hours required for the M.S., at least 17 must be at the 600 level. Of the 33 credit hours, at least 27 must be GEO courses. Some electives from other departments may be taken to complement GEO courses, with permission of the graduate advisor.~~

Electives:

GEO 501: Historical Geography (3 credits)
GEO 502: Geography of Appalachia (3 credits)
GEO 503: Geography of Asia (3 credits)
GEO 504: Geography of Europe (3 credits)
GEO 505: Political Geography (3 credits)
GEO 506: Population Geography (3 credits)
GEO 507: Geography of Sub-Saharan Africa (3 credits)
GEO 508: Geography of South and Middle America (3 credits)
GEO 509: Geography of North Africa and the Middle East (3 credits)
GEO 510: Urban Geography (3 credits)
GEO 511: Medical Geography (3 credits)
GEO 512: Geography of Russia (3 credits)
GEO 514: Principles and Methods of Planning (3 credits)
GEO 515: Urban Land Use Planning (3 credits)
GEO 516: Environmental Issues in Planning (3 credits)
GEO 519: Geography of Gender (3 credits)
GEO 522: Environmental Geography (3 credits)
GEO 525: Climatology (4 credits)
GEO 529: Principles of GIS 2 - Vector Analysis (4 credits)
GEO 530: GIS - Raster Analysis (4 credits)
GEO 531: Principles of Remote Sensing and Photogrammetry (3 credits)
GEO 532: Enterprise GIS (3 credits)
GEO 533: GPS and Mobile Geospatial Technologies (3 credits)

GEO 607: Economic Geography
GEO 617-619: Seminars in Geography (3 credits)
GEO 620: Topics in Environmental Geography (3 credits)
GEO 623: Regions of North America (3 credits)
GEO 631: Advanced GIS Projects (3 credits)
GEO 690: Internship (1-6 credits)
Some GEO courses may not be listed here, but still count for credit in the program; see an adviser.

Of the credit hours required for the degree, at least half must be at the 600 level. Courses from other departments may be taken to complement GEO courses and may count toward the M.A. or M.S. in Geography with permission of the graduate adviser.

Plan of Study
A Plan of Study approved by the student's advisor must be submitted for approval to the Graduate College Dean before the student registers for his or her 12th semester hour. The Plan of Study is a student's "blueprint" for completing graduation requirements.

Minor in Geography
Students who minor in Geography should choose a minimum of six hours of appropriate courses from one of the specialties below in consultation with their major faculty advisor and a Geography faculty advisor.

Regional Geography: GEO 623, Regions of North America, is required. Choose additional coursework from GEO 502, 503, 504, 507, 508, 509, 512, ~~520 (regional topic)~~, 610-614, 617-619.
Physical Geography: Choose from ~~GEO 520 (physical topic)~~, 522, 525, 530, 531, 617-619, 620
Human Geography: Choose from GEO 501, 505, 506, 510, 511, 518, 519, ~~520 (human topic)~~, 522, 607, 617-619, 620
Planning: Choose from GEO 514, 515, 516, ~~520 (planning topic),~~ 617-619
Geographic Information Systems/Remote Sensing: Choose from GEO 526, 529, 530, 531, 532, 533, 540, 617-619, 631

Catalog Entry Changes

Proposed New (October 2016) – Clean Copy

Program Description

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For more information about other financial support, please see www.marshall.edu/graduate/.

Degree Requirements
Candidates for the master's degree must meet the general requirements for the Graduate College and complete a minimum of 32 total credits.

Required Courses

- GEO 526 Principles of GIS (requirement waived if taken at the undergraduate level)
- GEO540 Spatial Statistics and GIS; (with permission from a Graduate adviser, a student may substitute one of the following: EDF 617, SOC 606, CJ 656, MGT 500, PSC 604;) requirement waived if statistics passed with a grade of C or better at the undergraduate level.
- GEO 615 Geographic Thought and Methods
- GEO 616 Geographical Research
- For the M.A.: GEO 679 Applied Projects (1-3 credits)
- For the M.S.: GEO 679 Applied Projects (3 credits) and GEO 681 Thesis (3 credits)

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Human Geography: Choose from GEO 501, 505, 506, 510, 511, 518, 519, 522, 607, 617-619, 620
Planning: Choose from GEO 514, 515, 516, 617-619
Geographic Information Systems/Remote Sensing: Choose from GEO 526, 529, 530, 531, 532, 533, 540, 617-619, 631

Request for Graduate Addition, Deletion, or Change of a Major or Degree

NOTE: Before you submit a request for a new Major or Degree, you must submit an INTENT TO PLAN form. Only after the INTENT TO PLAN goes through the approval process are you ready to submit this request for a new Major or Degree. For detailed information on new programs please see: http://wvhepcdoc.wvnet.edu/resources/133-11.pdf.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy without signatures to the Graduate Council Chair.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Liberal Arts

Dept/Division: Geography

Contact Person: James Leonard

Phone: 6-4626

Degree Program: Geography MS

Check action requested: ☐ Addition ☐ Deletion ☒ Change

Effective Term/Year: Fall 20 ☐ Spring 20 17 Summer 20 ☐

Information on the following pages must be completed before signatures are obtained.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head J M Leonard	Date 10/3/16
College Curriculum Chair [signature]	Date 10/17/16
College Dean R B Barksdale	Date 10/17/16
Graduate Council Chair Christofero	Date 1-13-17
Provost/VP Academic Affairs	Date
Presidential Approval	Date
Board of Governors Approval	Date

Form updated 3/2012

Rec'd In COLA Office
Date: 10/5/16

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 2

Please provide a rationale for addition, deletion, change: (May attach separate page if needed)

See attachments.

Please describe any changes in curriculum:
List course number, title, credit hours. Note whether each course is required or optional. Enter NONE if no change. (May attach separate page if needed)
See attachments.

1. ADDITIONAL RESOURCE REQUIREMENTS: If your program requires additional faculty, equipment or specialized materials to ADD or CHANGE this major or degree, attach an estimate of the time and money required to secure these items.
NOTE: Approval of this form does not imply approval for additional resources. Enter NONE if not applicable.

NONE

2. NON-DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the request and any response received from them. Enter NONE if not applicable.

NONE

For catalog changes as a result of the above actions, please fill in the following pages.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 3

3. *Current* Catalog Description

Insert the *Current* Catalog Description and page number from the latest catalog for entries you would like to change. (May attach separate page if needed)

See attachments.

4. *Edits* to the Current Description

Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 4

5. *New* Catalog Description

Insert a 'clean' copy of your proposed description, i.e., no strikethroughs or highlighting included. This should be what you are proposing for the new description. (May attach separate page if needed)

See attachments.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 5

Please insert in the text box below your change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Major or Degree:
Type of Change: *(addition, deletion, change)*
Rationale:

Department: Geography
Major or Degree: MS
Type of Change: change
Rationale: Improve student education; see attachments.

Change of Degree Program

Geography, MS

Rationale for the changes:

1. Change credit hours required from 33 to 32 for the MS. This aligns with our MA program.
2. Thesis will use the course numbers GEO679 and GEO681. GEO679 will consist of initial research and a proposal defense. Only after providing an acceptable proposal defense will students be allowed to continue with the thesis. This change provides quality control over theses and also guides students toward a non-thesis option in the event that their thesis proposal and initial research is deficient, since they can count GEO679 for the MA requirement.
3. Raise admission standards for MS students. We find that only strong students can successfully complete a thesis.
4. Delete the language in our admission requirements referencing the old GRE scoring system. The scores are only valid for five years and the new GRE scoring system began in 2011.
5. Among the options for the required statistics course, list our GEO540 Spatial Statistics and GIS as the first course with other courses acceptable with permission of the graduate adviser. We feel students should take the department's statistics course where possible because it covers discipline-specific material. We will continue to allow (with permission) another statistics course to substitute to prevent delays in graduation.
6. Change the language about required 600-level courses to more simply reflect the Graduate College requirements.
7. Change the language about the minimum number of hours that must be GEO. The current language permitting electives outside the department exists because sometimes students would delay graduation if they couldn't get enough Geography courses. However, we also believe that students should take Geography courses where possible. By changing the language, students would seek Geography courses first, although we will still allow an elective or two when necessary to avoid delays in graduation or where appropriate for a student's interests or research.
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Degree Requirements

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Required Courses ~~(M.A.)~~

- GEO 526 Principles of GIS (requirement waived if taken at the undergraduate level)
- ~~Statistics – 3 credit hours;~~ GEO540 Spatial Statistics and GIS; (with permission from a Graduate adviser, a student may substitute one of the following ~~choose from~~: EDF 517, SOC 606, CJ 656, MGT 500, PSC 604;) requirement waived if statistics passed with a grade of C or better at the undergraduate level.
- GEO 615 Geographic Thought and Methods
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- For the M.A.: GEO 679 Applied Projects (1-3 credits)

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~~Of the 30 credit hours required for the M.A., at least 15 must be at the 600 level. Of the 30 credit hours, at least 24 must be GEO courses. Some electives from other departments may be taken to complement GEO courses, with permission of the graduate advisor.~~

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Physical Geography: Choose from ~~GEO 520 (physical topic)~~, 522, 525, 530, 531, 617-619, 620
Human Geography: Choose from GEO 501, 505, 506, 510, 511, 518, 519, ~~520 (human topic)~~, 522, 607, 617-619, 620
Planning: Choose from GEO 514, 515, 516, ~~520 (planning topic),~~ 617-619
Geographic Information Systems/Remote Sensing: Choose from GEO 526, 529, 530, 531, 532, 533, 540, 617-619, 631

Catalog Entry Changes

Proposed New (October 2016) – Clean Copy

Program Description

Geography is the systematic study of the spatial aspects of human activity, the natural world, and human-environment interaction. The discipline of geography occupies a unique position as a bridge between the social sciences (Human Geography), natural sciences (Physical Geography), and STEM fields (GIScience). From this interdisciplinary perspective, geography helps us understand and address numerous contemporary challenges ranging from economic development, urban planning, and ethnic conflict to climate change, environmental sustainability, and natural resource management. As a result, geography is a rapidly expanding discipline with diverse career opportunities across the environmental sciences, social sciences, and technological fields in both the public and private sectors. Both the U.S. Department of Labor and the Bureau of Labor Statistics predict that demand for trained geographers will grow much faster than average over the next decade.

The Geography Department prepares students to succeed as professionals in today's job market through an innovative curriculum focusing on building critical thinking, technical, and practical skills across a range of human geography, physical geography, and geospatial information science (GIScience) courses. The curriculum includes a mixture of classroom and lab instruction, hands-on projects, and professional internships experiences that actively engage students in the learning process and provide the skills necessary for lifelong learning. The department maintains state-of-the-art facilities, including technology-enhanced classrooms, a physical geography lab, and a GIScience computer lab, supporting students as they utilize the latest software and hardware. The department provides a supportive learning environment where students work closely with faculty and peers while enjoying numerous opportunities to participate in campus, state, and national professional activities.

Geography alumni have successfully applied their knowledge and practical skills in a variety of career paths in both the public and private sectors, including urban and regional planning, economic development, environment planning, natural resource and energy management, weather forecasting, emergency response and homeland security, GIS analysis, and education. Other alumni have continued with geography studies at the doctoral level.

Students wishing to earn a master's degree in geography have the option of selecting either a Master of Arts (M.A.) or Master of Science (M.S.) degree. Both the M.S. and M.A. degree options prepare the graduate for professional employment or advanced work at the doctoral level. Because M.S. students are required to complete a thesis, the M.S. option is the best choice for students wishing to engage in geographical research projects or in preparation for entrance into a doctoral program.

For more information, please see the departmental website at www.marshall.edu/geography, email geography@marshall.edu, or call (304) 696-4364.

Admission Requirements
M.A. applicants should follow the admissions process described in this catalog or at the Graduate Admissions website at www.marshall.edu/graduate/.

M.S. applicants should follow the admissions process described in this catalog or at the Graduate Admissions website at www.marshall.edu/graduate/.

In addition, M.S. applicants must:
• Submit GRE (Graduate Record Examination) scores with the graduate application;
• Have a minimum undergraduate GPA of 3.5 or minimum GRE scores (Verbal greater than or equal to 150 and Quantitative greater than or equal to 150 and Writing greater than or equal to 4.5).

M.S. applicants demonstrating potential but not meeting these criteria may be admitted to the M.S. program with permission from the faculty.

Graduate Assistantships
Applications for department research or teaching assistantships are available from the department website at www.marshall.edu/geography. For more information about graduate assistantships at Marshall University, please see www.marshall.edu/graduate.

For more information about other financial support, please see www.marshall.edu/graduate/.

Degree Requirements
Candidates for the master's degree must meet the general requirements for the Graduate College and complete a minimum of 32 total credits.

Required Courses

- GEO 526 Principles of GIS (requirement waived if taken at the undergraduate level)
- GEO540 Spatial Statistics and GIS; (with permission from a Graduate adviser, a student may substitute one of the following: EDF 617, SOC 606, CJ 656, MGT 500, PSC 604;) requirement waived if statistics passed with a grade of C or better at the undergraduate level.
- GEO 615 Geographic Thought and Methods
- GEO 616 Geographical Research
- For the M.A.: GEO 679 Applied Projects (1-3 credits)
- For the M.S.: GEO 679 Applied Projects (3 credits) and GEO 681 Thesis (3 credits)

Electives:

GEO 501: Historical Geography (3 credits)

GEO 502: Geography of Appalachia (3 credits)
GEO 503: Geography of Asia (3 credits)
GEO 504: Geography of Europe (3 credits)
GEO 505: Political Geography (3 credits)
GEO 506: Population Geography (3 credits)
GEO 507: Geography of Sub-Saharan Africa (3 credits)
GEO 508: Geography of South and Middle America (3 credits)
GEO 509: Geography of North Africa and the Middle East (3 credits)
GEO 510: Urban Geography (3 credits)
GEO 511: Medical Geography (3 credits)
GEO 512: Geography of Russia (3 credits)
GEO 514: Principles and Methods of Planning (3 credits)
GEO 515: Urban Land Use Planning (3 credits)
GEO 516: Environmental Issues in Planning (3 credits)
GEO 519: Geography of Gender (3 credits)
GEO 522: Environmental Geography (3 credits)
GEO 525: Climatology (4 credits)
GEO 529: Principles of GIS 2 - Vector Analysis (4 credits)
GEO 530: GIS - Raster Analysis (4 credits)
GEO 531: Principles of Remote Sensing and Photogrammetry (3 credits)
GEO 532: Enterprise GIS (3 credits)
GEO 533: GPS and Mobile Geospatial Technologies (3 credits)
GEO 607: Economic Geography
GEO 617-619: Seminars in Geography (3 credits)
GEO 620: Topics in Environmental Geography (3 credits)
GEO 623: Regions of North America (3 credits)
GEO 631: Advanced GIS Projects (3 credits)
GEO 690: Internship (1-6 credits)
Some GEO courses may not be listed here, but still count for credit in the program; see an adviser.

Of the credit hours required for the degree, at least half must be at the 600 level. Courses from other departments may be taken to complement GEO courses and may count toward the M.A. or M.S. in Geography with permission of the graduate adviser.

Plan of Study

A Plan of Study approved by the student's advisor must be submitted for approval to the Graduate College Dean before the student registers for his or her 12th semester hour. The Plan of Study is a student's "blueprint" for completing graduation requirements.

Minor in Geography

Students who minor in Geography should choose a minimum of six hours of appropriate courses from one of the specialties below in consultation with their major faculty advisor and a Geography faculty advisor.

Regional Geography: GEO 623, Regions of North America, is required. Choose additional coursework from GEO 502, 503, 504, 507, 508, 509, 512, 610-614, 617-619.

Physical Geography: Choose from ~~5~~22, 525, 530, 531, 617-619, 620
Human Geography: Choose from GEO 501, 505, 506, 510, 511, 518, 519, 522, 607, 617-619, 620
Planning: Choose from GEO 514, 515, 516, 617-619
Geographic Information Systems/Remote Sensing: Choose from GEO 526, 529, 530, 531, 532, 533, 540, 617-619, 631

Chair: Tracy Christofero | **GC#2: Certificate**

Request for Graduate Addition, Deletion, or Change of a Certificate

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

NOTE: If proposing a new certificate, please read this first: www.marshall.edu/graduate/graduatecouncil/certificatespolicy/certificatepolicy.pdf

College: Liberal Arts

Dept/Division: Geography

Contact Person: James Leonard

Phone: 6-4626

Name of Certificate: Geospatial Information Science - Advanced

Check action requested: ☐ Addition ☐ Deletion ☒ Change

Effective Term/Year: Fall 20 ☐ Spring 20 17 ☐ Summer 20 ☐

Information on the following pages must be completed before signatures are obtained.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head J M Leonard	Date 9/28/16
College Curriculum Chair [signature]	Date 10/17/16
College Dean R B Bamlette	Date 10/7/16
Graduate Council Chair T Christofero	Date 1-13-17
Provost/VP Academic Affairs	Date
Presidential Approval	Date

Form updated 10/2016

Rec'd in COLA Office
Date: 10/5/16

Request for Graduate Addition, Deletion, or Change of a Certificate-Page 2

Please provide a rationale for addition, deletion, change:

See attached.

Please describe any changes in curriculum:
List course number, title, credit hours. Note whether each course is required or optional. Enter NONE if no change.

See attached.

1. ADDITIONAL RESOURCE REQUIREMENTS: If your program requires additional faculty, equipment or specialized materials to ADD or CHANGE this certificate, attach an estimate of the time and money required to secure these items.
NOTE: Approval of this form does not imply approval for additional resources. Enter NONE if not applicable.

NONE

2. NON-DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the request and any response received from them. Enter NONE if not applicable.

See attached.

For catalog changes as a result of the above actions, please fill in the following pages.

3. *Current* Catalog Description

Insert the *Current* Catalog Description and page number from the latest catalog for entries you would like to change. May attach separate page if needed)

See attached.

4. *Edits* to the Current Description

Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

5. *New* Catalog Description

Insert a 'clean' copy of your proposed description, i.e., no strikethroughs or highlighting included. This should be what you are proposing for the new description. (May attach separate page if needed).

See attached.

Request for Graduate Addition, Deletion, or Change of a Certificate-Page 4

Please insert in the text box below your change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Name of Certificate:
Credit Hours:
Type of Change: *(addition, deletion, change)*
Rationale:

Department: Geography
Name of Certificate: Geospatial Information Science - Advanced
Credit Hours: 12
Type of Change: change
Rationale: See attached.

Leonard, Jamie

From: Somerville, Chuck
Sent: Tuesday, April 19, 2016 4:19 PM
To: Leonard, Jamie
Subject: Re: support email

Jamie,

Sorry for the continued delay – it has been a brutal spring.

I have read through the documents and I don't see any problems with the changes that you have made, or have any new edits to suggest. The proposed changes to the GIS Certificates and minor look good to me, and are officially supported by the College of Science.

Thanks,

Chuck

Charles C. Somerville, PhD, FLS
Dean, College of Science
Marshall University
(304)696-2424

From: "Leonard, Jamie" <leonard@marshall.edu>
Date: Monday, April 18, 2016 at 5:25 PM
To: somervil <somervil@marshall.edu>
Subject: support email

Chuck,

As we discussed last week, I just need an email from you stating: "I support the changes in the GIScience certificates and minor."

Jamie

James Leonard, Ph.D.
Geography Department
Marshall University
1 John Marshall Drive
Huntington, WV 25755
Voice: 304 696-4626
leonard@marshall.edu
http://www.marshall.edu/geography

Request for Change of a Graduate Certificate

Geospatial Information Science Certificate – Advanced

Rationale for the changes:

Adjust the list of choices for the required applications/research methods/internship: Added a new course from Natural Resources and Recreation Management; deleted a course that hasn't been offered in years.

Adjust the list of GIScience electives: Added new GIS courses from Geography, Natural Resources and Recreation Management, and Physical Science.

Adjust the members of the GIScience Curriculum Committee: Faculty and staff come and go.

Add information about the Administrative Home of the program: Directs students, faculty and staff to the director of the program for more information.

New description based on the proposed changes:

Geospatial Information Science Certificate – Advanced

Admission Requirements

Students can pursue the graduate certificate while enrolled in a master's program OR as a certificate-only student.

- Applicants interested in the certificate-only program should apply for admission to Marshall University as a Certificate/Professional Development student and select on the application form the Certificate in Geospatial Information Science - Advanced.
- Students already enrolled in a master's degree program should submit to ~~Graduate Admissions~~ the Graduate College a Secondary Program Request form at www.marshall.edu/graduate/. [Link changed.]

Applicants to the Graduate GIScience Certificate – Advanced program must have completed the Certificate in Geospatial Information Science – Basic before entry into the program. Students transferring from other institutions or Marshall graduates with the equivalent of the Basic certificate may enroll for the Advanced certificate.

GIScience credits can count toward a master's degree in several departments such as Geography, Physical Science, Environmental Sciences, Technology Management, and Information Technology. Please see an advisor in the appropriate department.

Program

Geospatial Information Science is a research field that utilizes specialized computer hardware, software, and procedures for presentation and analysis of all types of natural and social science data referenced (mapped) to the earth's surface. Students who complete the requirements for the Advanced certificate should be able to:

- perform advanced GIScience techniques using vector, raster, and remote sensing data;
- apply GIScience to display, support, and analyze research questions in the social or natural sciences;
- collect and create GIScience data using various technologies and softwares;
- recognize and apply computer science concepts such as data collection, representation, queries, and storage; and
- enter GIScience employment or continue GIScience work at the doctoral level.

An Advanced graduate certificate in GIScience consists of a **minimum of 12 hours** in courses designated as GIScience courses beyond the requirement for the GIScience Certificate - Basic. Students must have a B (3.0) average in all their GIScience courses and no grade below a C (2.0) in their GIScience courses to earn the certificate.

Required courses

- At least one advanced analysis course: GEO 529 Principles of GIS 2 - Vector Analysis (4 hrs.) or GEO 530 GIS Raster Analysis (4 hrs.). This requirement is waived if a student completed one of these courses as part of the Certificate in Geospatial Information Science – Basic, an undergraduate equivalent of one of these courses, or an equivalent advanced analysis course from another institution.
- At least one remote sensing course: GEO531 Principles of Remote Sensing and Photogrammetry (3 hours), BSC/PS510 Remote Sensing with GIS Applications (4 hours), BSC 511/PS 511 Digital Image Processing and GIS Modeling (4 hrs.), NRRM533 GIS and Remote Sensing for Natural Resource Management (3 hrs.), or a Special Topics remote sensing course. This requirement is waived if a student completed one of these courses as part of the Certificate in Geospatial Information Science – Basic, an undergraduate equivalent of one of these courses, or an equivalent Remote Sensing course from another institution.
- At least one applications course, research methods, or internship (minimum three credit hours): GEO 631 Advanced GIS Projects, GEO 690 Internship (must be GIScience approved by the student's advisor in advance), ~~IS 645 Geographic Information Systems~~, or NRRM602 GIS/RS Research Method in NRRM.

GIScience electives

- BSC 510/PS 510 Remote Sensing with GIS Applications (4 credit hours)
- BSC 511/PS 511 Digital Image Processing and GIS Modeling (4 hrs.)
- GEO 529 Principles of GIS 2 – Vector Analysis (4 hrs.)
- GEO 530 ~~Intermediate~~ GIS – Raster Analysis (4 hrs.)
- GEO 531 Principles of Remote Sensing and Photogrammetry (3 hrs.)

- GEO 532 Enterprise GIS (3 hrs.)
- GEO 533 GPS and Mobile Geospatial Technologies (3 hrs.)
- GEO 540 Spatial Statistics and GIS (4 hrs.)
- GEO 631 Advanced GIS Projects (3 hrs.)
- GEO 690 Internship (1-6 hrs.; must be GIScience approved by the student's advisor in advance ~~to qualify~~)
- IS 645 Geographic Information Systems (3 hrs.)
- NRRM533 GIS and Remote Sensing for Natural Resource Management (3 hrs.)
- NRRM602 GIS/RS Research Method in NRRM (3 hrs.)
- PS 570 Practicum (4 hrs.; must be GIScience approved by the student's advisor in advance)
- PS 670 Advanced Practicum (4 hrs; must be GIScience approved by the student's advisor in advance)
- Special Topics courses as approved in advance by the GIScience Curriculum Committee
- Independent Study courses as approved by the ~~GIScience Curriculum Committee~~ student's advisor in advance

Oversight of the GIScience Certificate Program

The interdisciplinary GIScience Curriculum Committee oversees the program, approves Special Topics and Independent Study courses, and approves changes to the program. Additional GIScience faculty members and administrative stakeholders may be added to the Committee by consensus of the members or at the request of their Dean. As members leave university service, they may be replaced at the discretion of their department.

Current members and their departments/colleges are:

- Anne Axel, Biological Sciences/COS
- Richard Begley, Enginering/CITE
- David Cartwright, ISAT/COS
- Jan Fox, Senior VP for Information Technology/CIO
- Jeffrey Huffman, Engineering/CITE
- Tom Jones, Integrated Science and Technology/COS
- Min Kook Kim, Integrated Science and Technology/COS
- Jamie Leonard, Geography/COLA, Director of Undergraduate and Graduate Certificate Programs and Undergraduate Minor
- Brian Morgan, Integrated Science and Technology/COS
- Andrew Nichols, Engineering/CITE
- Bill Niemann, Geology/COS
- Mitchell Scharman, Geology/COS
- Jonathan Thompson, Computer Science/CITE
- Jayme Waldron, Biological Sciences/COS
- Anita Walz, Geography/COLA
- Jamie Wolfe, CITE/CEGAS

Administrative Home

James Leonard, Ph.D., Geography Department, College of Liberal Arts, is the director of the program and can provide students with information, advising, forms, and other assistance.

Request for Change of a Graduate Certificate

Geospatial Information Science Certificate – Advanced

Admission Requirements

Students can pursue the graduate certificate while enrolled in a master's program OR as a certificate-only student.

- Applicants interested in the certificate-only program should apply for admission to Marshall University as a Certificate/Professional Development student and select on the application form the Certificate in Geospatial Information Science - Advanced.
- Students already enrolled in a master's degree program should submit to the Graduate College a Secondary Program Request form at www.marshall.edu/graduate/.

Applicants to the Graduate GIScience Certificate – Advanced program must have completed the Certificate in Geospatial Information Science – Basic before entry into the program. Students transferring from other institutions or Marshall graduates with the equivalent of the Basic certificate may enroll for the Advanced certificate.

GIScience credits can count toward a master's degree in several departments such as Geography, Physical Science, Environmental Sciences, Technology Management, and Information Technology. Please see an advisor in the appropriate department.

Program

Geospatial Information Science is a research field that utilizes specialized computer hardware, software, and procedures for presentation and analysis of all types of natural and social science data referenced (mapped) to the earth's surface. Students who complete the requirements for the Advanced certificate should be able to:

- perform advanced GIScience techniques using vector, raster, and remote sensing data;
- apply GIScience to display, support, and analyze research questions in the social or natural sciences;
- collect and create GIScience data using various technologies and softwares;
- recognize and apply computer science concepts such as data collection, representation, queries, and storage; and
- enter GIScience employment or continue GIScience work at the doctoral level.

An Advanced graduate certificate in GIScience consists of a **minimum of 12 credit hours** in courses designated as GIScience courses beyond the requirement for the GIScience Certificate - Basic. Students must have a B (3.0) average in all their GIScience courses and no grade below a C (2.0) in their GIScience courses to earn the certificate.

Required courses

- At least one advanced analysis course: GEO 529 Principles of GIS 2 - Vector Analysis (4 hrs.) or GEO 530 GIS Raster Analysis (4 hrs.). This requirement is waived if a student completed one of these courses as part of the Certificate in Geospatial Information Science – Basic, an undergraduate equivalent of one of these courses, or an equivalent advanced analysis course from another institution.
- At least one remote sensing course: GEO531 Principles of Remote Sensing and Photogrammetry (3 hours), BSC/PS510 Remote Sensing with GIS Applications (4 hours), BSC 511/PS 511 Digital Image Processing and GIS Modeling (4 hrs.), NRRM533 GIS and Remote Sensing for Natural Resource Management (3 hrs.), or a Special Topics remote sensing course. This requirement is waived if a student completed one of these courses as part of the Certificate in Geospatial Information Science – Basic, an undergraduate equivalent of one of these courses, or an equivalent Remote Sensing course from another institution.
- At least one applications course, research methods, or internship (minimum three credit hours): GEO 631 Advanced GIS Projects, GEO 690 Internship (must be GIScience approved by the student's advisor in advance), or NRRM602 GIS/RS Research Method in NRRM.

GIScience electives

- BSC 510/PS 510 Remote Sensing with GIS Applications (4 credit hours)
- BSC 511/PS 511 Digital Image Processing and GIS Modeling (4 hrs.)
- GEO 529 Principles of GIS 2 – Vector Analysis (4 hrs.)
- GEO 530 GIS – Raster Analysis (4 hrs.)
- GEO 531 Principles of Remote Sensing and Photogrammetry (3 hrs.)
- GEO 532 Enterprise GIS (3 hrs.)
- GEO 533 GPS and Mobile Geospatial Technologies (3 hrs.)
- GEO 540 Spatial Statistics and GIS (4 hrs.)
- GEO 631 Advanced GIS Projects (3 hrs.)
- GEO 690 Internship (1-6 hrs.; must be GIScience approved by the student's advisor in advance)
- IS 645 Geographic Information Systems (3 hrs.)
- NRRM533 GIS and Remote Sensing for Natural Resource Management (3 hrs.)
- NRRM602 GIS/RS Research Method in NRRM (3 hrs.)
- PS 570 Practicum (4 hrs.; must be GIScience approved by the student's advisor in advance)
- PS 670 Advanced Practicum (4 hrs; must be GIScience approved by the student's advisor in advance)
- Special Topics courses as approved in advance by the GIScience Curriculum Committee
- Independent Study courses as approved by the student's advisor in advance

Oversight of the GIScience Certificate Program

The interdisciplinary GIScience Curriculum Committee oversees the program, approves Special Topics and Independent Study courses, and approves changes to the program. Additional GIScience faculty members and administrative stakeholders may be added to the Committee by consensus of the members or at the

request of their Dean. As members leave university service, they may be replaced at the discretion of their department.

Current members and their departments/colleges are:

- Anne Axel, Biological Sciences/COS
- Richard Begley, Enginering/CITE
- David Cartwright, ISAT/COS
- Jan Fox, Senior VP for Information Technology/CIO
- Jeffrey Huffman, Engineering/CITE
- Tom Jones, Integrated Science and Technology/COS
- Min Kook Kim, Integrated Science and Technology/COS
- Jamie Leonard, Geography/COLA, Director of Undergraduate and Graduate Certificate Programs and Undergraduate Minor
- Brian Morgan, Integrated Science and Technology/COS
- Andrew Nichols, Engineering/CITE
- Bill Niemann, Geology/COS
- Mitchell Scharman, Geology/COS
- Jonathan Thompson, Computer Science/CITE
- Jayme Waldron, Biological Sciences/COS
- Anita Walz, Geography/COLA
- Jamie Wolfe, CITE/CEGAS

Administrative Home

James Leonard, Ph.D., Geography Department, College of Liberal Arts, is the director of the program and can provide students with information, advising, forms, and other assistance.

Chair: Tracy Christofero | **GC#2: Certificate**

Request for Graduate Addition, Deletion, or Change of a Certificate

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

NOTE: *If proposing a new certificate, please read this first:* www.marshall.edu/graduate/graduatecouncil/certificatespolicy/certificatepolicy.pdf

College: Liberal Arts

Dept/Division: Political Science

Contact Person: Cheryl Brown

Phone: 304.696.2351

Name of Certificate: Graduate Certificate in Non-Profit Management

Check action requested: ☒ Addition ☐ Deletion ☐ Change

Effective Term/Year: Fall 20 17 Spring 20 ☐ Summer 20 ☐

Information on the following pages must be completed before signatures are obtained.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/18/2016
College Curriculum Chair	Date 10/21/16
College Dean	Date 10/24/16
Graduate Council Chair	1-13-17 ~~10/24/16~~
Provost/VP Academic Affairs	Date
Presidential Approval	Date

Rec'd in COLA Date: 10/21/16

Request for Graduate Addition, Deletion, or Change of a Certificate-Page 2

Please provide a rationale for addition, deletion, change:

A certificate in Non-Profit Management will meet the needs of mid level administrators for continuing education purposes. This certificate consists of already existing classes, which we hope will lead students into either the MBA or the MPA. In addition, it will be available completely online, with every class offered at least once per academic year depending on enrollment. This certificate will appeal to a greater range of people.

Please describe any changes in curriculum:
List course number, title, credit hours. Note whether each course is required or optional. Enter NONE if no change.

None

1. ADDITIONAL RESOURCE REQUIREMENTS: If your program requires additional faculty, equipment or specialized materials to ADD or CHANGE this certificate, attach an estimate of the time and money required to secure these items.
NOTE: Approval of this form does not imply approval for additional resources. Enter NONE if not applicable.

None

2. NON-DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the request and any response received from them. Enter NONE if not applicable.

The programs that already had a class that was necessary to the certificate have agreed to the inclusion of those classes (see attached). There are no duplications.

For catalog changes as a result of the above actions, please fill in the following pages.

3. *Current* Catalog Description

Insert the *Current* Catalog Description and page number from the latest catalog for entries you would like to change. May attach separate page if needed)

None

4. *Edits* to the Current Description

Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

5. *New* Catalog Description

Insert a 'clean' copy of your proposed description, i.e., no strikethroughs or highlighting included. This should be what you are proposing for the new description. (May attach separate page if needed).

The Graduate Certificate in Non-Profit Management is designed to enhance job skills, earn recognition, increase marketability, and meet professional development requirements. This is an interdisciplinary program housed in the Political Science department. The coursework focuses on the practical aspects of managing Non-Profits, as well as the theoretical underpinnings of all organizations. With advisor approval, certificate program course credit may be applied towards a graduate degree in either Public Administration or Business Administration.

Admission Requirements:
Students already enrolled in the Master's of Public Administration or the Master's in Business Administration should submit a Secondary Program Request form to Graduate Admissions. www.marshall.edu/graduate/secondary-program-request-form
Prospective certificate-only students should apply for admission to Marshall University as a Professional Developmental student and select the application form for the Certificate in Non-Profit Management,

Program Requirements:
The program requires 18 hours (PSC 532, PSC 533, PSC 553, MGT 672, MGT 682, LS 626). All classes for this certificate are online.

Request for Graduate Addition, Deletion, or Change of a Certificate-Page 4

Please insert in the text box below your change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Name of Certificate:
Credit Hours:
Type of Change: *(addition, deletion, change)*
Rationale:

Department: Political Science
Name of Certificate: Non-Profit Management
Credit Hours: 18 hours
Type of Change: Addition
Rationale: Meet the needs of in service professionals in any location. Increase the number of students in classes currently being offered in both the MPA program and the College of Business MBA program.

Brown, Cheryl

From: McInerney, Marjorie
Sent: Tuesday, October 11, 2016 2:45 PM
To: Brown, Cheryl
Subject: RE: Non Profit Management certificate - MGT 672 and 682

Cheryl,

The Graduate School of Management (COB) has agreed to offer MGT 672 Fall 2017 and MKT 682 Spring 2018 as needed by the Non Profit Management Certificate. If enrollment does not justify the offering of such courses, the COB does have the right to cancel the course.

Margie

Margie L. McInerney, Ph.D.
Professor of Management
Associate Dean, College of Business Graduate Programs
Marshall University
One John Marshall Drive
Huntington WV 25755
304-696-2675
mcinerne@marshall.edu

From: Brown, Cheryl
Sent: Tuesday, October 11, 2016 11:00 AM
To: McInerney, Marjorie <mcinerne@marshall.edu>
Subject: Non Profit Management certificate - MGT 672 and 682

Margie,
I know that you have already agreed to allow MGT 672 Organizational Behavior and MGT 682 Marketing to be included as part of the Non Profit Management Certificate. I need an email from you confirming that to include with the paperwork for the graduate council.

Just to recap, the program will be housed in the political science department, will be for graduate students only, will be completely online, and will be able to complete within one year. In our tentative planning, we have MGT 672 planned for fall 2017 and MGT 682 planned for spring 18.

An email confirming this is all I need. Thanks,
Cheryl

Cheryl A. Brown, Associate Dean
College of Liberal Arts
Professor, Department of Political Science
110 Old Main
One John Marshall Drive
Huntington, WV 25755

Brown, Cheryl

From: Watts, Louis
Sent: Thursday, October 13, 2016 4:19 PM
To: Brown, Cheryl
Subject: LS 626

Dear Cheryl:

I am sending this email to give my approval as program director to include our course, LS 626 (Fundraising Management) in your program of studies for the Non Profit Management certificate program you are creating.

Thank you.

Louis Watts, Ed.D.
Professor/Program Director--Leadership Studies/ATE
Marshall University—South Charleston Campus
100 Angus E. Peyton Drive
South Charleston, West Virginia 25303

Phone: 304-746-1933 (1-800-642-9842 x61933)
wattsl@marshall.edu