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: ENGR 682 | ○ Graded ◉ CR/NC

Contact Person: Andrew Nichols | Phone: 63203

NEW COURSE DATA:

New Course Title: Research

Alpha Designator/Number: E N G R 6 8 2

Title Abbreviation: R e s e a r c h

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Completion of research under the supervision of a faculty member. Six semester hours of credit in research are applied toward the Thesis Option in the engineering MS degrees.

Co-requisite(s): None

First Term to be Offered: Fall-2015

Prerequisite(s): Approval

Credit Hours: 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 4-6-15
Registrar Roberta Ferguson 140101 ~~140107~~	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair JChristofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ENGR 682

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.

All engineering faculty who advise graduate students

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)

Student must actively work on research tasks directed by the faculty advisor. This research will include the generation of a thesis proposal and a thesis defense.

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

The outline will vary by student and project. Generally will include:
1. Thesis proposal
2. Completion of work
3. Prepare written thesis
4. Present and defend thesis

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)

Any instruction that occurs will be one-on-one between the student and faculty.

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: ENGR 682 Research

Catalog Description:
Completion of research under the supervision of a faculty member. Six semester hours of credit in research are applied toward the Thesis Option in the engineering MS degrees.

Prerequisite: Approval

First year Offered: Fall 2015

Credit Hours: 1-6

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: CITE Dept/Division: Engineering Current Alpha Designator/Number: ENGR 699

Contact Person: Andrew Nichols Phone: 63203

CURRENT COURSE DATA:

Course Title: Final Project

Alpha Designator/Number: E N G R 6 9 9

Title Abbreviation: F i n a l P r o j e c t

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 A. Se	Date 4/7/15
Registrar Roberta Ferguson	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair T Christofero	Date 5-20-15

Request for Graduate Course Change - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ENGR 699

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☒ YES ☐ NO

From: Final Project (limited to 30 characters and spaces)

To: Comprehensive Project

If Yes, Rationale: TE 699 Comprehensive Project is currently used for MS degrees in Engineering to fulfill the requirements for the project option. We plan to start using ENGR 699 instead of TE 699 since the TE designation is relatively unknown for our students.

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: Completion of comprehensive project under the supervision of a faculty member. Includes final written submittal and public oral presentation. Fulfills engineering MS requirement for Project Option.

If Yes Rationale: Provides additional information to students registering for the course.

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

To

Change in COURSE CONTENT: ☐ YES ☒ NO

From

To

Rationale

Request for Graduate Course Change-Page 4

College: CITE

Department: Engineering

Course Number/Title ENGR 699 Final Project

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.

N/A

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.

N/A

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.

N/A

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 Description/Title Change
Department: Engineering

Current Course Title: Final Project

New Course Title: Comprehensive Project

Course Description (old):
None

New Course Description:
Completion of comprehensive project under the supervision of a faculty member. Includes final written submittal and public oral presentation. Fulfills engineering MS requirement for Project Option.

Rationale:
The MS degrees in Engineering have traditionally used TE 699 Comprehensive Project to fulfill the requirements of the Project Option. Since the TE designator is relatively unknown, we now plan to start using ENGR 699 for this. ENGR 699 is an existing course with a title that isn't consistent with what we have been using. We are simply changing the title for consistency and adding a description of the course.

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: ES AS&T | Alpha Designator/Number: ES522 | (•) Graded ( ) CR/NC

Contact Person: Scott Simonton | Phone: 746-2045

NEW COURSE DATA:

New Course Title: ~~Sustainability: Principles and Practice~~ Environmental Sustainability (AN)

Alpha Designator/Number: E S 5 2 2

Title Abbreviation: S u s t a i n a b i l i t y E n v i r o n

before (Limit of 25 characters and spaces) (AN)

Course Catalog Description (Limit of 30 words): The course will introduce students to the ideas behind, the debates within, and the work that goes into sustainability, including a review of things we value, how nature works, and intelligent policy decisions.

Co-requisite(s): na | First Term to be Offered: Sp 2016

Prerequisite(s): na | Credit Hours: 3

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

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

Dept. Chair/Division Head A. Szuh	Date 4-6-15
Registrar Roberta Ferguson 030103	Date 4/8/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair J Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ES AS&T | Alpha Designator/Number: ES522

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.

Dr. Scott Simonton

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.

Not Applicable

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.

Not Applicable

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

Attached

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

Attached

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

Attached

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

Lecture, discussion, case study evaluation, group projects

Request for Graduate Course Addition - Page 4

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

Discussion questions, Projects, Mid-term and Final exams

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

Greater detail required in data evaluation, project development and discussion questions, additional section in exams

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

Attached

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: CITE AS&T Environmental Science
Course Number and Title: ES522 ~~Sustainability: Principles and Practice~~ Environmental Sustainability
Catalog Description: The course will introduce students to the ideas behind, the debates within, and the work that goes into sustainability, including a review of the things we value, how nature works, and intelligent policy decisions.
Prerequisites: None
First Term Offered: Spring 2016
Credit Hours: 3

Sustainability
Course Outline

		Readings	Assignments
Week 1	Class expectations, intros, discussion about sustainability		
Week 2	Definitions, nature and values	Leopold	Discussion Question #1
Week 3	The land ethic, history of environmentalism	Leopold	Discussion Question #2
Week 4	The land ethic, history of environmentalism, cont.	Leopold	Discussion Question #3
Week 5	Population trends and demand on resources	Tragedy of the Commons	Discussion Question #4
Week 6	Energy needs, future projections	EIA data, assigned current reading	
Week 7	Sustainable energy		Mid–term handed out
Week 8	Food needs, feeding the world, modern agriculture	New Food Revolution, National Geographic May 2014, other current articles	Mid-term due
Week 9	Sustainable agriculture		Discussion Question #5

Week 10	Micro-level demand on resources including housing, transportation, waste management	Current data and relevant and current articles	Discussion Question #6
Week 11	Sustainable housing		Discussion Question #7
Week 12	Corporate sustainability efforts; Policies and institutions	Nike, Walmart, Patagonia Sustainability reports, other current articles	
Week 13	Sustainability efforts		Class Presentations
Week 14	Sustainability efforts		Class Presentations
Week 15 Dead week	Wrap up, case studies of where we are today, what can we personally do		Final exam distributed

Sample Text:

Leopold, A. 1949. A Sand County Almanac. Oxford University Press, Oxford, UK.

Bibliography

Abend, L. 2010. How cows (grass-fed only) could save the planet.

Boulding, K. E. 1966. The economics of coming spaceship Earth. Page 3-14 in Environmental Quality for a Growing Economy. Resources for the Future, Johns Hopkins University Press.

Coleman, J. 2005. Animal last stands: empathy and extinction in the American West. Montana, The Magazine of Western History 55: 2-13.

Crozier, L G., A. P. Hendry, P. W. Lawson, T. P. Quinn, N. J. Mantua, J. Battin, R. G. Shaw, and R. B. Huey. 2008. Potential responses to climate change in organisms with complex life histories: evolution and plasticity in Pacific salmon. Evolutionary Applications 1: 252-270.

Economist. 2012. June 22

Hardin, G. 1968. The tragedy of the commons. Science 162: 1243-1248. 11

Kolstø,, S. D. 2001. Scientific literacy for citizenship: tools for dealing with the scientific dimension of controversial socioscientific issues. Science Education 85: 291-310.

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Locke, R. M., R.Henderson, C. Lyddy, and C. Reavis. 2009. Nike considered: getting traction on sustainability. MIT Sloan Management 08-077. https://mitsloan.mit.edu/MSTIR/sustainability/NikeConsidered/Documents/08.077.Nike%20Considered.Getting%20Traction%20on%20Sustainability.Locke.Henderson.pdf.

Marris, E., P. Kareiva, J. Macaro, and E. C. Ellis. 2011. Hope in the age of man. New York Times, December 7, http://www.nytimes.com/2011/12/08/opinion/the-age-of-man-is-not-adisaster.html.

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Oreskes, N. 2004. The scientific consensus on climate change. Science 306 1686.

Patagonia. 2001. Don't buy this jacket. New York Times. November 25, http://patagonia.typepad.com/files/nyt_11-25-11.pdf.

Pollan, M. 2006. Omnivores Dilemma: A Natural History of Four Meals. Penguin Press, New York, NY.

Pretty, J. 2008. Agricultural sustainability: concepts, principles and evidence. Philosophical Transactions of the Royal Society of London Series B 262: 447- 465.

Ratner, S. 2011. The great corn con. New York Times, June 25.

Scharlemann, J. P. W., and W. F. Laurance. 2008. How green are biofuels? Science 319: 43-44.

Shulman, S., J. Deyette, B. Ekurzel, D. Friedman, M. Mellon, J. Rogers, S. Shaw. 2012. Cooler smarter: practical steps for low-carbon living. Island Press, Washington DC.

Smith, P., D. Martino, Z. Cai, D. Gwary, H. Janzen, et al. 2007. Agriculture. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter8.pdf

Speth, J. G. 2008. The Bridge at the End of the World. Yale University Press, New Haven, CT.

Stein, J. 2012. It's not easy being green: why Gen Y can't be bothered to save the planet. Time Magazine, April 2.

Strohm, S. 2011. When business is good. New York Times, February 22. 12

Tilman, D., K. G. Cassman, P. A. Matson, and S. Polasky. 2002. Agricultural sustainability and intensive production practices. Nature 418: 671-677.

United Nations. 2011. State of the World Population: People and Possibilities in a world of 7 billion. Available online at: http://foweb.unfpa.org/SWP2011/reports/EN-SWOP2011-FINAL.pdf

Wald, M. 2011. U.S. Backs project to produce fuel from corn waste. New York Times, July 7.

Welch, D. and A. Aston. 2006. "Fill 'er up—but at what price? BusinessWeek, May 22. White,

L. W. 1967. The historical roots of our ecologic crisis. Science 155: 1203- 1207. White, R. 1996. The Organic Machine. Hill and Wang, New York, NY.

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: ES AS&T | Alpha Designator/Number: ES~~555~~ 554 | (•) Graded ( ) CR/NC

Contact Person: Scott Simonton | Phone: 746-2045

NEW COURSE DATA:

New Course Title: Watershed Protection and Stream Restoration

Alpha Designator/Number: E S ~~5 5 5~~ 554

Title Abbreviation: W a t e r s h e d P r o t e c t i o n

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course reviews key components of watershed structure and functions before investigating and applying concepts for managing and restoring aquatic ecosystems.

Co-requisite(s): NA | First Term to be Offered: Spring 2016

Prerequisite(s): NA | Credit Hours: 3

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

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

Dept. Chair/Division Head	Date 4-6-15
Registrar 030103	Date 4/8/15
College Curriculum Chair	Date 4/7/15
Graduate Council Chair	Date 5-20-15

College: CITE | Department/Division: ES AS&T | Alpha Designator/Number: ES~~555~~ 554

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.

Dr. Scott Simonton
Dr. Mindy Armstead

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.

NA

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

NA

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.

NA

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.

NA

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

Attached

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

Attached

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

Attached

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

Lecture, discussion, case study evaluation, group projects

Request for Graduate Course Addition - Page 4

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

Discussion questions, projects, mid-term and final exams

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

Greater detail required in data evaluation, project development and discussion questions

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

attached

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: CITE ES AS&T
Course Number and Title: Watershed Protection and Stream Restoration
Catalog Description: This course reviews key components of watershed structure and functions before investigating and applying concepts for managing and restoring aquatic ecosystems.
Prerequisites: NA
First Term Offered: Spring 2016
Credit Hours: 3

Watershed Protection and Stream Restoration
Course Outline

		Readings	Assignments
Week 1	Review watershed relationships: Watershed functions/processes	Methods in Stream Ecology	
Week 2	Review watershed relationships: upland land uses and stream system health		
Week 3	Review watershed relationships: type and affects of land use scenarios		Discussion Question #1
Week 4	Designating uses	Case studies	
Week 5	Protecting uses - Hydrologic, physical and chemical impairment		
Week 6	Protecting uses - 303(d), TMDL process, Source Water Protection	US EPA Guidance Documents	Class Presentations
Week 7	Mechanisms for evaluating use attainment – water quality criteria, biocriteria, others	US EPA Guidance Documents	Mid–term handed out
Week 8	Mechanisms for evaluating use attainment - TMDL case studies	WVDEP and USEPA examples	Mid-term due
Week 9	Prioritizing Competing Uses Restoration - the global strategy	http://www.unwater.org/activities/thematic-priority-areas/water-quality/en/	

Week 10	Prioritizing Competing Uses Restoration – in the United States and locally Begin Restoration	Case studies – to be distributed	
Week 11	Restoration - Theory	Chapters in Rosgen, 1996	Discussion Question #2
Week 12	Restoration methods	USDA, 1998	
Week 13	Implementation Restoration Techniques		Class Presentations
Week 14	Case studies in Restoration	Case studies – to be distributed	
Week 15 Dead week	Evaluating Restoration Success		Restoration write- up due Final exam distributed

Course catalog description: This course reviews key components of watershed structure and functions before applying concepts for managing and restoring aquatic ecosystems. Topics include designating uses, protecting uses, prioritizing competing interests, recognizing disturbance types and effects, and selection and implementation of appropriate restoration techniques.

Not current. Refer to form.

Course objectives: To understand watershed compeonets and functions, to understand relationships between land use and aquatic system health, to understand watershed disturbance and to explore currently accepted mechanisms for evaluating watershed uses and protecting uses, to comprehend restoration theory adequately that students select appropriate restoration tools from available alternatives for successful application to divers disturbance scenarios

Potential textbooks to be use for
Watershed Protection and Stream Restoration

Stream Restoration: A natural channel design handbook. Doll, F.A., GL Grabow, K.R. Hall, J.Halley, W.A. Hartman, G.D. Jennings & D.E. Wise. NC Stream Restoration Institute. NC State University 128 ppp. 2003.

Applied River Morphology 2nd ed., Dave Rosgen. Fort Collins, Wildland Hydrology Publs. 1996

Stream and Watershed Restoration: A Guide to Restoring Riverine Processes and Habitats. Philip Roni (Editor), Tim Beechie (Editor), ISBN: 978-1-4051-9956-8 316 pages, December 2012, Wiley-Blackwell

Stream Restoration in Dynamic Fluvial Systems: Scientific Approaches, Analysis, and Tools. A. Simon, S.J. Bennett and J.M. Castro (editors). American Geophysical Union. 2011. ISBN-13: 978-0875904832

Bibliography
Watershed Protection and Stream Restoration

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Christy R. Violin, Peter Cada, Elizabeth B. Sudduth, Brooke A. Hassett, David L. Penrose, and Emily S. Bernhardt 2011. Effects of urbanization and urban stream restoration on the physical and biological structure of stream ecosystems. Ecological Applications 21:1932–1949

Doyle, M.W., F.D. Shields. 2012. Compensatory mitigation for streams under the Clean Water Act: Reassessing science and redirecting policy. J. Am. Water Resour. Assoc. 48:494-509.

Kondolf, G. M., A. J. Boulton, S. O'Daniel, G. C. Poole, F. J. Rahel, E. H. Stanley, E. Wohl, A. Bång, J. Carlstrom, C. Cristoni, H. Huber, S. Koljonen, P. Louhi, and K. Nakamura 2006. Process-based ecological river restoration: visualizing three-dimensional connectivity and dynamic vectors to recover lost linkages.
Ecology and Society 11(2): 5.

Millennium Development Goals Report. 2014 United Nations Department of Economic and Social Affairs.

Nilsson, C., R. Jansson, B. Malmqvist, and R. J. Naiman 2007. Restoring riverine landscapes: the challenge of identifying priorities, reference states, and techniques. Ecology and Society 12(1): 16.

Palmer, M.A. & K.L. Hondula. 2014. Restoration as Mitigation: Analysis of Stream Mitigation for Coal Mining Impacts in Southern Appalachia. Environ. Sci. Technol. 48:10552-10560.

Petty, J.T., G. Gingerich, J.T. Anderson, and P.F. Ziemkiewicz. 2013. Ecological function of constructed perennial stream channels on reclaimed surface coal mines. Hydrobiologia 720:39-53.

Nilsson, C., R. Jansson, B. Malmqvist, and R. J. Naiman 2007. Restoring riverine landscapes: the challenge of identifying priorities, reference states, and techniques. Ecology and Society 12(1): 16.

Ryder, D.S. & W. Miller. 2005. Setting goals and measuring success: linking patterns and processes in stream restoration. Hydrobiologia 552:147-158.

Schiff, R., G. Benoit, and J. MacBroom. 2011. Evaluating stream restoration: A case study rom two partially developed 4th order Connecticut, USA streams and evaluating monitoring strategies. River Research and Applications 27(4): 431-460.

Stream Corridor Restoration: Principles, Processes & Practices GPO Item#0120-A Sci Docs No A57.6/2:EN 3/PT.653

Wortley, L., J.M. Hero & M. Howes. 2013. Evaluating Ecological Restoration Success: A Review of the Literature. Restoration Ecology 21(5) 537-543.

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: ES AT&T | Alpha Designator/Number: ES670 | (•) Graded ( ) CR/NC

Contact Person: Scott Simotnon | Phone: 746-2045

NEW COURSE DATA:

New Course Title: Sustainable Energy

Alpha Designator/Number: E S 6 7 0

Title Abbreviation: S u s t a i a b l e E n e r g y

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
The course focuses on the technological and cost fundamentals of what is generally considered sustainable energy technologies, including solar, wind, biomass and other energy sources.

Co-requisite(s): na | First Term to be Offered: Fall 2015

Prerequisite(s): na | Credit Hours: 3

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

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

Dept. Chair/Division Head A Switch	Date 4-6-15
Registrar Roberta Ingerson 030103	Date 4/8/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair J Christofero	Date 5-20-15

Form updated 10/2011

College: CITE | Department/Division: ES AS&T | Alpha Designator/Number: ES670

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.

Scott Simonton

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.

Not Applicable

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.

Not Applicable

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

Attached

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

Attached

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

Attached

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

Lecture, discussion, case study evaluation, projects

Discussion questions/homework, projects, midterm and final exams

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

Not Applicable

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

Attached

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: CITE ES AS&T
Course Number and Title: ES670 Sustainable Energy
Catalog Description: The course focuses on the technological and cost fundementals of what is generally considered sustainable energy technologies, incling solar, wind, biomass and other energy sources
Prerequisites: None
First Term Offered: Fall 2015
Credit Hours: 3

ES 670 Sustainable Energy
Course Objectives

This course is designed to increase an environmental science students understanding of the role of energy in modern society, energy demand and its growth, available traditional energy resources and their conversion technologies, sustainable/renewable energy sources and technologies, energy end-uses and conservation issues, and the link between energy consumption and environmental degradation.

Outcomes
Students should:
A student who successfully completes this course will
1. Understand the desirability of establishing sustainability in the context of energy generation
2. Appreciate the complexity of the problem and the interactions between the various components of the global ecosystem
3. Understand the tradeoffs between environmental impact, resource depletion and economic development
4. Understand the technical basics of each of the major non-renewable and renewable sources of energy.
5. Understand the extent of the environmental impact and resource depletion of each of the major non-renewable and renewable sources of energy.
6. Be able to apply this knowledge in gauging different options for specific scenarios.

Sustainable Energy
Course Outline

		Readings	Assignments
Week 1	Class expectations, introduction, discussion about sustainability, Estimation and Evaluation of Energy Resources	All readings will come from chosen text as well as supplemental readings as appropriate and current	
Week 2	Local, Regional, and Global Environmental Effects of Energy		Discussion Question #1
Week 3	Project Economic Evaluation, Energy Systems and Sustainability Metrics		Discussion Question #2
Week 4	Fossil Fuels and Fossil Energy		Discussion Question #3
Week 5	Nuclear Power		Discussion Question #4
Week 6	Generally on Renewables & Biomass		Project Proposal
Week 7	Geothermal Energy		Mid–term handed out
Week 8	Hydropower		Mid-term due
Week 9	Solar Energy		Discussion Question #5

Week 10	Solar Photovoltaic (PV) Systems		Discussion Question #6
Week 11	Wind Energy		PV Design
Week 12	Ocean Waves, Tide, and Thermal Energy Conversion		
Week 13			Class Presentations
Week 14			Class Presentations
Week 15 Dead week			Final exam distributed

Sample Text:

Sustainable Energy Systems Engineering, Gevorkian, McGraw-Hill 2007.

Bibliography

Bisio, Attilio, and Sharon Boots. *Wiley Encyclopedia of Energy Technology and the Environment*. Wiley-Interscience, 1996. ISBN: 9780471148272.

Twidell, John, and Tony Weir. *Renewable Energy Resources*. Taylor and Francis, 2005. ISBN: 9780419253303.

Randolph, John, and Gilbert M. Masters. *Energy for Sustainability: Technology, Planning, Policy*. Island Press, 2008. ISBN: 9781597261036.

McKay, David J. C. *Sustainable Energy – Without the Hot Air.* UIT Cambridge, Ltd., 2009. ISBN: 9780954452933.

Deutch, John, Ernest Moniz, et al. *The Future of Nuclear Power.* Massachusetts Institute of Technology, 2009.

Tester, Jefferson W., et al. *The Future of Geothermal Energy: Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century.* Massachusetts Institute of Technology, 2006.

Deutch, John, Ernest Moniz, et al. *The Future of Coal: Options for a Carbon-Constrained World.* Massachusetts Institute of Technology, 2007.

Bernstein, Lenny, et al. *Climate Change 2007: Synthesis Report - Summary for Policymakers*. Intergovernmental Panel on Climate Change, 2007. (PDF - 1.9MB)

Bali Action Plan. UN Framework Convention on Climate Change, 2007. (PDF)

Lomborg, Bjørn. *Cool It: The Skeptical Environmentalist's Guide to Global Warming*. Vintage, 2010. ISBN: 9780307741103.

"Struggling to Hold up a Bank." *The Economist*, August 6, 2009.

"The Electric-Fuel-Trade Acid Test." *The Economist*, September 3, 2009.

"Oil: The Long Goodbye (An FP Special Report)." *Foreign Policy*, August 12-17, 2009.

Lizza, Ryan. "As The World Burns." *The New Yorker*, October 11, 2010.

"Addressing New Jersey's Climate and Energy Challenges." PSEG, Summer 2007. (PDF)

Davis, Steven J., Ken Caldeira, and H. Damon Matthews. "Future CO2 Emissions and Climate Change from Existing Energy Infrastructure."*Science* 329 (September 10, 2010): 1330-1333.

Hoffert, Martin I. "Farewell to Fossil Fuels?" *Science* 329 (September 10, 2010): 1292-1294.

"USG Position on the African Development Bank's Investment in ESKOM Medupi Coal Fired Power Project." U.S. Department of Treasury, November 25, 2009. (PDF)

Bekker, Bernard, et al. "South Africa's Rapid Electrification Programme: Policy, Institutional, Planning, Financing, and Technical Innovations."*Energy Policy* 36 (2008): 3125-3137.

Wroughton, Lesley. "Global Climate Battle Plays Out in World Bank." *Reuters*, March 7, 2010.

Course Objectives

This course begins with the premise that moving toward sustainability involves mastering at least three sorts of skills and knowledge, and exercising them conjointly. First, moving toward sustainability requires making difficult decisions between things that we value, when these values often pull in different directions. It might also require transforming the way we, and others, value our world. Moving toward sustainability means being able to talk intelligently about those values and how they are formed and transformed, and being able to balance different values held by different groups, so as to promote and sustain intelligent debate when values conflict. Second, moving toward sustainability means knowing how nature works and how the decisions we make to achieve what we value will affect and change the natural world in which we live and on which we rely. Third, moving toward sustainability means making intelligent policy decisions out of the knowledge of what is possible now in our society, even if we want to try to stretch the limits of what is possible. That requires knowing how economic and political systems work, and how far they can stretch before they break. It also involves knowing what technology (both present and projected) can and cannot do. The course goals involve one or another of these three tasks and how they relate, and we apply these concepts to sustainability and the interfaces between environmental, economic and social responsibilities.

Outcomes

Students should:

1. be able to identify and describe the principal elements of a scientific understanding of an ecosystem in relation to a challenge to sustainability.
2. be able to identify different stakeholders in a challenge to sustainability, and analyze the political and economic structures that connect them.
3. be able to describe sources from U.S. history of current approaches to challenges to sustainability and assess their continuing utility.
4. be able to analyze debates over challenges to sustainability in terms of different value systems, differing appropriations of scientific findings and different background commitments in economics and politics, and then assess different positions in those debates according to the adequacy of all three.
5. be able to propose a viable solution to a particular challenge to sustainability and create a persuasive proposal that advocates this solution.
6. have developed a greater capacity to contribute to sustainability drawing on their own area of expertise in conversation with others and their areas of expertise.
7. have developed a greater appreciation both of the complex challenges we face in moving toward a more sustainable world but also of the possibility of crafting creative and effective responses to those challenges.

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: Liberal Arts Dept/Division: Geography Current Alpha Designator/Number: GEO529

Contact Person: James Leonard Phone: 6-4626

CURRENT COURSE DATA:

Course Title: Intermediate GIS - Vector Analysis

Alpha Designator/Number: G E O 5 2 9

Title Abbreviation: G I S - V e c t o r A n a l y s i s

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	Date 2-16-15
Registrar Roberta Ferguson	Date 3/2/15
College Curriculum Chair Kevin Law	Date 3/12/15
Graduate Council Chair JChristofero	Date 5-20-15

Request for Graduate Course Change - Page 2

College: Liberal Arts | Department/Division: Geography | Alpha Designator/Number: GEO529

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☒ YES ☐ NO

From: Intermediate GIS - Vector Anal (limited to 30 characters and spaces)

To: GIS Vector Analysis

If Yes, Rationale: Better describes the more advanced nature of the course.

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: Introduction to GIS vector analysis, beginning with the vector data model, and including buffering, overlay analysis, geocoding, and network analysis.

To: GIS vector analysis and spatial statistics, including topics such as map overlay and distance analysis, pattern analysis, spatial joins, network analysis, spatial autocorrelation, geographically weighted regression.

If Yes Rationale: Better describes the "non-introductory" level of the course and the more advanced nature of the material.

Request for Graduate Course Change - Page 3

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

To

Change in COURSE CONTENT: ☐ YES ☒ NO (May attach separate page if needed)

From

To

Rationale

Request for Graduate Course Change-Page 4

College: Liberal Arts

Department: Geography

Course Number/Title GEO529 Intermediate GIS - Vector Analysis

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.

n/a

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.

n/a

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.

n/a

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
Department:
Course Number and Title:
Rationale:
Course Description (old)
Course Description: (new)
Catalog Description:

COURSE NUMBER CHANGE
Department:
Current Course Number/Title:
New Course Number:
Rationale:
Catalog Description:
Credit hours:

COURSE TITLE CHANGE
Department:
Current Course Number/Title:
New Course Title:
Rationale:
Catalog Description:

COURSE DESCRIPTION CHANGE
Department: Geography
Course Number and Title: GEO529 GIS - Vector Analysis
Rationale: better describes the more advanced nature of the course.
Course Description (old) Introduction to GIS vector analysis, beginning with the vector data model, and including buffering, overlay analysis, geocoding, and network analysis.
Course Description: (new) GIS vector analysis and geostatistics, including topics such as geo-visualization, map overlay and distance analysis, pattern analysis, spatial joins, geocoding, network analysis, spatial autocorrelation, geographically weighted regression.
Catalog Description: GIS vector analysis and geostatistics, including topics such as geo-visualization, map overlay and distance analysis, pattern analysis, spatial joins, geocoding, network analysis, spatial autocorrelation, geographically weighted regression.

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: Liberal Arts Dept/Division: Geography Current Alpha Designator/Number: GEO540

Contact Person: James Leonard Phone: 6-4626

CURRENT COURSE DATA:

Course Title: Quantitative Methods in Geography

Alpha Designator/Number: G E O 5 4 0

Title Abbreviation: Quant Methods in GEO

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	Date 2-16-15
Registrar Roberta Ferguson	Date 3/2/15
College Curriculum Chair Kevin Law	Date 3/12/15
Graduate Council Chair	Date

Request for Graduate Course Change - Page 2

College: COLA Department/Division: GEOGRAPHY Alpha Designator/Number: GEO 540

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☒ YES ☐ NO

From Quantitative Methods in Geogra (limited to 30 characters and spaces)

To Spatial Statistics

If Yes, Rationale: Better describes the course.

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: Introduction to the application of statistical methods in geographical problems. Attention given to analysis of areal data, area sampling, and spatial analysis techniques.

To: Application of statistical methods to problem solving in geography. Primary focus on descriptive spatial statistics, mapping, analysis of spatial data, spatial sampling, map pattern analysis, and inferential spatial statistics.

If Yes Rationale: Better describes the course content.

Request for Graduate Course Change - Page 3

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

To

Change in COURSE CONTENT: ☐ YES ☒ NO (May attach separate page if needed)

From

To

Rationale

Request for Graduate Course Change-Page 4

College: Liberal Arts

Department: Geography

Course Number/Title GEO540 Quantitative Methods in Geography

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.

n/a

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.

n/a

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.

n/a

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
Department:
Course Number and Title:
Rationale:
Course Description (old)
Course Description: (new)
Catalog Description:

COURSE NUMBER CHANGE
Department:
Current Course Number/Title:
New Course Number:
Rationale:
Catalog Description:
Credit hours:

COURSE TITLE CHANGE
Department:
Current Course Number/Title:
New Course Title:
Rationale:
Catalog Description:

COURSE DESCRIPTION CHANGE
Department: Geography
Course Number and Title: GEO540 Spatial Statistics
Rationale: better describes the course.
Course Description (old) Introduction to the application of statistical methods in geographical problems. Attention given to analysis of areal data, area sampling, and spatial analysis techniques.
Course Description: (new) Application of statistical methods to problem solving in geography. Primary focus on descriptive spatial statistics, mapping, analysis of spatial data, spatial sampling, map pattern analysis, and inferential spatial statistics.
Catalog Description: Application of statistical methods to problem solving in geography. Primary focus on descriptive spatial statistics, mapping, analysis of spatial data, spatial sampling, map pattern analysis, and inferential spatial statistics.

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: Business | Dept/Division: Management, Mark | Alpha Designator/Number: HCA 622 | (•) Graded ( ) CR/NC

Contact Person: Doohee Lee, PhD | Phone: 304-746-1973

NEW COURSE DATA:

New Course Title: Utilization of Health Services Research

Alpha Designator/Number: HCA 622

Title Abbreviation: Utilization of HSR

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Provides an introduction to methods of undertaking research and program evaluation within heath services organizations and delivery systems.

Co-requisite(s):

First Term to be Offered: Spring 2016

Prerequisite(s): HCA 600 and MKT 511

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 4/13/15
Registrar for Roberta Ferguson	Date 4-13-15
College Curriculum Chair	Date 4-13-15
Graduate Council Chair	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: Business | Department/Division: Management, Marketing, MI | Alpha Designator/Number: HCA 622

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.

William Kent Willis

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.

Not Applicable

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.

Not Applicable

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

Obj. 1. Demonstrate proficiency in basic concepts, principles, and applications of data utilization for managerial purposes;
Obj. 2. Analyze data from case studies to make managerial decisions using financial and business related methodologies;
Obj. 3. Apply collected data to the functions of management, finance, and human resources in a health care organization;
Obj. 4. Learn of the various study designs for collecting and analyzing data used within the business of health care management;
Obj. 5. Practice the use of common statistical measurement techniques used in health care decision making; and
Obj. 6 Develop written and oral communication skills.

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

Health Services Research (HSR) is a multidisciplinary scientific field that examines how people get access to health care practitioners and health care services, how much care costs, and what happens to patients as a result of this care (AcademyHealth 2000). Health services researchers attempt to evaluate the effects and outcomes of the health care system on people's health.

Health services research examines how social factors, financing systems, organizational structures and processes, medical technology, and personal behaviors affect access to health care, the quality and cost of health care, and quantity and quality of life. HSR is a relatively young science that developed through the bringing together of social science perspectives with the contributions of individuals and institutions engaged in delivering health services (Sheikh 2011).

The primary goal of HSR is to utilize data in efforts to identify the most effective ways to organize, manage, finance, and deliver high quality care; reduce medical errors; and improve patient safety (Agency for Healthcare Research and Quality 2002). HSR is concerned with delivery and access to care and seeks to perform research and utilize data that can be applied by physicians, nurses, health managers and administrators, and other people who make decisions or deliver care in the health care system.
The business structure of health care delivery becomes critically important as health care managers are becoming more accountable for the delivery of quality health care. The utilization of health services research data is a major component of how a health care manager makes business decisions, as the manager plans, monitors, and evaluates health delivery.

As a MSHA course, Utilization of Health Services Research will allow a student to examine a broad array of research topics such as: individuals cared for in a particular service area of a hospital or clinic, persons who are covered by a particular insurance provider, persons who receive Medicare or Medicaid supplement, outcomes of services provided by a health care facility, and global health care management and health care policy impact decision making.

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

Shi. L. Health Services Research Methods. (2008).Delmar Learning, Clifton Park, NY.

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

Lecture, class discussion, small group discussion, and group project

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

Midterm exam, final exam, final research group project

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

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

1. Health and Human Services. Healthcare Cost and Utilization Project (HCUP). HCUP is the Nation's most comprehensive source of hospital data, including information on in-patient care, ambulatory care, and emergency department visits. HCUP enables researchers, insurers, policymakers and others to study health care delivery and patient outcomes over time, and at the national, regional, State, and community levels.
2. Agency for Healthcare Research and Quality. Data Sources Available from AHRQ. The Agency for Healthcare Research and Quality (AHRQ) provides a range of data resources in the form of online, searchable databases. Data are provided on topics such as the use of health care, the costs of care, trends in hospital care, health insurance coverage, out-of-pocket spending, and patient satisfaction.
3. Journal of Health Services Research. AcademyHealth. Rated as one of the top journals in the field, HSR publishes outstanding articles reporting the findings of original investigations that expand understanding of the wide-ranging field of health care and help improve the health of individuals and communities.
4. National Center for Health Statistics (NCHS) Research Data Center.
5. Centers for Medicare and Medicaid Services. Research and Statistics.
6. National Institute of Health. National Information Center on Health Services Research and Health Care Technology (NICHSR)

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:

Management, Marketing, MIS
HCA 622, Utilization of Health Services Research
Course provides an introduction to methods of undertaking research and program evaluation within health services organizations and delivery systems. Recommended for students who will be involved in policy research, social science research, or program impact evaluation within health delivery systems.
HCA 600, MKT 511
Spring 2016
3

Syllabus: Utilization of Health Service Research. Graduate course proposal for MSHA program.

Course Title/number	**HCA 622** **Utilization of Health Services Research**
Semester/Year	Fall 2016
Instructor	**William "Kent" Willis**
Days/Time	
Room	
Office Number	**Room 336**
Phone	**304-746-8967 (South Charleston office)**
Email	willis23@marshall.edu **BEST CONTACT METHOD**
Office hours	By appointment or before/after class
MU Policies	This course complies with all Marshall University Policies as stated by the Office of Academic Affairs. These policies are accessible via the website (www.marshall.edu/academic-affairs) by clicking on the link to "Marshall University Policies" on the right side of the page. Policies at this link include Academic Dishonesty, Excused Absence Policy for Undergraduates, University Computing Service 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.
Disclaimer	This syllabus or any portion of this course is subject to change at the instructor's discretion.

Course Description:

Utilization of Health Services Research. 3 hrs.

Course provides an introduction to methods of undertaking research and program evaluation within health services organizations and delivery systems. Recommended for students who will be involved in policy research, social science research, or program impact evaluation within health delivery systems.

Pre-requisites: HCA 600, MKT 511

Course information:

Health Services Research (HSR) is a multidisciplinary scientific field that examines how people get access to health care practitioners and health care services, how much care costs, and what happens to patients as a result of this care (AcademyHealth 2000). Health services researchers attempt to evaluate the effects and outcomes of the health care system on people's health.

Health services research examines how social factors, financing systems, organizational structures and processes, medical technology, and personal behaviors affect access to health care, the quality and cost of health care, and quantity and quality of life. HSR is a relatively young science that developed through the bringing together of social science perspectives with the contributions of individuals and institutions engaged in delivering health services (Sheikh 2011).

The primary goal of HSR is to utilize data in efforts to identify the most effective ways to organize, manage, finance, and deliver high quality care; reduce medical errors; and improve patient safety (Agency for Healthcare Research and Quality 2002). HSR is concerned with delivery and access to care and seeks to perform research and utilize data that can be applied by physicians, nurses, health managers and administrators, and other people who make decisions or deliver care in the health care system.

The business structure of health care delivery becomes critically important as health care managers are becoming more accountable for the delivery of quality health care. The utilization of health services research data is a major component of how a health care manager makes business decisions, as the manager plans, monitors, and evaluates health delivery.

As a MSHA course, Utilization of Health Services Research will allow a student to examine a broad array of research topics such as: individuals cared for in a particular service area of a hospital or clinic, persons who are covered by a particular insurance provider, persons who receive Medicare or Medicaid supplement, outcomes of services provided by a health care facility, and global health care management and health care policy impact decision making.

Course Text:

Shi. L. Health Services Research Methods. (2008).Delmar Learning, Clifton Park, NY.

Additional course material can be posted on Blackboard for student access.

Learning Outcomes:

Obj. 1. Demonstrate proficiency in basic concepts, principles, and applications of data utilization for managerial purposes.
Obj. 2. Analyze data from case studies to make managerial decisions using financial and business related methodologies
Obj. 3. Apply collected data to the functions of management, finance, and human resources in a health care organization.
Obj. 4. Learn of the various study designs for collecting and analyzing data used within the business of health care management.
Obj. 5. Practice the use of common statistical measurement techniques used in health care decision making.
Obj. 6 Develop written and oral communication skills.

Practiced and assessed learner outcomes

	Objectives	Practiced	Assessed
Students will:	1, 4, 5	Exercises, assignments	Exams, project assignments
Students will:	2, 3, 4, 6	Case studies, exercises, assignments	Exams/essay, project assignments
Students will:	1, 2, 3, 6	Case studies, exercises, assignments	Exams/essay, project assignments
Students will:	1, 2, 3, 6	Case studies, exercises, assignments	Exams/essay, project assignments, presentation
Students will:	1, 2, 3, 4, 5, 6	Case studies, exercises, assignments	Exams/essay, project assignments

Course work:

Course work will focus on both the individual and small student group component. As the course utilizes some case studies and the application of results stemming from the case studies to the health management functions, the group and individual approach will allow the student to interact with fellow students on assignments, in addition to individual work, thus allowing the instructor to evaluate the students from both perspectives. The course work will be structured allowing the student to build a working knowledge of the application of collected data to health care management.

Outside exercises and assignments will allow the student research opportunities and develop application skills.

Grade scale:
Standard 90, 80, 70, 60% scale

Supporting materials:

1. Agency for Healthcare Research and Quality. (AHRQ) U.S. Department of Health and Human Services. Healthcare Cost and Utilization Project (HCUP). HCUP is the Nation's most comprehensive source of hospital data, including information on in-patient care, ambulatory care, and emergency department visits. HCUP enables researchers, insurers, policymakers and others to study health care delivery and patient outcomes over time, and at the national, regional, State, and community levels.
2. Agency for Healthcare Research and Quality. Data Sources Available from AHRQ. The Agency for Healthcare Research and Quality (AHRQ) provides a range of data resources in the form of online, searchable databases. Data are provided on topics such as the use of health care, the costs of care, trends in hospital care, health insurance coverage, out-of-pocket spending, and patient satisfaction.
3. Journal of Health Services Research. AcademyHealth. Rated as one of the top journals in the field, *HSR* publishes outstanding articles reporting the findings of original investigations that expand understanding of the wide-ranging field of health care and help improve the health of individuals and communities.
4. National Center for Health Statistics (NCHS) Research Data Center.
5. Centers for Medicare and Medicaid Services. Research and Statistics.
6. National Institute of Health. National Information Center on Health Services Research and Health Care Technology (NICHSR)

Additional current articles and readings will be utilized as they become available.

References:

1. AcademyHealth. What is HSR?, June 2000
2. Sheikh K, et al. (2011) Building the Field of Health Policy and Systems Research: Framing the Questions. *PLoS Med*, 8(8): e1001073.
3. Agency for Healthcare Research and Quality, February 2002

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: Computer Science | Alpha Designator/Number: IS 681 | ○ Graded ◉ CR/NC

Contact Person: Venkat N Gudivada | Phone: 304 - 696 - 5452

NEW COURSE DATA:

New Course Title: Thesis

Alpha Designator/Number: I S 6 8 1

Title Abbreviation: T h e s i s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Investigate a research problem of theoretical interest and practical value under mentorship of a information systems and computer science faculty.

Co-requisite(s): None | First Term to be Offered: Fall 2015

Prerequisite(s): Permission of instructor | Credit Hours: 1.0 - 6.0

Course(s) being deleted in place of this addition (*must submit course deletion form*): None

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

Dept. Chair/Division Head VNGudivada	Date 1 April 2015
Registrar Roberta Ferguson 110401	Date 4/2/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Computer Science | Alpha Designator/Number: IS 681

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.

John Biros, Jamil Chaudri, Paulus Wahjudi, Jonathan Thompson, Hyoil Han, and Venkat Gudivada

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.

Not Applicable

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.

Existing Marshall University BigGreen supercomputer is adequate for the proposed course. No additional resources are required.

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

The overarching goal of this course is to learn how to develop new scientific knowledge through research. More specifically, to gain new insights into a problem using systematic approaches while representing the problem at right level of abstraction. Student makes original contribution to the research area.

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

Students perform the following activities independently under a computer science faculty mentorship:

1. Learn the background knowledge and previous work and approaches in a chosen research topic area,

2. Analyze and compare various approaches and solutions pertaining to the chosen research topic area,

3. Apply critical thinking in problem identification, analysis, and solution,

4. Develop a formal report which documents the literature search, review of existing approaches to the problem, details of proposed approach, evaluation of proposed approach, and conclusions and future research direction, and

5. Present research findings and defend conclusions at a public forum held in the department.

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

Not Applicable

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

One-on-one discussions between student and faculty mentor.

Request for Graduate Course Addition - Page 4

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

Thesis presentation, and written report.

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

Not Applicable

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

Not Applicable

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: Weisberg Division of Computer Science

Course Number and Title: IS 681: Thesis

Catalog Description: Investigate a research problem of theoretical interest and practical value under mentorship of a information systems and computer science faculty.

Prerequisites: Permission of instructor

First Term Offered: Fall 2015

Credit Hours: 1.0 - 6.0

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: Computer Science | Alpha Designator/Number: IS ~~690~~ 691 | ○ Graded ◉ CR/NC

Contact Person: Venkat N Gudivada | Phone: 304 - 696 - 5452

NEW COURSE DATA:

New Course Title: Comprehensive Project

Alpha Designator/Number: I S 6 ~~9~~ 91 ~~0~~

Title Abbreviation: C o m p r e h e n s i v e P r o j e c t

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words): Develop expertise in an emerging area of information systems through guided study under faculty mentorship.

Co-requisite(s): None | First Term to be Offered: Fall 2015

Prerequisite(s): Permission of instructor | Credit Hours: 3.0

Course(s) being deleted in place of this addition (*must submit course deletion form*): None

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

Dept. Chair/Division Head [signature]	Date 1 April 2015
Registrar [signature] 110401	Date 4/2/15
College Curriculum Chair [signature]	Date 4/9/15
Graduate Council Chair [signature]	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Computer Science | Alpha Designator/Number: IS ~~690~~ 691

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.

John Biros, Jamil Chaudri, Paulus Wahjudi, Jonathan Thompson, Hyoil Han, and Venkat Gudivada

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.

Not Applicable

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.

Existing Marshall University BigGreen supercomputer is adequate for the proposed course. No additional resources are required.

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

At this end of this course, students will:

Be able to locate relevant sources of literature, search for articles of interest, read, analyze, and summarize information systems research on a given topic.
Be able to write a review/survey paper which provides a unified view of algorithms, approaches, and solutions to topic area problems.
Be able to present the results to peers and professors.

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

Students perform the following activities independently under a information systems and computer science faculty mentorship:

1. Learn the background knowledge and previous work and approaches in a chosen research topic area,

2. Analyze and compare various approaches and solutions pertaining to the chosen research topic area,

3. Develop a formal report which documents: the literature search, review of existing approaches to topic area problems, summarizes the state of the art, and indicates future research direction, and

5. Present literature review findings and defend conclusions at a public forum held in the department.

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

Not Applicable

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

One-on-one discussions between student and faculty mentor.

Request for Graduate Course Addition - Page 4

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

Project presentation, and written report.

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

Not Applicable

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

Not Applicable

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: Weisberg Division of Computer Science

Course Number and Title: IS ~~690~~ 691: Comprehensive Project

Catalog Description: Develop expertise in an emerging area of computer science through guided study under faculty mentorship.

Prerequisites: Permission of instructor

First Term Offered: Fall 2015

Credit Hours: 3.0

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- 515 | (●) Graded ( ) CR/NC

Contact Person: Asad Salem | Phone: 696-3207

NEW COURSE DATA:

New Course Title: Vehicle Dynamics

Alpha Designator/Number: M E 5 1 5

Title Abbreviation: V e h i c l e D y n a m i c s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Deals with ground vehicle stability and control. Contribution of tire lateral force, stiffness, and aligning torque to stability. Effects of suspension geometry, chassis stiffness, and roll stiffness.

Co-requisite(s): None | First Term to be Offered: Fall-2015

Prerequisite(s): Graduate Status | 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 [signature]	Date 4-6-15
Registrar [signature] 14/901	Date 4/7/15
College Curriculum Chair [signature]	Date 4/9/15
Graduate Council Chair [signature]	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-515

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, Gang Chen

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

Road Vehicle Dynamics, SAE Publishing 2009, Rao Dukkipati,

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

Lecture

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

Mid-term exams 45%
Assignments : 25%
Final Exam: 30%

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

None

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

Vehicle Dynamics, Theory and Application, Springer, 2009 Jazar, Reza N.
Fundamentals of Vehicle Dynamics, SAE Publising, 1992, Thomas D. Gillespie
References: vehicle dynamics paper series, SAE, 2000-2014

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: Weisberg Division of Engineering
Course Number and Title: ME515 vehicle Dynamics
Catalog Description:
Deals with ground vehicle stability and control. Contribution of tire lateral force, stiffness, and aligning torque to stability. Effects of suspension geometry, chassis stiffness, and roll stiffness.

Prerequisite: Graduate status

First Term Offered: Fall 2015

Credit Hours: 3

Marshall University
Syllabus

Course Title/Number	**Vehicle Dynamics / ME515**
Semester/Year	**Fall / 2015**
Days/Time	**MWF / 2:00 – 2:50 pm**
Location	**Weisberg Engineering Lab 101 Classroom**
Instructor	**Gang Chen**
Office	**Weisberg Engineering Lab Room 109c** **Division of Engineering** **College of Information Technology and Engineering** **Marshall University** **Huntington, WV 25755**
Phone	**304-696-3204**
E-Mail	**chenga@marshall.edu**
Office/Hours	**MWF: 12:00-2:00pm** **For those of you who will not be able to meet the instructor during the assigned office hours, you are welcome to come and ask instructor by appointment or at an appropriate time.**
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

Catalog Course Description

Deals with ground vehicle stability and control. Contribution of tire lateral force, stiffness, and aligning torque to stability. Effects of suspension geometry, chassis stiffness, and roll stiffness.

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 basic concepts of Vehicle Dynamics	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination	a2,e2

		problems.	
Students will be able to solve for Tire Behavior: Longitudinal, Vertical, and Lateral	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 solve for Longitudinal Vehicle Dynamics	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 Ride and Suspension dynamics	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 solve for Cornering, Steering, and Handling	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 solve for Rollover Modeling, Analysis, and Prevention	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 solve Three-Dimensional Multibody Mechanics Models for Vehicle Dynamics	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2

Objective:

After taking this course, students should be able to

- Understand tire behavior.
- Calculate the limits of acceleration and braking
- Understand and characterize handling dynamics
- Calculate suspension dynamics

Required Texts, Additional Reading, and Other Materials

Road Vehicle Dynamics, SAE Publishing 2009, Rao Dukkipati,
Vehicle Dynamics, Theory and Application, Springer, 2009 Jazar, Reza N.
Fundamentals of Vehicle Dynamics, SAE Publising, 1992, Thomas D. Gillespie
References: vehicle dynamics paper series, SAE, 2000-2014

Course Requirements / Due Dates

Course Requirements : Attendance/Homework /Examinations

TEST SCHEDULE:

Hourly Exam #1
Hourly Exam #2
Hourly Exam #3
Final Exam (two hours)

Homework due Dates:

- **Homework will regularly be assigned either during the class time or by e-mail/blackboard.**
- **Checking your e-mail is required on a daily-basis for information regarding homework assignment. Homework must be submitted before the starting time of class on the assignment date.**
- **Late homework is acceptable for an excused absence. For unexcused delay submission, there will be a 20% late penalty for each day it is late--starting with a 20% penalty on the first day if it is not turned in at the beginning of class. After 5 days, it will not be accepted at all.**
- **No late homework will be accepted after the final day of classes for the semester.**
- **You are expected to provide your homework on engineering papers - not a Xerox copy.**
- **Homework must be neat, readable, and must conform to acceptable Standards of Engineering Computation.**

Grading Policy

Exams:

Three exams and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Grading Policy:

Homework and Attendance	**25% (attendance 10%)**
Exam 1	**15%**
Exam 2	**15%**
Exam 3	**15%**
Final Exam	**30%**

Total	**100%**

Letter Grade Scale:

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

The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.

Attendance Policy

The attendance policy will follow University's excused absence policy.

You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Course Schedule:

LECTURE SUBJECT Schedule & TEXT REFERENCE

1. Introduction of Vehicle Dynamics
2. Tire Behavior: Longitudinal, Vertical, and Lateral
3. Longitudinal Vehicle Dynamics
4. Ride and Suspension dynamics
5. Cornering, Steering, and Handling:
6. Rollover Modeling, Analysis, and Prevention
7 Three-Dimensional Multibody Mechanics Models for Vehicle Dynamics

** The instructor reserves the right to slightly change the topics and their order to achieve the maximum benefit of the course learning outcomes.*

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 520 | (●) Graded ( ) CR/NC

Contact Person: SARDER E. SADIQUE, Ph.D., P.E. (CA) | Phone: 3046965621

NEW COURSE DATA:

New Course Title: Introduction to Computational Fluid Dynamics

Alpha Designator/Number: M E 5 2 0

Title Abbreviation: I n t r o C o m p F l u i d D y n a m i c s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers governing equations, ordinary differential equations (ODEs), numerical integration; finite difference and finite volume methods for parabolic, elliptic, hyperbolic partial differential equations (PDEs), numerical linear algebra; turbulence modeling.

Co-requisite(s):

First Term to be Offered: Fall 2015

Prerequisite(s): Graduate Status

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 4-6-15
Registrar 141901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME 520

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.

SARDER E. SADIQUE, Ph.D., P.E. (CA), Assistant Professor of Mechanical Engineering

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.

Not Applicable

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.

Not Applicable

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

Submitted as a separate document in the Course Syllabus

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

Submitted as a separate document in the Course Syllabus

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

Submitted as a separate document in the Course Syllabus

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

Lecture/Lab

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

MIDTERM, FINAL, PROJECTS, LAB

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

N/A

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

Submitted as a separate document in the Course Syllabus

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: ME 520 Introduction to Computational Fluid Dynamics

Catalog Description:
This course covers governing equations, ordinary differential equations (ODEs), numerical integration; finite difference and finite volume methods for parabolic, elliptic, hyperbolic partial differential equations (PDEs), numerical linear algebra; turbulence modeling.

Prerequisites: None

First Term Offered: Fall 2015

Credit Hours: 3

Course Title/ Number	**Introduction to Computational Fluid Dynamics - ME 520**
Semester/Year	
Days/Time	
Location	
Instructor	Sarder E. Sadique, Ph.D., P.E.(CA)
Office	Weisberg Engineering Lab Room 109 (previously lab general office) Division of Engineering College of Information Technology and Engineering Marshall University Huntington, WV 25755
Phone	304-696-5621
E-Mail	sadique@marshall.edu
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

Catalog Course Description:

This course covers governing equations, ordinary differential equations (ODEs), numerical integration; finite difference and finite volume methods for parabolic, elliptic, hyperbolic partial differential equations (PDEs), numerical linear algebra; turbulence modeling.

Course Prerequisites:

None

Course Objectives:

Develop an understanding of introductory concepts in computational fluid mechanics with emphasis on the numerical solution of ordinary and partial differential equations; solution of ODEs by numerical integration; finite difference and finite volume methods for parabolic, elliptic, and hyperbolic PDEs (techniques for single and multi-dimensional problems); numerical linear algebra. Ability to implement and utilize various numerical methods and basic mathematical analysis for canonical problems in fluid mechanics. Develop advanced skills in MATLABand programming languages such as C/C++ & Fortran.

Required Texts, Additional Reading, and Other Materials

- Anderson, J. D. Computational Fluid Dynamics|The Basics with Applications. McGraw-Hill.
- Ferziger, J.H. and Peri_c, M. Computational Methods for Fluid Dynamics. Springer.
- Tannehill, J.C., Anderson, D.A., and Pletcher, R.H. Computational Fluid Mechanics and Heat Transfer. Second edition. Taylor & Francis.

Class/Laboratory Schedule

- Class: 3 hrs

Grade Policy:

The grading for the class will be determined using the following weights:

Lab Reports	30%
Homework	10%
Quizzes	5%
Midterm Exam	15%
Research Project	15%
Final Exam	25%

Letter Grade Scale*:

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

* *The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.*

Tests/Exams:

Makeup exams will be given only due to **extraordinary circumstances**, and only if the instructor is notified **prior** to the exam and the instructor judges it to be an acceptable excuse. Academic dishonesty (cheating) on any exam will result in a grade of zero for that exam. A second infraction will result in a course grade of F and possible University sanctions.

Grading Policy of Tests/Exams:

Three tests and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Course Requirements / Due Dates

Exam/Test/Quiz/Project	Due Dates
Quiz 1	
Test 1	
Quiz 2	
Test 2	
Project	
Final Exam	

Grading

You **may be** allowed to reschedule an exam **only if**: you inform me and arrangements are made, at least **one week** before the exam date. Every effort will be made to fairly grade the exams, lab reports, and

homework. If you feel an error has been made in grading the exam it must be turned-in at the end of the class period it was distributed. Any error in grading of a lab report or homework assignment must be submitted within two days for re-grading.

Schedule of Topics* (tentative – subject to change)

Lecture	Topics	Chapter
1	Introduction to CFD	
2	The governing equations and their behavior	
3	Numerical solution of ODEs	
4	Methods for parabolic equations	
5	Methods for elliptic equations	
6	Methods for hyperbolic equations	
7	Numerical methods	
8	Finite difference methods	
9	Finite volume methods	
10	Turbulence modeling	
11	Systems of equations	
12	Numerical solution of diffusion-type equations	
13	Numerical solution of fluid flow equations	
14	Advanced/emerging topics	

* *The above schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students i.e. Schedule may be revised if necessary. Students will be notified if this is the case.*

Learning Outcomes:

Course Outcome – student will:	**Implementation Method**	**Evaluation Method**
Identify, formulate, and solve engineering problems by approximating complex physical systems in fluid flow by simplified canonical models	• Lectures • In-class assignment • Solve exercise problems	• Homework • Assignments • Exam, Quiz etc.
Integrate various numerical techniques in formulating a numerical solution method	• Lectures • In-class assignment • Solve exercise problems	• Homework • Assignments • Exam, Quiz etc.
Apply knowledge of math and science to engineering by describing a continuous fluid-flow phenomena in a discrete numerical sense.	• Lectures • In-class assignment • Laboratory	• Homework • Lab reports • Exam Quiz etc.
Demonstrate the techniques, skills, & engineering tools necessary for engineering practice by applying numerical methods to a "real-world" fluid-flow problem	• Lectures • In-class assignment • Laboratory	• Homework • Lab reports • Exam, Quiz etc.
Analyze and interpret data obtained from the numerical solution of fluid flow problems	• Lectures • In-class assignment • Laboratory	• Homework • Lab reports • Exam, Quiz etc.

PROGRAM LEARNING OUTCOMES (ABET)

Item No.	Outcome
a-2	Complete an engineering assignment that involves the use of calculus and scientific principles (e.g., chemistry or physics)
c-2	Complete a design with clearly defined objectives, engineering standards, and realistic constraints. Present a design in a professional manner
e-1	Formulate and solve an engineering problem with given data and constraints using applicable standards for a problem already identified. Present the results in a professional manner
k-3	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice: Use of a modern engineering too for a design

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.

Attendance Policy:

The attendance policy will follow University's excused absence policy. You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

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- 530 | (•) Graded ( ) CR/NC

Contact Person: Asad Salem | Phone: 696-3207

NEW COURSE DATA:

New Course Title: Renewable Energy

Alpha Designator/Number: M E 5 3 0

Title Abbreviation: R e n e w a b l e E n e r g y

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Basic principles and technical details of various renewable energy technologies for the sustainable future. Process design, energy analysis, engineering economics and environmental assessment of renewable energy systems.

Co-requisite(s): None | First Term to be Offered: Spring-2016

Prerequisite(s): Graduate Status | 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 Asad A. Salem	Date 3/30/15
Registrar Roberta Ferguson 141901	Date 3/31/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair TChristofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-530

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.

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

1. Duffie, J. A. & W. A. Beckman. 2006. Solar Engineering of Thermal Processes, 3rd ed. John Wiley & Sons, Inc.
2. Boyle, G. 2004. Renewable energy: Power for a sustainable future. Oxford University Press, Oxford, UK.
3. Demirbas, A. 2010. Bio-refineries – for biomass upgrading facilities. Springer publishers.

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

Lecture

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

Mid-term exam 50%
Assignments including Projects: 25%
Final Exam: 25%

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

None

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

1. Duffie, J. A. & W. A. Beckman. 2006. Solar Engineering of Thermal Processes, 3rd ed. John Wiley & Sons, Inc.
2. Boyle, G. 2004. Renewable energy: Power for a sustainable future. Oxford University Press, Oxford, UK.
3. Demirbas, A. 2010. Bio-refineries – for biomass upgrading facilities. Springer publishers.
4. RETScreen International. 2006. Users' guide. Natural Resources Canada, Ottawa, Canada.
5. Sims, R. 2002. The Brilliance of Bioenergy. James and James Publications, London, UK.
6. Frank Rosillo-Calle, Sarah Hemstock, Peter de Groot and Jeremy Woods. 2006. The Biomass Assessment Handbook, James and James Publications, London, UK.
7. Journals related to Renewable energy engineering
   a. Biomass and Bioenergy
   b. International Journal of Renewable Energy Engineering
   c. Bio-resource Technology
   d. Bio-resouces
   e. Bio-Products, Bio-Fuels & Bio-Refinery (BioPFR)
   f. Renewable and Sustainable Energy Reviews g. Energy Conversion Management
   h. Solar Energy
   i. Applied Energy
8. CIGR Handbook of Agricultural Engineering Volume V: Biomass Engineering. ASABE Publications, MN, USA.

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: Weisberg Division of Engineering

Course Number and Title: ME 530 Renewable Energy

Catalog Description:
Basic principles and technical details of various renewable energy technologies for the sustainable future. Process design, energy analysis, engineering economics and environmental assessment of renewable energy systems.

Prerequisite: Graduate Status

First year Offered: Spring 2016

Credit Hours: 3

Course Title/Number	**ME 530: Renewable Energy**
Semester/Year	
Days/Time	
Location	EL 101
Instructor	Dr. Asad Salem
Office	EL 108
Phone	304-696-3207
E-Mail	salema@marshall.edu
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:
Basic principles and technical details of various renewable energy technologies (solar, biomass, wind, hydroelectric, geothermal, tidal and wave energy) for the sustainable future. Process design, energy analysis, engineering economics and environmental assessment of renewable energy systems
Prerequisite: Undergraduate courses of Thermodynamics and Heat Transfer
Required Text:

1. Duffie, J. A. & W. A. Beckman. 2006. **Solar Engineering of Thermal Processes**, 3rd ed. John Wiley & Sons, Inc.
2. Boyle, G. 2004. **Renewable energy: Power for a sustainable future**. Oxford University Press, Oxford, UK.
3. Demirbas, A. 2010. **Bio-refineries** – for biomass upgrading facilities. Springer publishers.

References:

4. RETScreen International. 2006. Users' guide. Natural Resources Canada, Ottawa, Canada.
5. Sims, R. 2002. The Brilliance of Bioenergy. James and James Publications, London, UK.
6. Frank Rosillo-Calle, Sarah Hemstock, Peter de Groot and Jeremy Woods. 2006. The Biomass Assessment Handbook, James and James Publications, London, UK.
7. Journals related to Renewable energy engineering
    a. Biomass and Bioenergy
    b. International Journal of Renewable Energy Engineering
    c. Bio-resource Technology
    d. Bio-resouces
    e. Bio-Products, Bio-Fuels & Bio-Refinery (BioPFR)
    f. Renewable and Sustainable Energy Reviews g. Energy Conversion Management
    h. Solar Energy
    i. Applied Energy

8. CIGR Handbook of Agricultural Engineering Volume V: Biomass Engineering. ASABE Publications, MN, USA.

Course objectives

This course provides the principles of renewable technologies for sustainable future. It also provides the details of renewable resources, energy conversion techniques and applications of solar, wind, biomass, geothermal, hydro-electric, wave and tidal energy technologies. More emphasis is given to bioenergy technologies to convert biomass into fuels, energy, chemicals and bio-products.

Upon completion of this course, the students should be able to

1) Recognize the need of renewable energy technologies and their role in the US and world energy demand.
2) Distinguish between the sustainable energy sources and fossil energy sources
3) Describe the principles of renewable energy production from various renewable sources
4) Apply the knowledge of thermodynamic and heat transfer principles to evaluate the performance of energy conversion systems for maximum efficiency
5) Compare the pros and cons of various renewable energy technologies and propose the best possible energy conversion system for a particular location

Course expected learning outcomes

Upon completion of this course, the students should be able to

1) Meet all the above objectives and
2) Use an engineering economic tool (Retscreen International Software) to perform energy balance and economic evaluation of renewable energy systems
3) Apply engineering principles to assess and evaluate renewable energy systems for maximum performance
4) Conduct a comprehensive economic assessment of energy conversion systems for both large and small scale applications
5) Modify or propose a new process design to increase energy efficiency and reduce environmental impacts
6) Demonstrate energy technology systems and communicate effectively by both oral and written presentations.

Course Outlines:

1. Introduction
   - 1.1. US & World energy consumption & Demand
   - 1.2. Renewable vs fossil energy sources
   - 1.3. Future outlook
2. Overview of renewable energy technologies
   - 2.1. Renewable energy sources
   - 2.2. Advantages and benefits
   - 2.3. Available technologies and challenges
3. Solar energy
   - 3.1. Solar thermal energy
   - 3.2. Solar photovoltaics
4. Biomass and Bioenergy
   - 4.1. Biomass resources

4.1.1. Feedstock collection, transport methods
4.1.2. Feedstock preprocessing and treatment methods
4.2. Biomass conversion technologies
4.2.1. Thermo-chemical platform
4.2.1.1. Combustion technology
4.2.1.2. Gasification technology
4.2.1.3. Pyrolysis technology
4.2.1.4. Trans-esterification or biodiesel technology
4.2.2. Biological platform
4.2.2.1. Hydrolysis and fermentation of biomass into ethanol
4.2.2.2. Anaerobic fermentation of wastes into methane
4.3. Recent advances and applications of bioenergy technology
5. Wind energy
5.1. Wind resources
5.2. Wind turbines and power generating systems
5.3. Current status and R& D needs
6. Geothermal energy
6.1. Geothermal resources
6.2. Principles, operation and recovery of energy
6.3. Current status and R & D needs
7. Hydro power energy
7.1. Stored hydro energy
7.2. Principles of hydro power technology
8. Wave & tidal energy
8.1. Energy from tides and waves
8.2. Technological and economic prospects
9. Energy, economics and environmental assessments
9.1. Technical and economical assessment of renewable technology
9.2. Environmental impact assessments and sustainability issues
9.3. Renewable energy technologies software use – RETScreen International

Grading:

Grading Basis:	Mid-term exams:	50%	A:	90-100%
	Assignments:	25%	B:	80-90%
	Final Exam:	25%	F:	0-60%

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

ABET Program Outcomes:

(a-2) an ability to apply knowledge of mathematics, science, and engineering
(c-3) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d-2) an ability to function on multidisciplinary teams
(e-3) an ability to identify, formulate, and solve engineering problems
(f-1) an understanding of professional and ethical responsibility
(g-2) an ability to communicate effectively
(h-2) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

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/545 | (•) Graded ( ) CR/NC

Contact Person: Dr. Asad A. Salem | Phone: 304-696-3207

NEW COURSE DATA:

New Course Title: Nano-Materials

Alpha Designator/Number: M E / 5 4 5

Title Abbreviation: N A N O - M A T E R I A L S

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Covers fundamentals of nanomaterial and nanotechnology. Unique properties of nanomaterials. Synthesis methods of various nanomaterials. Nano and microfabrication techniques. Applications of nanomaterials in various technologies, environmental science, biotechnology and biomedicine.

Co-requisite(s):

First Term to be Offered: Spring 2016

Prerequisite(s): ~~ENGR/215~~ Grad Status (AN)

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 Asad A. Salem	Date 3/31/15
Registrar Roberta Ferguson 141901	Date 3/31/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair TChristofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME/545

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.

Dr. Iyad Hijazi

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.

Not Applicable

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.

Not Applicable

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

Please refer to the attached syllabus

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

Please refer to the attached syllabus

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

Daniel L. Schodek, Paulo Ferreira, Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects, 2008, ISBN-10 0750681497

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

Lecture

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

Homework, Project, Exams

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

None

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

•Daniel L. Schodek, Paulo Ferreira, Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects, 2008, ISBN-10 0750681497.
• Stuart Lindsay, Introduction to Nanoscience, Oxford University Press, USA; Pap/Cdr edition, 2009. ISBN-10: 0199544212.
• G. Cao, Nanostructures and nanomaterials: Synthesis, Properties and Applications, Imperial College Press, 2004. ISBN-10: 1860944809.

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: ME 545 Nano-Material
Catalog Description: Covers fundamentals of nanomaterial and nanotechnology. Unique properties of nanomaterials. Synthesis methods of various nanomaterials. Nano and microfabrication techniques. Applications of nanomaterials in various technologies, environmental science, biotechnology and biomedicine

Prerequisites: Graduate status

First Term Offered: Spring 2016

Credit Hours: 3

ME 545 – Nano-Materials

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

Course Title/Number	Nano-Materials -ME 545
Semester/Year	
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

Catalog Course Description

Covers fundamentals of nanomaterial and nanotechnology. Unique properties of nanomaterials. Synthesis methods of various nanomaterials. Nano and microfabrication techniques. Applications of nanomaterials in various technologies, environmental science, biotechnology and biomedicine.

Required Text: Additional Reading and Other Materials

Daniel L. Schodek, Paulo Ferreira, Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects, 2008, ISBN-10 0750681497.

References:

- Stuart Lindsay, Introduction to Nanoscience, Oxford University Press, USA; Pap/Cdr edition, 2009. ISBN-10: 0199544212.
- G. Cao, Nanostructures and nanomaterials: Synthesis, Properties and Applications, Imperial College Press, 2004. ISBN-10: 1860944809.

Course Objectives:

- To discuss unique mechanical, chemical, electrical, optical and magnetic properties of nanomaterials as a result of reduction in dimensionality.
- To highlight the principles of different techniques used for the synthesis of nanomaterials and nanofabrication.
- To give applications of nanomaterials in catalysis, electronics, optoelectronics, composite technology, environmental science, biotechnology and biomedicine.

Grade Policy:

Attendance and Participation	**5%**
Homework	**20%**
Quizzes	**10%**
Project	**20%**
Exams	**45%**

Attendance Policy:

Students are expected to attend all class sessions. Attendance will be taken and will influence the overall grade in the course (see below). The MU policy on absences will be followed; students should read and understand this policy.

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	ABET Outcome (letter) & Level (number)
Describe the basics of simulation techniques in nanoscale systems.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz • Project	a2,c2,e2
Discuss unique mechanical, chemical, electrical, optical and magnetic properties of nanomaterials as a result of reduction in dimensionality.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz • Project	a2,c2,e2

Describe applications of nanomaterials in catalysis, electronics, optoelectronics, composite technology, environmental science, biotechnology and biomedicine.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz • Project	a2,c2,e2
Describe various methods used in characterization of nanomaterials.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz • Project	a2,c2,e2
Explain various methods used in synthesis of nanomaterials.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz • Project	a2,c2,e2
Identify nanomaterial Forms and functions.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz • Project	a2,c2,e2

Course Schedule:

No of Weeks	Topic	Chapter
1	Introduction to Nanomaterials and Nanotechnologies	1
2	Modelling in Nanotechnology: Basics of simulation techniques in nanoscale systems: molecular dynamics, density functional theory and Monte Carlo methods. Understanding the basics of constructing energy models for nanostructures	=
3	Material classes, structures and properties	4
4-5	Nanomaterial classes and fundamentals	6
6-7	Nanomaterial properties	7
8-9	Nanomaterial syntheses and characterization	8
10-11	Nanomaterial Forms and functions	10
12-13	Nanomaterials and Nanotechnologies	11 and 12

Prepared by Dr. Iyad Hijazi

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- 560 | (•) Graded ( ) CR/NC

Contact Person: Gang Chen | Phone: 696-3204

NEW COURSE DATA:

New Course Title: Automation and Control

Alpha Designator/Number: M E 5 6 0

Title Abbreviation: Automation and Control

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course provides an overview of the principles of automation and concept of system control, including instrumentation, control, human interface, and communication subsystems.

Co-requisite(s): None | First Term to be Offered: Spring-2016

Prerequisite(s): Graduate Status | 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 Arnold Sue	Date 3/30/15
Registrar Roberta Ferguson 141901	Date 3/31/15
College Curriculum Chair	Date 4/7/15
Graduate Council Chair T Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-560

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.

Gang Chen

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

Industrial Automation and Process Control, Jon Stenerson, Springer, 2002
Overview of Industrial Process Automation, K. L. S. Sharma, Elsevier, 2011
Modern Control Engineering, K. Ogata, Prentice hall, 2010
Any text on fundamental control engineering

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.)

Mid-term exams 45%
HW & Projects: 25%
Final Exam: 30%

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

None

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

Industrial Automation and Process Control, Jon Stenerson, Springer, 2002
Overview of Industrial Process Automation, K. L. S. Sharma, Elsevier, 2011
Modern Control Engineering, K. Ogata, Prentice hall, 2010
Any text on fundamental automation and control engineering
ASME Journal of Dynamical System, measurement and control

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: Weisberg Division of Engineering
Course Number and Title: ME 560 Automation and Control
Catalog Description:
This course provides an overview of the principles of automation and concept of system control, including instrumentation, control, human interface, and communication subsystems.

Prerequisite: Graduate status
First year Offered: Spring 2016
Credit Hours: 3

Marshall University
Syllabus

Course Title/Number	**Automation and Control, ME560**
Semester/Year	Fall / 2015
Days/Time	MWF / 11:00 – 11:50 am
Location	Weisberg Engineering Lab 101 Classroom
Instructor	Gang Chen
Office	Weisberg Engineering Lab Room 109c Division of Engineering College of Information Technology and Engineering Marshall University Huntington, WV 25755
Phone	304-696-3204
E-Mail	chenga@marshall.edu
Office/Hours	MWF: 12:00-2:00pm For those of you who will not be able to meet the instructor during the assigned office hours, you are welcome to come and ask instructor by appointment or at an appropriate time.
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 provides an overview of the principles of automation and concept of system control, including instrumentation, control, human interface, and communication subsystems

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 determine automation Characteristics	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 instrumentations and sensors	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 robotics, and control components	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 conduct process control analysis and PLC	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 solve differential Equations, Dynamic System Characteristics: Transient, Steady-state Frequency Response, System Identification, Signal Conditioning, Spectrum Analysis	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 get an introduction for Software and Data Acquisition, Computer based instrumentation, Signal Conditioning, Data recording and Logging, Amplifiers, input/Output Ports	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 design basic control: System Response-polar (Nyquist) Plot and Bode Diagrams	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 solve Open and Closed-Loop Control Systems, human interface, and	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2

communication subsystems			

Objective:

After taking this course, students should be able to

- Understand the fundamentals of automation
- Select proper sensors, power control components.
- Conduct basic automation and control analysis
- Understand control concepts and basic control system (C,E,F, I or more)

Required Texts, Additional Reading, and Other Materials

Industrial Automation and Process Control, Jon Stenerson, 2002, Springer
Overview of Industrial Process Automation, K. L. S. Sharma, Elsevier, 2011
K. Ogata, "Modern Control Engineering, 2010, Prentice hall
Any text on fundamental control engineering

Course Requirements / Due Dates

Course Requirements : Attendance/Homework /Examinations

TEST SCHEDULE:

Hourly Exam #1
Hourly Exam #2
Hourly Exam #3
Final Exam (two hours)

Homework due Dates:

- **Homework will regularly be assigned either during the class time or by e-mail/blackboard.**
- **Checking your e-mail is required on a daily-basis for information regarding homework assignment. Homework must be submitted before the starting time of class on the assignment date.**
- **Late homework is acceptable for an excused absence. For unexcused delay submission, there will be a 20% late penalty for each day it is late--starting with a 20% penalty on the first day if it is not turned in at the beginning of class. After 5 days, it will not be accepted at all.**
- **No late homework will be accepted after the final day of classes for the semester.**
- **You are expected to provide your homework on engineering papers - not a Xerox copy.**
- **Homework must be neat, readable, and must conform to acceptable Standards of Engineering Computation.**

Grading Policy

Exams:

Three exams and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Grading Policy:

Homework and Attendance	**25% (attendance 10%)**
Exam 1	**15%**
Exam 2	**15%**
Exam 3	**15%**
Final Exam	**30%**

Total	**100%**

Letter Grade Scale:

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

The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.

Attendance Policy

The attendance policy will follow University's excused absence policy.

You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Course Schedule:

LECTURE SUBJECT Schedule & TEXT REFERENCE

- Introduction of industrial automation and control
- human interface, and communication subsystems
- Static Instrument Characteristics, sensors, control components.
- Solution of Differential Equations, Dynamic System Characteristics: Transient, Steady-state, Frequency Response, System Identification, Signal Conditioning, Spectrum Analysis
- Introduction to Software and Data Acquisition, Computer based instrumentation, Signal Conditioning, Data recording and Logging, Amplifiers, input/Output Ports
- Concept of control: System Response-polar (Nyquist) Plot and Bode Diagrams
- Open and Closed-Loop Control Systems, Sensitivity, Transient Response, Transfer functions, Stability of Linear Feedback Systems, Applications.

* *The instructor reserves the right to slightly change the topics and their order to achieve the maximum benefit of the course learning outcomes.*

Course Prerequisites:

PR - Statics, Dynamics, Mechanics of Deformable Bodies, Calculus, Differential Equations.

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- 602 | (X) Graded ( ) CR/NC

Contact Person: Asad Salem | Phone: 696-3207

NEW COURSE DATA:

New Course Title: Advanced Engineering Analysis II

Alpha Designator/Number: M E 6 0 2

Title Abbreviation: A d v a n c e d E n g r A n a y l s i s I I

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This is the second course in a two-course sequence to learn advanced analytical and computational methods to solve multi-dimensional diffusion, heat, biharmonic, and elasticity equations.

Co-requisite(s): None | First Term to be Offered: Spring-2016

Prerequisite(s): ME 601 | 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 4-6-15
Registrar 14901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair	Date 5-20-15

9

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-602

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.

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

Advanced Engineering Mathematics: 4th Ed., by D. Zill and W. Right. 2011

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

Lecture

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

Mid-term exams 50%
Assignments including Projects: 25%
Final Exam: 25%

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

None

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

- Advanced Engineering Mathematics, 10th Ed., Erwin Kreyszig, 2011.
- Advanced Mathematics for Engineers and Scientists, Paul Duchateau, 2013
- Advanced Engineering Mathematics, Alan Jeffrey, 2001
- Advanced Engineering Mathematics. 2nd Ed, Michael D. Greenberg, 1998

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: Weisberg Division of Engineering
Course Number and Title: ME 602: Advanced Engineering Analysis II

Catalog Description:
This is the second course in a two-course sequence to learn advanced analytical and computational methods to solve multi-dimensional diffusion, heat, biharmonic, and elasticity equations.

Prerequisite: ME 601

First year Offered: Spring 2016

Credit Hours: 3

Course Title/Number	ME 602: Advanced Engineering Analysis II
Semester/Year	
Days/Time	
Location	EL 101
Instructor	Dr. Asad Salem
Office	EL 108
Phone	304-696-3207
E-Mail	salema@marshall.edu
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 is the second course in a two-course sequence to learn advanced analytical and computational methods to solve multi-dimensional diffusion, heat, biharmonic, and elasticity equations.

Prerequisite: ME 601

Required Text: *Advanced Engineering Mathematics: 4th Ed.*, by D. Zill and W. Right. 2011.

References:

- Advanced Engineering Mathematics, 10th Ed., Erwin Kreyszig, 2011.
- Advanced Mathematics for Engineers and Scientists, Paul Duchateau, 2013
- Advanced Engineering Mathematics, Alan Jeffrey, 2001
- Advanced Engineering Mathematics. 2nd Ed, Michael D. Greenberg, 1998

Course Motivation: This course provides analytical and computational techniques in the more advanced areas of mathematics that are of most relevance to engineering disciplines. Applications of these techniques for the solution of boundary value and initial value problems will be given. The problems treated and solved in this course are typical of those seen in applications and include problems of heat conduction, mechanical vibrations and wave propagation.

Course Outcomes: With the successful completion of the course, the student should be able to:

a) Strengthen their fundamental analytical skills, in preparation for advanced studies and research.
b) Gain an Understanding of how to use mathematics to address practical operational issues facing dynamical, mechanical and thermal systems engineers.

Course Objectives: The objective of this course is to provide graduate mechanical engineering students of with various mathematical techniques that are necessary in order to solve practical problems.

1. Students will demonstrate ability to solve linear systems, apply various methods of mathematical, and communicate solutions in writing.
2. Students will demonstrate ability to solve non-linear systems, apply various methods of mathematical, and communicate solutions in writing
3. Students will demonstrate ability to solve PD's, apply various methods of mathematical, and communicate solutions in writing.
4. Students will demonstrate the ability to comprehend advanced mathematics, and present the material orally and in writing

Course Outlines:

- **Emphasis I: Diffusion/ Heat Equation (4 weeks)**
  1. Approximate and numerical solutions of multi-dimensional heat equation with transient and moving heat source

  Emphasis II: Biharmonic and wave equations (4 weeks)
  1. Approximate solutions
  2. Numerical solutions

- **Emphasis III: Nonlinear Elasticity Equation (4weeks)**
  1. Approximate Solution
  2. Numerical of non-linear elasticity equation
- **Emphasis IV: Special and orthogonal Functions and their applications in dynamics systems**
  1. Spherical Bessel Function, Hermite, Laguerre, and Legendre polynomials, and Weber-Hermite Functions

Grading:

Grading Basis:	Mid-term exams:	50%	A:	90-100%
	Assignments:	25%	B:	80-90%
	Final Exam:	25%	F:	0-60%

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

Relationships between Course, Program, and Degree Profile Outcomes

Course Outcome – student will:	Implementation Method	Evaluation Method	Program Outcomes	Degree Profile Outcomes
Strengthen their fundamental mathematical skills, in preparation for advanced studies and research.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam problems	a3, b3, e3, k3	• Specialized knowledge • IS: Quantitative Fluency • IS: Communication Fluency
Gain an Understanding of how to use mathematics to address practical operational issues facing dynamical, mechanical and thermal systems engineers.	• Lectures • In-class examples • Homework assignments	• Homework • Exam problems	a3, b3, e3, k3	• Specialized knowledge • IS: Quantitative Fluency • IS: Analytic Inquiry • IS: Communication Fluency

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- ~~603~~ 604 | (•) Graded ( ) CR/NC

Contact Person: Asad Salem | Phone: 696-3207

NEW COURSE DATA:

New Course Title: Research Methods

Alpha Designator/Number: M E 6 0 ~~3~~ 4

Title Abbreviation: R e s e a r c h M e t h o d s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Research methods in engineering conducting critical reviews of research literature, preparing pre-proposal, and initiating background research on a thesis topic. student is expected to submit a thesis Pre-proposal

Co-requisite(s): None | First Term to be Offered: Fall-2015

Prerequisite(s): Graduate Status | 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 2/18/15
Registrar 14/901	Date 2/18/15
College Curriculum Chair	Date 3/25/15
Graduate Council Chair J Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-~~603~~ 604

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.

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

Textbooks:
1. Alley, Michael, The Craft of Scientific Writing, 3rd Edition, Springer, 1996.
2. Alley, Michael, The Craft of Scientific Presentations, Springer, 2003.

Reference:
Hubbuch, Susan M., Writing Research Papers Across the Curriculum, 5th Edition, Thompson, 2005.

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.)

Project Plan ☒☒☒☒ 50 points
Synthesis Paper (min 20 papers) ☒100 points
Critique (journal article) ☒☒100 points
Pre-Proposal Paper ☒☒☒100 points
Pre-Proposal Presentation ☒☒ 50 points

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

None

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

1. Alley, Michael, The Craft of Scientific Writing, 3rd Edition, Springer, 1996.
2. Alley, Michael, The Craft of Scientific Presentations, Springer, 2003.

3. Hubbuch, Susan M., Writing Research Papers Across the Curriculum, 5th Edition, Thompson, 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: Weisberg Division of Engineering
Course Number and Title: ME ~~603~~ 604: Research Methods
Catalog Description:
Research methods in engineering conducting critical reviews of research literature, preparing pre-proposal, and initiating background research on a thesis topic. student is expected to submit a thesis Pre-proposal

Prerequisite:Graduate Status
First year Offered: Fall 2015
Credit Hours: 3

Revised 11/15/2014

Course Title/Number	Research Methods- ME ~~603~~ 604
Semester/Year	
Days/Time	
Location	
Instructor	Dr. Asad Salem
Office	EL 108
Phone	304-696-3207
E-Mail	salema@marshall.edu
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 introduces students to research methods in mechanical engineering. A primary focus of the course is on conducting critical reviews of research literature, preparing a thesis pre-proposal, and initiating background research on a thesis topic. At the conclusion of the course, the students are expected to submit a thesis pre-proposal, literature review, and plan of study for the completion of the MSME degree offered through the department. Pre-Req: Graduate standing or instructor approval.

Textbooks:

1. Alley, Michael, The Craft of Scientific Writing, 3rd Edition, Springer, 1996.
2. Alley, Michael, The Craft of Scientific Presentations, Springer, 2003.

Reference:

Hubbuch, Susan M., Writing Research Papers Across the Curriculum, 5th Edition, Thompson, 2005.

Student Learning Outcomes:

At the completion of the course, students will have

- Articulated the metrics of success within a research career
- Developed a plan for managing ME degree requirements
- Identified technical gaps in the literature by conducting a literature review
- Critiqued quantitative and/or qualitative research methodologies relevant to their research work
- Demonstrated proposal writing skills by developing a research pre-proposal
- Demonstrated presentation skills by presenting a research pre-proposal in class

Course Outlines

Week 1	Course introduction Academic honesty / Plagiarism
Week 2	Types of research Introduction to statistics used in research

Week 3	Quantitative and Qualitative research
Week 4	Research reports
Week 5	Research manuscript structure and content
Week 6	Selecting research reports
	Literature review
Week 7	Reference list
Week 8	Reading research reports and reviews
Week 9	Reading research reports and reviews
Week10	APA style mechanics
Week 11	Crediting sources
Week 12	Writing guidelines
Week 13	Sources of credibility
Week 14	Publication process
Week 15	Abstracts
Week 16	***Final manuscript due***

Class Attendance, Participation, and Expectations

Students are expected to attend all classes. The nature of the course requires that students actively participate in class. Class participation can take different forms, including contributing to a discussion, sharing an experience or idea relevant to the topic being discussed, or asking a question or making an insightful comment that would lead into a discussion that can benefit the entire class. Assigned readings are a critical part of this course. Students are expected to have read the material prior to class to make meaningful contributions to in-class discussions. The quality of contributions is as important as the frequency of contributions.

Class Assignments

The assignments in this class fall into five categories:

1. A project plan for your degree
2. One synthesis paper
3. One critique of a journal paper
4. One pre-proposal paper
5. One pre-proposal presentation

Project Plan

Students tend to assume that thesis or project research and any related writing can be put off until after the coursework is completed. The purpose of this assignment is to help you focus on developing a project plan with key target dates for all major events of your program to ensure timely completion of your degree. You will develop the project plan yourself but are required to get your major professor's input and approval. The project plan should include all major events of your program as suggested by your advisor with target (or actual) dates. At a minimum, major events should include *program events* outlined in the Mechanical Engineering Graduate Program guide; *research events* such as when you will have data collected and write ups for major portions of your thesis/project; as well as dates for completing your coursework. A Gantt chart can be used to present your project plan or any other software that you think is most useful to effectively communicate the project plan to your advisor/committee. It is your responsibility to make the necessary arrangements with your major professor to assist you with the development of the project plan. At least two meetings with your major professor are recommended to go over the project plan prior to submitting it. The project plan must be signed by your major professor before submission.

Synthesis Paper

The purpose of the synthesis paper is to become familiar with the style, structure and research methods associated with papers in your area of research and to demonstrate your ability to synthesize information from disparate sources (papers). The goal of synthesis is to draw commonalities and differences out of those sources in an effort to establish technical gaps (research issues that have not been previously addressed). These gaps will provide insight for future proposal opportunities. The paper must synthesize at least 20 research articles in your area of research.

The paper will be graded based upon the following criteria:

1. The effectiveness of synthesizing information in the selected articles (50%)
2. Writing composition (spelling, grammar, style, clarity, references, and ease of reading) (30%)
3. Have technical gaps in the literature been identified and clearly articulated? (20%)

Critique of a Journal Paper

The purpose of the critique is to demonstrate your ability to comprehend the research reported in a journal paper within your area of research, objectively critique the structure and methodology [i.e., model(s), experiment(s) and/or solution technique(s)] presented in the paper, and suggest improvements to the paper (as a reviewer) or to extend the research presented in the paper (as a proposer). It is expected that this paper will be one of the papers reviewed for the synthesis paper and that the critique of it will sharpen your critique of the technical literature and motivate you toward proposing new research.

Your critique should have two parts. The first part should focus on the objective critique of the article, listing your concerns and the reasons for your concerns. This should focus on issues such as, but not limited to, the relevance and objectives of the research, assumptions made, modeling/experimental techniques used, solutions developed, statistical tests used, findings presented, and conclusions made. The second part should focus on how you propose to improve the paper or extend the results.

The paper will be graded based upon the following criteria:

1. Relative depth and breadth of critical evaluation (50%)
2. Writing composition (grammar, spelling, logic and ease of reading) (30%)
3. How would you improve the methodological issues or extend the research noted in the paper? (20%)

Pre-Proposal Paper

Independent research begins by crafting excellent research proposals. The purpose of a research proposal is to persuade your audience (proposal reviewers) to give you the resources to conduct your research. It is therefore incumbent upon you to convince your proposal reviewers that you are investigating a relevant question (or problem) that has not yet been answered (or solved) and that your approach will likely meet the research objective leading to significant positive impact on your research community and the world.

In this class, you will be asked to write a pre-proposal paper in an effort to move your research forward toward a proposal. Like a research proposal, the pre-proposal should have two parts. The first part should synthesize the relevant technical literature showing where gaps exist in current knowledge and technology. Where necessary, you should provide background information to help explain these gaps to a general technical audience (reviewers) in making the case that a research question or problem exists. It is expected that this

first section will largely build upon the synthesis and critique developed in your first two papers but will focus the reader on a specific objective (problem you propose to solve or question you propose to answer) that you intend to pursue. The second part should focus on your proposed approach to the research problem or question emphasizing how you will measure progress, why your methods are feasible and why you are uniquely qualified to conduct them. In addition to addressing technical merit, you will also be expected to address the cost and timeline aspects of your research.

The paper will be graded based upon the following criteria:

1. Is the author focused on a relevant problem/question?	(30%)
2. Does the author propose a unique approach that is feasible for them to carry out?	(40%)
3. Writing composition (grammar, spelling, logic and ease of reading)	(30%)

Pre-Proposal Presentation

Throughout your career, you will be asked to make oral presentations representing the findings that you found individually or as a member of a team. As part of your graduate degree requirements, you will be asked to present information about your research at all major events/milestones including your program meeting, your preliminary exam, your proposal exam, and/or your final defense.

The purpose of this assignment is to help you improve your presentation skills by making an in class individual presentation. You will present the content of your research proposal. The time limit for the presentation will be based on the number of students in class and the class time available. Students exceeding the time limit will be penalized. You will be responsible for making the slides for the presentation, and making sure that the material you have compiled can be presented clearly within the allotted time.

***Grading Policy*:**

Project Plan		50 points
Synthesis Paper (min 20 papers)		100 points
Critique (journal article)		100 points
Pre-Proposal Paper		100 points
Pre-Proposal Presentation		50 points
TOTAL =	**400 points**	
	A:	90-100%
Grades:	B:	80-90%
	C:	70-80%
	D:	60-70%
	F:	0-60%

Students are responsible for any changes to this syllabus announced in class.

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: ME 617 | (●) Graded ( ) CR/NC

Contact Person: SARDER E. SADIQUE, Ph.D., P.E. (CA) | Phone: 3046965621

NEW COURSE DATA:

New Course Title: Additive Manufacturing

Alpha Designator/Number: M E 6 1 7

Title Abbreviation: A D D I T I V E M A N U F A C T U R I N G

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Additive manufacturing (AM), rapid prototyping, rapid tooling, joining processes, direct digital manufacturing to form 3D parts with applications ranging from prototyping to production in aerospace, defense, and biomedical industries.

Co-requisite(s): Not Applicable | First Term to be Offered: Fall 2015

Prerequisite(s): Graduate Status | 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 4-6-15
Registrar 141901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME 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.

SARDER E. SADIQUE, Ph.D., P.E. (CA), Assistant Professor of Mechanical Engineering

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.

Not Applicable

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.

Not Applicable

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

Submitted as a separate document in the Course Syllabus

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

Submitted as a separate document in the Course Syllabus

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

Submitted as a separate document in the Course Syllabus

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

Lecture/Lab

Request for Graduate Course Addition - Page 4

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

MIDTERM, FINAL, PROJECTS, LAB

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

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

Submitted as a separate document in the Course Syllabus

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: ME 617 Additive Manufacturing

Catalog Description:
Additive manufacturing (AM), rapid prototyping, rapid tooling, joining processes, direct digital manufacturing to form 3D parts with applications ranging from prototyping to production in aerospace, defense, and biomedical industries.

Prerequisites: Graduate Status

First Term Offered: Fall 2016

Credit Hours: 3

Course Title/Number	Additive Manufacturing - ME 617
Semester/Year	
Days/Time	
Location	
Instructor	Sarder E. Sadique, Ph.D., P.E.(CA)
Office	Weisberg Engineering Lab Room 109 (previously lab general office) Division of Engineering College of Information Technology and Engineering Marshall University Huntington, WV 25755
Phone	304-696-5621
E-Mail	sadique@marshall.edu
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

Catalog Course Description:

Additive manufacturing (AM), rapid prototyping, rapid tooling, joining processes, direct digital manufacturing to form 3D parts with applications ranging from prototyping to production in aerospace, defense, and biomedical industries.

Course Prerequisites:

Graduate Status

Required Text:

Course Textbook:

Additive Manufacturing Technologies by Brent Stucker, David Rosen, and Ian Gibson, Springer: 2010; ISBN 978-1-4419-1120-9.

Lecture notes will be given before classes.

References:

- Manufacturing Processes and Systems, Phillip F. Ostwald Jairo Munoz. ISBN 0-471-04741-4.
- Bourell, Leu, and Rosen, *Roadmap for Additive Manufacturing*, NSF Workshop report, 2009.
- Gibson, Rosen, Stucker, *Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing*. Springer, 2009.
- Hopkinson, Hague, Dickens, *Rapid Manufacturing: An Industrial Revolution for the Digital Age*. Wiley, 2005.
- Gibson, *Advanced Manufacturing Technologies for Medical Applications*. Wiley, 2005.

- S. Kalpakjian, and S. R. Schmid, *Manufacturing Engineering and Technology,* 7th Edition, Pearson Prentice Hall, Singapore, 2013, ISBN-10: 0133128741.

Course Objectives:

At the successful completion of this course, the students should be able to:

- Use commercial software for digitizing free-form geometry.
- Capture digital data from a difficult to design object and make a manufactured model.
- Create the design of an object suitable for additive manufacturing processes.
- Compare traditional versus next generation manufacturing.
- Define and apply criterion for selecting appropriate additive manufacturing process for any given application.
- Investigate application domain of additive manufacturing like aerospace, defense, biomedical etc.
- Learn important process parameters for bio-manufacturing and determine a suitable additive technique for bio-manufacturing.

Class/Laboratory Schedule

- Class: 3 hrs

Grade Policy:

The grading for the class will be determined using the following weights:

Assignments	30%
Literature review project	20%
Technology survey project	15%
Development project	25%
Participation	10%
Total Score	100%

Problem Assignments: Students will be given ~2 weeks for each assignment, which will consist of solving problems that correspond to the materials covered in class.

Literature review project: The objective of the literature review projects is to help the students to learn how to identify and read literatures. Students will discuss the review topic with the professor. The project will be done with a presentation and a review report.

Technology survey project: The objective of the technology survey project is to help the students to understand potential applications and opportunities in various fields. Students will discuss the survey topic with the professor. The project will be done with a presentation and a survey report.

Development project: The objective of the development project is to help the students to gain hands-on experience of solving a problem related to 3D printing. Students will discuss the problem with the professor. The project will be done with a demonstration, a presentation, and a technical report.

Participation: Active participation in the class discussion is required and will be taken into account.

Letter Grade Scale*:

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

0 - 59 ---------- F

* *The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.*

Tests/Exams:

Makeup exams will be given only due to **extraordinary circumstances**, and only if the instructor is notified **prior** to the exam and the instructor judges it to be an acceptable excuse. Academic dishonesty (cheating) on any exam will result in a grade of zero for that exam. A second infraction will result in a course grade of F and possible University sanctions.

Grading Policy of Tests/Exams:

Three tests and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Topics to be Covered*:

Lecture	Topic	Chapter
1	Introduction to unit - Overview, Basic principles, Research topic discussion	
2	Reverse Engineering: Introduction, From Scanner to Model validation	
3	Traditional manufacturing vs Additive manufacturing	
4	Additive Manufacturing Process Plan: Building Strategies & Post Processing	
5	Development of Additive Manufacturing Technology	
6	3D content editing - Design opportunities and CAD systems for AM	
7	Extrusion Based Additive Manufacturing Process	
8	Additive processes beyond layers - Hybrid processes	
9	Photo-polymer vat Additive Manufacturing Process	
10	Powder bed fusion and material jetting Additive Manufacturing Process	
11	Gear manufacture and Gear Measurement	
12	Issues with additive manufacturing	
13	Rapid tooling and indirect processes	
14	Additive manufacturing in medical applications	
15	Material issues - Heterogeneous & Functional materials	
16	3D Bio-manufacturing	
17	Process and quality control in additive manufacturing - Accuracy, repeatability, Process viability and sensors	
18	Zero skill manufacturing	
19	Fabrication speed and improvements	
20	Advanced Research in Laser Theory in Manufacturing Processes	
21	Vat Photopolymerization - 3D Systems/Stereolithography, Envision Technology, Direct digital manufacturing (DDM)	

* *The above schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students i.e. Schedule may be revised if necessary. Students will be notified if this is the case.*

Attendance Policy:
The attendance policy will follow University's excused absence policy. You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Learning Outcomes:

Course Outcome - student will:	**Implementation Method**	**Evaluation Method**	**Program Outcomes**
Provide a comprehensive overview of AM technologies including descriptions of related technologies including design and AM-specific software and post-processing/part finishing approaches.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	c2, e1, k3
Describe various additive manufacturing processes.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	c2, e1, k3
Explain the capabilities, limitations, and basic principles of alternative AM technologies.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	c2, e1, k3
Evaluate and select appropriate AM technologies for specific applications.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	a2, c2, e1
Demonstrate the use of selected laser based manufacturing machines. Explain the theory behind laser manufacturing processes.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	a2, c2, e1
Discuss the wide variety of new and emerging applications like micro-scale AM, medical applications, direct printing of electronics and Direct Digital Manufacturing of end-use components.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	a2, c2, e1
Define: 3D Printing, Stereolithography, Selective Laser Sintering and various metal deformation technologies.	• Lectures • In-class examples	• Homework Assignments • Exam, Quiz	a2, c2, e1

	• Project/CAD solutions • Homework assignments	• Project/CAD	
Explain product prototyping. Apply AM techniques to a challenging rapid manufacturing application.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	a2, c2, k3
Identify, explain, and prioritize some of the important research challenges in AM.	• Lectures • In-class examples • Project/CAD solutions • Homework assignments	• Homework Assignments • Exam, Quiz • Project/CAD	a2, c2, k3

PROGRAM LEARNING OUTCOMES (ABET)

Item No.	Outcome
a-2	Complete an engineering assignment that involves the use of calculus and scientific principles (e.g., chemistry or physics)
c-2	Complete a design with clearly defined objectives, engineering standards, and realistic constraints. Present a design in a professional manner
e-1	Formulate and solve an engineering problem with given data and constraints using applicable standards for a problem already identified. Present the results in a professional manner
k-3	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice: Use of a modern engineering too for a design

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/621 | (•) Graded ( ) CR/NC

Contact Person: Dr. Asad A. Salem | Phone: 304-696-3207

NEW COURSE DATA:

New Course Title: Corrosion Engineering

Alpha Designator/Number: M E / 6 2 1

Title Abbreviation: C O R R O S I O N E N G I N E E R I N G

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Covers the causes and mechanisms of aqueous corrosion, electrochemistry and thermodynamics of corrosion. Materials selection, design for minimization of corrosion, and corrosion protection. Case studies are discussed.

Co-requisite(s):

First Term to be Offered: Spring 2016

Prerequisite(s): Graduate status

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 4-6-15
Registrar 141901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair J Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME/621

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.

Dr. Iyad Hijazi

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.

Not Applicable

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.

Not Applicable

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

Please refer to the attached syllabus

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

Please refer to the attached syllabus

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

R. Winston Revie and Herbert H. Uhlig, Corrosion and Corrosion Control, An introduction to Corrosion Science and Engineering, 4th Edition, Wiley publication, 2008. ISBN 978-0-471-73279-2

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

Lecture

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

homework, quizzes, project, exams

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

None

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

- R. Winston Revie and Herbert H. Uhlig, Corrosion and Corrosion Control, An introduction to Corrosion Science and Engineering, 4th Edition, Wiley publication, 2008. ISBN 978-0-471-73279-2
- Pierre Roberge, Corrosion Engineering: Principles and Practice, McGraw-Hill Professional; 1 edition, 2008. ISBN-10: 0071482431.
- Callister, W. D., Jr., Materials Science and Engineering: An Introduction, Sixth Edition. New York, New York: John Wiley and Sons, Inc., 2003. ISBN: 0-471-13576-3.

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: Weisberg Division of Engineering

Course Number and Title: ME 621 Engineering Corrosion

Catalog Description: Covers the causes and mechanisms of aqueous corrosion, electrochemistry and thermodynamics of corrosion. Materials selection, design for minimization of corrosion, and corrosion protection. Case studies are discussed.

Prerequisites: Graduate Status

First Term Offered: Spring 2016

Credit Hours: 3

ME 621 – Corrosion Engineering

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

Course Title/Number	Corrosion Engineering-ME 621
Semester/Year	
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

Covers the causes and mechanisms of aqueous corrosion, electrochemistry and thermodynamics of corrosion. Materials selection, design for minimization of corrosion, and corrosion protection. Case studies are discussed.

Required Text:

- R. Winston Revie and Herbert H. Uhlig, Corrosion and Corrosion Control, An introduction to Corrosion Science and Engineering, 4th Edition, Wiley publication, 2008. ISBN 978-0-471-73279-2
- Pierre Roberge, Corrosion Engineering: Principles and Practice, McGraw-Hill Professional; 1 edition, 2008. ISBN-10: 0071482431.
- Callister, W. D., Jr., *Materials Science and Engineering: An Introduction*, Sixth Edition. New York, New York: John Wiley and Sons, Inc., 2003. ISBN: 0-471-13576-3.

Course Objectives:

- Develop skills for materials selection and protection to minimize impacts of corrosion.
- Describe the mechanisms and causes of corrosion.
- Build critical thinking and problem solving abilities as it extends the student's knowledge gained in prior courses.
- Build teamwork skills and enhances written and oral communication skills utilizing a design project.
- Acquire technology competencies through literature review for the design project which involve use of the Internet.

Grade Policy:

Attendance and Participation	**5%**
Homework	**10%**
Quizzes	**10%**
Project	**15%**
Exam	**60%**

Attendance Policy

Students are expected to attend all classes. Attendance will be taken and will influence the overall grade in the course (see below). The MU policy on absences will be followed; students should read and understand this policy.

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	ABET Outcome (letter) & Level (number)
Describe the mechanisms and causes of corrosion.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz	a2,c2,e2
Develop skills for materials selection and protection to minimize impacts of corrosion.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz	a2,c2,e2
Identify common types of corrosion.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam	a2,c2,e2

		• Quiz	
Explain the electrochemical basis for corrosion and use Pourbaix diagrams to give qualitative predictions of corrosion behaviour.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz	a2,c2,e2
Describe the relationship between the cathodic reaction and iron and steel corrosion rates and the effect of the environment.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz	a2,c2,e2
Describe the cathodic protection approach to corrosion control.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Project • Exam • Quiz	a2,c2,e2
Identify metallic, inorganic, and organic coatings; their methods of application and their advantages and disadvantages.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz	a2,c2,e2
Describe the classes of inhibiters and their effect on corrosion rate.	• Lectures • In-class examples • Homework assignments	• Homework Assignments • Exam • Quiz	a2,c2,e2

Course Schedule

No of Weeks	Topic	Chapter
1	Definition and importance of corrosion	1
1.5	Electrochemical mechanisms	2
1.5	Thermodynamics: corrosion tendency and electrode potential	3
1	Thermodynamics: Pourbaix diagrams	4
2	Kinetics: polarization and corrosion rates	5
2	Passivity	6
1	Iron and steel	7
2	Cathodic protection	13
1	Inhibitors and passivators	17
2	Coatings	14 & 15

Prepared by Dr. Iyad Hijazi

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/625 | (•) Graded ( ) CR/NC

Contact Person: Dr. Asad A. Salem | Phone: 304-696-3207

NEW COURSE DATA:

New Course Title: Tribology

Alpha Designator/Number: M E / 6 2 5

Title Abbreviation: T R I B O L O G Y

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Detailed coverage of the mechanisms of friction, material wear, and major lubrication techniques - liquids, solids, and gases - with traditional and modern applications. Coverage of micro/nanotribology, MEMS, and magnetic surface storage applications.

Co-requisite(s):

First Term to be Offered: Spring 2016

Prerequisite(s): Graduate status

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 4-6-15
Registrar 141901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME/625

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.

Dr. Iyad Hijazi

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.

Not Applicable

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.

Not Applicable

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

Please refer to the attached syllabus

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

Please refer to the attached syllabus

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

- Introduction to Tribology, Bharat Bhushan, Wiley and Sons, second edition, 2013, ISBN-13: 978-0471158936.

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

Lecture

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

Mid-Term 20%
Project 20%
Final Exam 20%
Homework, quizzes, attendance 40%

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

None

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

• Introduction to Tribology, Bharat Bhushan, Wiley and Sons, second edition, 2013, ISBN-13: 978-0471158936.
• Engineering Tribology, Gwidon Stachowiak and Andrew W Batchelor, Butterworth-Heinemann, third edition, 2005 , ISBN-13: 978-0750678360

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: Weisberg Division of Engineering

Course Number and Title: ME 625 Tribology

Catalog Description:
Detailed coverage of the mechanisms of friction, material wear, and major lubrication techniques - liquids, solids, and gases - with traditional and modern applications. Coverage of micro/nanotribology, MEMS, and magnetic surface storage applications.

Prerequisites: Graduate Status

First Term Offered: Spring 2016

Credit Hours: 3

ME 625 – Tribology

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

Course Title/Number	Tribology-ME 625
Semester/Year	
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

Detailed coverage of the mechanisms of friction, material wear, and major lubrication techniques - liquids, solids, and gases - with traditional and modern applications. Coverage of micro/nanotribology, MEMS, and magnetic surface storage applications.

Required Text: Additional Reading and Other Materials

- **Introduction to Tribology, Bharat Bhushan, Wiley and Sons, second edition, 2013, ISBN-13: 978-0471158936.**
- **Engineering Tribology, Gwidon Stachowiak and Andrew W Batchelor, Butterworth-Heinemann, third edition, 2005 , ISBN-13: 978-0750678360**

Course Objectives:

- Learn the basics of tribology and related sciences.
- Describe friction/lubrication mechanisms and know how to apply them to the practical engineering problem.
- Learn the methods to reduce friction for engineering surface.

Course Requirements / Due Dates

Prerequisites: Graduate Status

Grade Policy:

Exams	**40%**
Projects	**20%**
Homework	**30%**
Quizzes	**5%**
Attendance	**5%**

Attendance Policy

Students are expected to attend all class sessions. Attendance will be taken and will influence the overall grade in the course (see below). The MU policy on absences will be followed; students should read and understand this policy.

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	ABET Outcome (letter) & Level (number)
Describe surface topography and know how to model a rough engineering surface	Homework assignment And projects	Homework, Quiz, Tests and projects	a,e,k
Explain the basics of tribology and related sciences, theoretical background about processes in tribological system, mechanisms and forms of interaction of friction surfaces;	Homework assignment and Projects	Homework, Quiz, Tests and projects	a,d,k
Describe Hertz contact and rough surface contact.	Homework assignment and projects	Homework, Quiz, Tests and projects	a,e,k
Discuss adhesion theories and the effect of adhesion on friction and wear	Homework assignment	Homework, Quiz, Tests and projects	a,e,k

	And projects		
Describe friction/lubrication mechanisms and know how to apply them to the practical engineering problem	**Homework assignment and Projects**	**Homework, Quiz, Tests and projects**	**a,d,k**
Describe the methods to reduce the friction for engineering surface	**Homework assignment and projects**	**Homework, Quiz, Tests and projects**	**a,e,k**

Course Schedule

No of Weeks	Topic	Chapter
1	**Introduction**, Definition and History of Tribology,Industrial Significance of Tribology, Origins and Significance of Micro/Nanotribology.	1
1	**Solid Surface Characterization,** The Nature of Surfaces, Physico-Chemical Characteristics of Surface Layers, Analysis of Surface Roughness, and Measurement of Surface Roughness.	2
1	**Contact Between Solid Surfaces**, Analysis of the Contacts, and Measurement of the Real Area of Contact	3
1	**Adhesion,** Solid–Solid Contact and Liquid-Mediated Contact	4
1	**Friction,** Solid–Solid Contact, Liquid-Mediated Contact and Friction of Materials	5
1	**Interface Temperature of Sliding Surfaces,** Thermal Analysis, Interface Temperature Measurements.	6
1	**Wear,** Types of Wear Mechanism, Types of Particles Present in Wear Debris and Wear of Materials.	7
1	**Fluid Film,** Regimes of Fluid Film Lubrication, Viscous Flow and Reynolds Equation, Hydrostatic Lubrication, Hydrodynamic Lubrication, and Elastohydrodynamic Lubrication.	8
1	**Boundary Lubrication and Lubricants,** Boundary Lubrication, Liquid Lubricants, and Greases.	9
1	**Nanotribology,** SFA Studies, AFM/FFM Studies, and Atomic-Scale Computer Simulations.	10
1	**Friction and Wear Screening Test Methods, Design** Methodology, Typical Test Geometries.	11
1	**Tribological Components and Applications, Common** Tribological Components, MEMS/NEMS, Material Processing, Industrial Applications.	12
1	**Green Tribology and Biomimetics,** Green Tribology, and Biomimetics	13

Prepared by Dr. Iyad Hijazi

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/628 | (•) Graded ( ) CR/NC

Contact Person: Dr. Asad A. Salem | Phone: 304-696-3207

NEW COURSE DATA:

New Course Title: Applied Biomaterials

Alpha Designator/Number: M E / 6 2 8

Title Abbreviation: A P P L I E D B I O M A T E R I A L S

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Covers the knowledge needed to select and design biomaterials used in medical devices with emphasis on metallic, ceramic, polymeric, and composite biomaterials. Explains the difference between materials science and materials engineering.

Co-requisite(s):

First Term to be Offered: Spring 2016

Prerequisite(s): ~~ENGR 215~~ Graduate Status (ADN)

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 Daniel Sen	Date 3/30/15
Registrar Roberta Ferguson 141901	Date 3/31/15
College Curriculum Chair [illegible]	Date 4/9/15
Graduate Council Chair J Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME/628

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.

Dr. Iyad Hijazi

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.

Not Applicable

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.

Not Applicable

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

Please refer to the attached syllabus

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

Please refer to the attached syllabus

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

- Introduction to Biomaterials, Basic Theory with Engineering Applications, C. M. Agrawal, Cambridge University Press, 2013, ISBN-13: 978-0521116909

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

Lecture

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

Mid-Term 20%
Project 20%
Final Exam 20%
Homework, quizzes, attendance 40%

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

None

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

• Introduction to Biomaterials, Basic Theory with Engineering Applications, C. M. Agrawal, Cambridge University Press, 2013, ISBN-13: 978-0521116909
• Biomaterials: The Intersection of Biology and Materials Science, A.G. Mikos J.S. Temenoff, Pearson International Edition, first edition, 2008 , ISBN-13: 978-0132350440

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: Weisberg Division of Engineering

Course Number and Title: ME 628 Applied Biomaterials

Catalog Description: Covers the knowledge needed to select and design biomaterials used in medical devices with emphasis on metallic, ceramic, polymeric, and composite biomaterials. Explains the difference between materials science and materials engineering.

Prerequisites: Graduate Status

First Term Offered: Spring 2016

Credit Hours: 3

ME 628 – Applied Biomaterials

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

Course Title/Number	Applied Biomaterials-ME 628
Semester/Year	
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

Covers the knowledge needed to select and design biomaterials used in medical devices with emphasis on metallic, ceramic, polymeric, and composite biomaterials. Explains the difference between materials science and materials engineering.

Required Text: Additional Reading and Other Materials

- **Introduction to Biomaterials, Basic Theory with Engineering Applications, C. M. Agrawal, Cambridge University Press, 2013, ISBN-13: 978-0521116909**
- **Biomaterials: The Intersection of Biology and Materials Science, A.G. Mikos J.S. Temenoff, Pearson International Edition, first edition, 2008 , ISBN-13: 978-0132350440**

Course Objectives:

- Describe biological systems, biological environment, and biological testing techniques
- Learn different technics for characterization of biomaterials
- Understand bioceramics, composite biomaterials, common polymeric biomaterials, and natural biomaterials.

Course Requirements / Due Dates

Prerequisites: Graduate status

Grade Policy:

Exams	**40%**
Projects	**20%**
Homework	**30%**
Quizzes	**5%**
Attendance	**5%**

Attendance Policy

Students are expected to attend all class sessions. Attendance will be taken and will influence the overall grade in the course (see below). The MU policy on absences will be followed; students should read and understand this policy.

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	ABET Outcome (letter) & Level (number)
Describe Biological systems, The biological environment, and Biological testing techniques	Homework assignment And projects	Homework, Quiz, Tests and projects	a,e,k
Describe different technics for Characterization of biomaterials	Homework assignment and Projects	Homework, Quiz, Tests and projects	a,d,k
Discuss bioceramics, Composite biomaterials, Common polymeric biomaterials, and natural biomaterials.	Homework assignment and projects	Homework, Quiz, Tests and projects	a,e,k
Explain cell–biomaterial interactions	Homework assignment	Homework, Quiz, Tests and projects	a,e,k

	And projects		
Describe Medical applications of biomaterials	Homework assignment and Projects	Homework, Quiz, Tests and projects	a,d,k

Course Schedule:

No of Weeks	Topic
1	Introduction, Types of bonds in materials, Types of materials, Impact of biomaterials and Future of biomaterials
2-3	Basic properties of materials, Mechanical properties, Electrochemical properties, And Surface properties
4	Biological systems, The biological environment, Genetic regulation and control systems, Biological testing techniques
5-6	Characterization of biomaterials, Infrared spectroscopy, X-ray photoelectron spectroscopy, Secondary ion mass spectrometry, Atomic force microscopy, etc..
7	Metals: structure and properties, Titanium and its alloys, Stainless steel, Cobalt–chromium alloys, Nitinol, Tantalum, etc..
8	Polymers, Molecular structure of polymers, Types of polymerization, Physical states of polymers, Common polymeric biomaterials, Hydrogels, and Nanopolymers
9	Ceramics, General properties, Classifications, and Bioceramics, Nanoceramics
10	Composite biomaterials.
11	Natural biomaterials, Collagen, Elastin, Silk, Chitosan , etc..
12	Cell–biomaterial interactions
13-14	Medical applications, Cardiovascular assist devices, Cardiovascular stents, Dental restoration, Dental implants, Orthopedic implants, etc.

Prepared by Dr. Iyad Hijazi

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 630 | (●) Graded ( ) CR/NC

Contact Person: SARDER E. SADIQUE, Ph.D., P.E. (CA) | Phone: 3046965621

NEW COURSE DATA:

New Course Title: Manufacturing Systems

Alpha Designator/Number: M E 6 3 0

Title Abbreviation: M A N U F A C T U R I N G S Y S T E M S

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course covers tool design and metal cutting theory, CAD/CAM, CIM, CNC m/c, CNC programming, fixture design, metal forming, gear manufacturing, non-traditional machining, PLC, flexible manufacturing, robotics, rapid prototyping/tooling.

Co-requisite(s): | First Term to be Offered: Spring 2015

Prerequisite(s): Graduate Status | 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 4-6-15
Registrar Roberta Ferguson 141901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair J Christofero	Date 5-20-15

9

5-26-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME 320

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.

SARDER E. SADIQUE, Ph.D., P.E. (CA), Assistant Professor of Mechanical Engineering

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.

Not Applicable

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.

Not Applicable

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

Submitted as a separate document in the Course Syllabus

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

Submitted as a separate document in the Course Syllabus

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

Submitted as a separate document in the Course Syllabus

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, 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)

Submitted as a separate document in the Course Syllabus

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: ME 630 Manufacturing Systems

Catalog Description:
This course covers tool design and metal cutting theory, CAD/CAM, CIM, CNC m/c, CNC programming, fixture design, metal forming, gear manufacturing, non-traditional machining, PLC, flexible manufacturing, robotics, rapid prototyping/tooling.

Prerequisites: Graduate status

First Term Offered: Fall 2016

Credit Hours: 3

Course Title/Number	Manufacturing Systems - ME 630
Semester/Year	Fall/2015
Days/Time	
Location	
Instructor	Sarder E. Sadique, Ph.D., P.E.(CA)
Office	Weisberg Engineering Lab Room 109 (previously lab general office) Division of Engineering College of Information Technology and Engineering Marshall University Huntington, WV 25755
Phone	304-696-5621
E-Mail	sadique@marshall.edu
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

Catalog Course Description:

This course covers tool design and metal cutting theory, CAD/CAM, CIM, CNC m/c, CNC programming, fixture design, metal forming, gear manufacturing, non-traditional machining, PLC, flexible manufacturing, robotics, rapid prototyping/tooling.

Course Prerequisites:

Graduate Status

Required Text:

Course Textbook:

- Manufacturing Processes and Systems, Phillip F. Ostwald Jairo Munoz. ISBN 0-471-04741-4

References:

- Programmable Logic Controllers & and their Engineering Applications. Alan J Crispin. McGraw-Hill Book Company
- Metrology for Engineers. Galyer J & shotbolt. Cassell.
- Materials and Processes in Manufacturing E. Paul De Garmo. J Temple Blank. Ronald A Kohser.
- Mac Millan Publishing Company. ISBN 0-02-946140-5.
- Processes and Design for Manufacturing. Sherif D.El Wakil. ISBN 0-534-95165-1
- Fundamentals of Modern Manufacturing. Mikell P. Groover. ISBN 0-471-36680-3
- Automation, Production Systems and Computer, Integrated Manufacturing, Third edition Groover M.P., Prentice Hall. ISBN 0-13-239321-2

- S. Kalpakjian, and S. R. Schmid, *Manufacturing Engineering and Technology,* 7th Edition, Pearson Prentice Hall, Singapore, 2013, ISBN-10: 0133128741.

Course Objectives:

- Describe differences between past and present methods of manufacturing.
- Identify the advantages of interchangeable parts, the assembly line, automation, robotics, and technology in the manufacturing process.
- Provides ways to analyze manufacturing systems in terms of modern and advanced manufacturing.
- Reviews fundamental topics including: optimization, process analysis and behavior of production systems.
- Analyze, design, and transform the complex systems of processes and technology that enable the extended enterprise.
- Continue to expand their capabilities through professional development and advanced education.
- Use knowledge of manufacturing principles to create, develop, and implement systems for the manufacture of products.

Class/Laboratory Schedule

- Class: 3 hrs

Grade Policy:

Attendance and Participation	5%
Homework	25%
Quizzes	10%
Project	15%
Midterm Exam	15%
Final Exam	30%

Letter Grade Scale*:

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

* *The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.*

Tests/Exams:

Makeup exams will be given only due to **extraordinary circumstances**, and only if the instructor is notified **prior** to the exam and the instructor judges it to be an acceptable excuse. Academic dishonesty (cheating) on any exam will result in a grade of zero for that exam. A second infraction will result in a course grade of F and possible University sanctions.

Grading Policy of Tests/Exams:

Three tests and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Topics to be Covered:

Lecture	Topic	Chapter
	Introduction to unit CNC programming.	
	CNC programming and CAD/CAM	
	Fixture design	
1	**Design for Manufacturability:** Product design and concurrent engineering. design for manufacture. Assembly, disassembly & service. Environmentally conscious design. Sustainable manufacturing & product life cycle.	1
2	**Design for Manufacturability:** Selecting Materials (material substitution, material properties, cost and availability, service life and recycling). Selecting manufacturing processes (casting, forming and shaping, machining (manual/CNC), joining, micro-manufacturing and nano-manufacturing, and finishing). Computer-Integrated Manufacturing. Lean Production and Agile Manufacturing. Quality Assurance and Total Quality Management.	=
3	Metal cutting theory	2
4	Cutting tool life	=
5	**Testing and Inspection:** Nondestructive testing techniques, Aautomated inspection, Quality Assurance, Statistical methods of quality control.	4
6	Logic and Boolean algebra	5
7	Non-traditional metal removal	5
8	Gear manufacturing and gear measurement.	5
9	Application of pneumatics and logic	6
10	**Bulk Deformation Processes:** Bending, Forging and Rolling, Extrusion. Rod, Wire, and Tube Drawing. Swaging. Die Manufacturing Methods. Economics of Bulk Forming.	=
7	**Sheet Metal Forming Processes**	7
8	Programmable logic controllers	8
9	**Rapid Prototyping and Rapid Tooling**	10
10	**Manufacturing of Composite Materials**	11
11	**Automation of Manufacturing Processes and Operations:** Hard automation, Numerical Control, Adaptive Control. Material Handling and Movement, Sensor Technology, Flexible Fixturing, Assembly, Disassembly and Service	14
12	**Computer-Integrated Manufacturing Systems:** Computer-integrated manufacturing databases. Computer-Aided Design and Engineering. Computer-Aided Manufacturing. Computer-Aided Process Planning. Computer Simulation of Manufacturing Processes and Systems. Cellular Manufacturing. Flexible Manufacturing Systems. Just-in-Time Production. Lean Manufacturing	15

* *The above schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students i.e. Schedule may be revised if necessary. Students will be notified if this is the case.*

Attendance Policy:

The attendance policy will follow University's excused absence policy. You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Learning Outcomes:

Course Outcome – student will:	**Implementation Method**	**Evaluation Method**	**Program Outcomes**
Describe modern manufacturing operations, including their capabilities, limitations, and how to design for lowest cost. Explain how designers influence manufacturing schedule and cost.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	c2, e2, k-3
Describe the relationship between customer desires, functional requirements, product materials, product design, and manufacturing process selection	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	c2, e2, k-3
Name the basic metal-casting Processes and Equipment including Sand, Investment, Die, Centrifugal casting, and others.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	c2, e2, k-3
Describe various Bulk Deformation Processes including forging, rolling, extrusion, drawing, and swaging.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Describe the most common sheet metal forming processes including bending of sheets, plates and tubes.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Define material removal operations including turning, boring, drilling, milling and others.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report	a2, c2, e2

		• Project	
Describe the most commonly used joining and fastening processes including oxyfuel gas welding, shielded metal arc welding, submerged arc welding, gas metal arc welding and others.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Describe the advantages and disadvantages of hard (inflexible) and soft (flexible) manufacturing automation	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Explain the advantages and disadvantages of discrete-event simulation and how it is used to reduce manufacturing costs	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2

- Demonstrate graduates have proficiency in materials and manufacturing processes: understanding the behavior and properties of materials as they are altered and influenced by processing in manufacturing.
- Demonstrate graduates have proficiency in process, assembly and product engineering: understanding the design of products and the equipment, tooling, and environment necessary for their manufacture.
- Demonstrate graduates have proficiency in manufacturing competitiveness: understanding the creation of competitive advantage through manufacturing planning, strategy and control.
- Demonstrate graduates have proficiency in manufacturing systems design: understanding the analysis, synthesis, and control of manufacturing operations using statistical and calculus based methods, simulations and information technology.

PROGRAM LEARNING OUTCOMES (ABET)

Item No.	Outcome
a-2	Complete an engineering assignment that involves the use of calculus and scientific principles (e.g., chemistry or physics).
c-2	Complete a design with clearly defined objectives, engineering standards, and realistic constraints. Present a design in a professional manner
e-1	Formulate and solve an engineering problem with given data and constraints using applicable standards for a problem already identified. Present the results in a professional manner
k-3	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice: Use of a modern engineering too for a design.

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- 635 | (•) Graded ( ) CR/NC

Contact Person: Gang Chen | Phone: 696-3204

NEW COURSE DATA:

New Course Title: Advanced Vibrations

Alpha Designator/Number: M E 6 3 5

Title Abbreviation: A d v a n c e d V i b r a t i o n s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Modeling of vibratory motion of advanced mechanical and structural systems, including continuous systems, nonlinear systems and systems with random excitations.

Co-requisite(s): None | First Term to be Offered: Spring-2016

Prerequisite(s): Graduate Status | 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 [signature]	Date 3/30/15
Registrar [signature] 141901	Date 3/31/15
College Curriculum Chair [signature]	Date 4/9/15
Graduate Council Chair [signature]	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-635

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.

Gang Chen

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

Mechanical Vibrations, 4th Ed, S. Rao, Prentice Hall, 2009.
Mechanical Vibrations: Theory and Applications, 1st Edition, Kelly, S. Graham, Cengage Learning, 2011
Any text on advanced mechanical vibrations
Journal of Sound & Vibrations

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.)

Mid-term exams 45%
HW & Projects: 25%
Final Exam: 30%

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

None

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

Mechanical Vibrations, 4th Ed, S. Rao, Prentice Hall, 2009.
Mechanical Vibrations: Theory and Applications, 1st Edition, Kelly, S. Graham, Cengage Learning, 2011
Any text on advanced mechanical vibrations
Journal of Sound & Vibrations

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: Weisberg Division of Engineering
Course Number and Title: ME 635 Advanced Vibrations
Catalog Description:
Modeling of vibratory motion of advanced mechanical and structural systems, including continuous systems, nonlinear systems and systems with random excitations.

Prerequisite: ~~Undergraduate courses in dynamics, vibrations, differential equation~~s graduate status
First year Offered: Spring 2016
Credit Hours: 3

Marshall University
Syllabus

Course Title/Number	**Advanced Vibrations, ME635**
Semester/Year	**Spring / 2016**
Days/Time	**MWF / 11:00 – 11:50 am**
Location	**Weisberg Engineering Lab 101 Classroom**
Instructor	**Gang Chen**
Office	**Weisberg Engineering Lab Room 109c** **Division of Engineering** **College of Information Technology and Engineering** **Marshall University** **Huntington, WV 25755**
Phone	**304-696-3204**
E-Mail	**chenga@marshall.edu**
Office/Hours	**MWF: 12:00-2:00pm** **For those of you who will not be able to meet the instructor during the assigned office hours, you are welcome to come and ask instructor by appointment or at an appropriate time.**
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**

Catalog Course Description

Modeling of vibratory motion of advanced mechanical and structural systems, including continuous systems, nonlinear systems and systems with random excitations.

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	Lectures, In-class discussions, in-	Questions in class, the	a2,e2

understand the concepts of advanced vibration systems and modeling	class excises, homeworks	evaluations of homework and examination problems.	
Students will be able to model and solve for continuous systems, string, rod, shaft and beam	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 analysis nonlinear vibration systems	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 mechanical system under random excitations	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2

Objective:

After taking this course, students should be able to

- Understand complex vibration systems.
- Develop dynamics models and solve for continuous system.
- Develop dynamics models and solve for nonlinear system
- Develop dynamics models and solve for randomly excited system

Required Texts, Additional Reading, and Other Materials

Mechanical Vibrations, 4th Ed, S. Rao, Prentice Hall, 2009. New York, USA, 2010,
Mechanical Vibrations: Theory and Applications, 1st Edition, Kelly, S. Graham
Any text on advanced mechanical vibrations
Journal of Sound & Vibrations

Course Requirements / Due Dates

Course Requirements : Attendance/Homework /Examinations

TEST SCHEDULE:

Hourly Exam #1
Hourly Exam #2
Hourly Exam #3
Final Exam (two hours)

Homework due Dates:

- Homework will regularly be assigned either during the class time or by e-mail/blackboard.
- Checking your e-mail is required on a daily-basis for information regarding homework assignment. Homework must be submitted before the starting time of class on the assignment date.
- Late homework is acceptable for an excused absence. For unexcused delay submission, there will be a 20% late penalty for each day it is late--starting with a 20% penalty on the first day if it is not turned in at the beginning of class. After 5 days, it will not be accepted at all.
- No late homework will be accepted after the final day of classes for the semester.
- You are expected to provide your homework on engineering papers - not a Xerox copy.
- Homework must be neat, readable, and must conform to acceptable Standards of Engineering Computation.

Grading Policy

Exams:

Three exams and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Grading Policy:

Homework and Attendance	25% (attendance 10%)
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	30%

Total	100%

Letter Grade Scale:

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

The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.

Attendance Policy

The attendance policy will follow University's excused absence policy.

You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Course Schedule:

LECTURE SUBJECT Schedule & TEXT REFERENCE

1. Introduction of Advanced Mechanical Vibrations
2. Continuous systems: string, rod, shaft and beam
3. Nonlinear systems:

- Duffing Eq.,
- Mathieu Eq.,
- van der Pol Eq.
- Analysis method

4. Mechanical vibration systems under random excitation.

- random process
- Correlation analysis, Power spectrum density
- System response

** The instructor reserves the right to slightly change the topics and their order to achieve the maximum benefit of the course learning outcomes.*

Course Prerequisites:
Graduate Status

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- 640 | (•) Graded ( ) CR/NC

Contact Person: Gang Chen | Phone: 696-3204

NEW COURSE DATA:

New Course Title: System Modeling

Alpha Designator/Number: M E 6 4 0

Title Abbreviation: S y s t e m M o d e l i n g

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Overview of system modeling and simulation of complex systems with mechanical, hydraulic, thermal and/or electrical elements. Frequency response analysis, stability, and numerical analysis of system modeling.

Co-requisite(s): None | First Term to be Offered: Fall-2016

Prerequisite(s): Graduate Status | 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 [signature]	Date 3/30/15
Registrar [signature] 141901	Date 3/31/15
College Curriculum Chair [signature]	Date 4/9/15
Graduate Council Chair [signature]	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-640

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.

Gang Chen

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

System Dynamics, 2nd Edition, Palm, William J., III, McGraw-Hill College, 2009.
Modeling Complex Systems, Nino Boccara, Springer, 2010
Any text on System Modeling
ASME Journal on dynamical systems.

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.)

Mid-term exams 45%
HW & Projects: 25%
Final Exam: 30%

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

None

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

System Dynamics, 2nd Edition, Palm, William J., III, McGraw-Hill College, 2009.
Modeling Complex Systems (Graduate Texts in Physics), Nino Boccara, Springer, 2010
Any text on System Modeling
ASME Journal on dynamical systems.

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: Weisberg Division of Engineering
Course Number and Title: ME 640 System Modeling
Catalog Description:
Overview of modeling and simulation of complex systems with mechanical, hydraulic, thermal and/or electrical elements. Frequency response analysis, stability, and numerical analysis of system modeling.

Prerequisite: ~~Undergraduate courses in dynamics, vibrations, differential equations~~
First year Offered: Fall 2016
Credit Hours: 3

Graduate Status (AN)

Marshall University
Syllabus

Course Title/Number	**System Modeling, ME640**
Semester/Year	**Fall / 2016**
Days/Time	**MWF / 11:00 – 11:50 am**
Location	**Weisberg Engineering Lab 101 Classroom**
Instructor	**Gang Chen**
Office	**Weisberg Engineering Lab Room 109c** **Division of Engineering** **College of Information Technology and Engineering** **Marshall University** **Huntington, WV 25755**
Phone	**304-696-3204**
E-Mail	**chenga@marshall.edu**
Office/Hours	**MWF: 12:00-2:00pm** **For those of you who will not be able to meet the instructor during the assigned office hours, you are welcome to come and ask instructor by appointment or at an appropriate time.**
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 modeling and simulation of complex systems with mechanical, hydraulic, thermal and/or electrical elements. Frequency response analysis, stability, and numerical analysis of system modeling.

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 determine Laplace	Lectures, In-class discussions, in-	Questions in class, the	a2,e2

Transform	class excises, homeworks	evaluations of homework and examination problems.	
Students will be able to Model Mechanical Systems	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 build Transfer Function Models	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 Model Electrical & Electromechanical Systems	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 Model Fluid & Thermal Systems	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 solve for Time Response of Linear Dynamic Systems	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 simulate Dynamic Systems using Computer	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 solve for Frequency Response of Linear Dynamic Systems	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 solve Free/forced Vibration of Multi-Degree of Freedom Systems	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 Input-Output Stability and Transient Response Analysis, Feedback Control Systems	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2

Objective:

After taking this course, students should be able to

- Integrate and model dynamical system

- Conduct time domain analysis
- Conduct frequency domain analysis
- Understand fundamentals of dynamical system and control (A,B,C,K,L or more)

Required Texts, Additional Reading, and Other Materials

System Dynamics, 2nd Edition, Palm, William J., III, McGraw-Hill College, 2009.
Modeling Complex Systems (Graduate Texts in Physics), Nino Boccara, Springer, 2010
Any text on System Modeling
ASME Journal on dynamical systems.

Course Requirements / Due Dates

Course Requirements : Attendance/Homework /Examinations

TEST SCHEDULE:

Hourly Exam #1
Hourly Exam #2
Hourly Exam #3
Final Exam (two hours)

Homework due Dates:

- **Homework will regularly be assigned either during the class time or by e-mail/blackboard.**
- **Checking your e-mail is required on a daily-basis for information regarding homework assignment. Homework must be submitted before the starting time of class on the assignment date.**
- **Late homework is acceptable for an excused absence. For unexcused delay submission, there will be a 20% late penalty for each day it is late--starting with a 20% penalty on the first day if it is not turned in at the beginning of class. After 5 days, it will not be accepted at all.**
- **No late homework will be accepted after the final day of classes for the semester.**
- **You are expected to provide your homework on engineering papers - not a Xerox copy.**
- **Homework must be neat, readable, and must conform to acceptable Standards of Engineering Computation.**

Grading Policy

Exams:

Three exams and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Grading Policy:

Homework and Attendance	**25% (attendance 10%)**
Exam 1	**15%**
Exam 2	**15%**
Exam 3	**15%**
Final Exam	**30%**

Total	**100%**

Letter Grade Scale:

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

The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.

Attendance Policy

The attendance policy will follow University's excused absence policy.

You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Course Schedule:

LECTURE SUBJECT Schedule & TEXT REFERENCE

1. Laplace Transform
2. Modeling of Mechanical Systems
3. Transfer Function Models
4. Modeling of Electrical & Electromechanical Systems
5. Modeling of Fluid & Thermal Systems
6. Time Response Analysis of Linear Dynamic Systems
7. Computer Simulation of Dynamic Systems
8. Frequency Response of Linear Dynamic Systems
9. Free/forced Vibration of Multi-Degree of Freedom Systems
10. Input-Output Stability and Transient Response Analysis
11. Introduction to Feedback Control Systems

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- 645 | (●) Graded ( ) CR/NC

Contact Person: Gang Chen | Phone: 696-3204

NEW COURSE DATA:

New Course Title: Nonlinear Dynamics

Alpha Designator/Number: M E 6 4 5

Title Abbreviation: N o n l i n e a r D y n a m i c s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Nonlinear dynamical systems, including concepts of chaos, fractal and classic dynamics equations, one dimension systems, two dimension systems, phase plane, limit cycle, bifurcation, Lorenz equation, and fractals.

Co-requisite(s): None | First Term to be Offered: Fall-2016

Prerequisite(s): Graduate Status | 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 4-6-15
Registrar 141901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair J Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-645

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.

Gang Chen

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

Lecture Notes on Nonlinear Vibrations, Richard H. Rand, Cornell Univ., 2010
Nonlinear Dynamics and Chaos, S H Strogatz, Perseus Book Publishing, 1994
Lecture Notes on Nonlinear Dynamics, Daniel Arovas, 2009, UCLA

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

Lecture

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

Mid-term exams 45%
HW & Projects: 25%
Final Exam: 30%

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

None

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

Lecture Notes on Nonlinear Vibrations, Richard H. Rand, Cornell Univ., 2010
Nonlinear Dynamics and Chaos, S H Strogatz, Perseus Book Publishing, 1994
Lecture Notes on Nonlinear Dynamics, Daniel Arovas, 2009, UCLA
Any text on nonlinear dynamics
ASME Journal on dynamical systems.

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: Weisberg Division of Engineering
Course Number and Title: ME 645 Nonlinear Dynamics
Catalog Description:
Nonlinear dynamical systems, including concepts of chaos, fractal and classic dynamics equations, one dimension systems, two dimension systems, phase plane, limit cycle, bifurcation, Lorenz equation, and fractals.

Prerequisite: Graduate status
First year Offered: Fall 2016
Credit Hours: 3

Marshall University
Syllabus

Course Title/Number	**Nonlinear Dynamics, ME645**
Semester/Year	Fall / 2016
Days/Time	MWF / 11:00 – 11:50 am
Location	Weisberg Engineering Lab 101 Classroom
Instructor	Gang Chen
Office	Weisberg Engineering Lab Room 109c Division of Engineering College of Information Technology and Engineering Marshall University Huntington, WV 25755
Phone	304-696-3204
E-Mail	chenga@marshall.edu
Office/Hours	MWF: 12:00-2:00pm For those of you who will not be able to meet the instructor during the assigned office hours, you are welcome to come and ask instructor by appointment or at an appropriate time.
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

Catalog Course Description

Nonlinear dynamical systems, including concepts of chaos, fractal and classic dynamics equations, one dimension systems, two dimension systems, phase plane, limit cycle, bifurcation, Lorenz equation, and fractals.

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 nonlinear dynamics	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 solve for classic nonlinear systems	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 phase plane, limit cycle, bifurcation.	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 one dimension system, two dimension system,	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 Lorenz Equation, fractal.	Lectures, In-class discussions, in-class excises, homeworks	Questions in class, the evaluations of homework and examination problems.	a2,e2

Objective:

After taking this course, students should be able to

- Understand nonlinear dynamics.
- Understand phase space, chaos, fractal, bifurcation.
- Develop dynamics models for complex nonlinear dynamics systems.
- Apply numerical technique for solution

Required Texts, Additional Reading, and Other Materials

Lecture Notes on Nonlinear Vibrations, Richard H. Rand, Cornell Univ., 2010
Nonlinear Dynamics and Chaos, S H Strogatz, Perseus Book Publishing, 1994
Lecture Notes on Nonlinear Dynamics, Daniel Arovas, 2009, UCLA
Any text on nonlinear dynamics

Course Requirements / Due Dates

Course Requirements : Attendance/Homework /Examinations

TEST SCHEDULE:

Hourly Exam #1

Hourly Exam #2
Hourly Exam #3
Final Exam (two hours)

Homework due Dates:

- Homework will regularly be assigned either during the class time or by e-mail/blackboard.
- Checking your e-mail is required on a daily-basis for information regarding homework assignment. Homework must be submitted before the starting time of class on the assignment date.
- Late homework is acceptable for an excused absence. For unexcused delay submission, there will be a 20% late penalty for each day it is late--starting with a 20% penalty on the first day if it is not turned in at the beginning of class. After 5 days, it will not be accepted at all.
- No late homework will be accepted after the final day of classes for the semester.
- You are expected to provide your homework on engineering papers - not a Xerox copy.
- Homework must be neat, readable, and must conform to acceptable Standards of Engineering Computation.

Grading Policy

Exams:

Three exams and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Grading Policy:

Homework and Attendance	25% (attendance 10%)
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	30%

Total	100%

Letter Grade Scale:

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

The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.

Attendance Policy

The attendance policy will follow University's excused absence policy.
You are expected to attend all classes. However, the instructor accepts your absence for one session provided that

an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Course Schedule:

LECTURE SUBJECT Schedule & TEXT REFERENCE

1. Introduction of nonlinear dynamical system
2. chaos, fractal and classic dynamics equations,
3. one dimension system,
4. two dimension system,
5. phase plan
6. limit cycle, bifurcation, Lorenz equation, fractal.
7. Applications in mechanical engineering

** The instructor reserves the right to slightly change the topics and their order to achieve the maximum benefit of the course learning outcomes.*

Course Prerequisites:

Graduate Status

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: ME649 | (•) Graded ( ) CR/NC

Contact Person: Asad Salem | Phone: 696-3207

NEW COURSE DATA:

New Course Title: Sustainable Energy Management

Alpha Designator/Number: M E 6 4 9

Title Abbreviation: S u s t a i n a b l e E n e r g y M g m t

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
Sustainable energy management, provides an overview of mechanical and control systems within buildings with sub-systems which possess a visible energy signature in terms of energy usage, inefficiency, and impact.

Co-requisite(s): None | First Term to be Offered: Spring-2016

Prerequisite(s): Graduate Status | 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 [signature]	Date 4-6-15
Registrar [signature] 141901	Date 4/7/15
College Curriculum Chair [signature]	Date 4/9/15
Graduate Council Chair TChristofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-649

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.

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.

None

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.

Not Applicable

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.

None

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

Please refer to the attached syllabus

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

Please refer to the attached Syllabus

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

Hand Outs

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

Lecture

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

Mid-term exams 50%
Assigements including Projects: 25%
Final Exam: 25%

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

None

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

- A Management System Standard for Energy, Georgia Tech Energy and Environmental Management Center. (www.ase.org/files/1152_file_brownpaper.pdf)
- ANSI/MSE 2000: A Single Standard for Diverse Business Sectors, Georgia Tech University. (https://txspace.tamu.edu/bitstream/1969.1/4565/1/ESL-HH-02-05-17.pdf)
- Lessons Learned from Case Studies of Six High-Performance Buildings, NREL, June 2006. (http://www.nrel.gov/docs/fy06osti/37542.pdf)
- Los Alamos National Laboratory Sustainable Design Guide, (http://www.eere.energy.gov/buildings/highperformance/pdfs/sustainable_guide/sustainable_guide_ch5.pdf)
- Procedure for Measuring and Reporting Commercial Building Energy Performance, NREL, October 2005. (http://www.nrel.gov/docs/fy06osti/38601.pdf)

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: Weisberg Division of Engineering
Course Number and Title: ME649 Sustainable Energy Management
Catalog Description:
Sustainable energy management, provides an overview of mechanical and control systems within buildings with sub-systems which possess a visible energy signature in terms of energy usage, inefficiency, and impact.

Prerequisite: Graduate status
First year Offered: Spring 2016
Credit Hours: 3

Course Title/Number	**ME 649: Sustainable Energy Management**
Semester/Year	
Days/Time	
Location	EL 101
Instructor	Dr. Asad Salem
Office	EL 108
Phone	304-696-3207
E-Mail	salema@marshall.edu
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

Catalog Course Description:
Sustainable energy management, provides an overview of mechanical and control systems within buildings with sub-systems which possess a visible energy signature in terms of energy usage, inefficiency, and impact.

Prerequisite: Graduate status
Required Text: None. Hand outs

References:

- A Management System Standard for Energy, Georgia Tech Energy and Environmental Management Center. (www.ase.org/files/1152_file_brownpaper.pdf)
- ANSI/MSE 2000: A Single Standard for Diverse Business Sectors, Georgia Tech University. (https://txspace.tamu.edu/bitstream/1969.1/4565/1/ESL-HH-02-05-17.pdf)
- Lessons Learned from Case Studies of Six High-Performance Buildings, NREL, June 2006. (http://www.nrel.gov/docs/fy06osti/37542.pdf)
- Los Alamos National Laboratory Sustainable Design Guide, (http://www.eere.energy.gov/buildings/highperformance/pdfs/sustainable_guide/sustainable_guide_ch5.pdf)
- Procedure for Measuring and Reporting Commercial Building Energy Performance, NREL, October 2005. (http://www.nrel.gov/docs/fy06osti/38601.pdf)

Course objectives

1. List the dominant energy resources currently being used
2. List potential future alternative energy resources and their current barriers to more extensive adoption

1. Appreciate the connection between current and future energy consumption and the environment, politics, economics, and society 2. Describe various emissions reduction technologies 3. Review, comprehend, describe, and critique current research and new publications relating to energy
4. Calculate basic energy and emission rates for Buildings 5. Conduct a basic economic analysis in order to compare competing options 6. Quantify energy resources and power generation rates for alternative energy technologies such as wind turbines, PV, and solar thermal 7. Assess the amount of energy one consumes and quantify the environment impact
8. Develop a short proposal for an energy option containing a simple analysis of both energy and environment impacts for a customer 9. Prepare a critical review of an emerging energy technology option 10. Research and debate a current energy issue

Course expected learning outcomes

Upon completion of this course, the students should be able to

1) Meet all the above objectives and
2) Apply engineering principles to assess and evaluate energy systems for maximum performance
4) Conduct a comprehensive economic assessment of energy conversion systems for Industrial and commercial applications
5) Modify or propose a new or alternative designs to enhance energy efficiency and reduce environmental impacts
6) Demonstrate energy assessment methods and communicate effectively by both oral and written presentations.

Course Outlines:

Part I: Energy Management and the Whole Building Design Process

1. ANSI/MSE 2000 System Requirements
2. Key performance indicators
3. Case studies where ANSI/MSE 2000 has been applied
4. Case studies by National Renewable Energy Lab of high-performance buildings

Part II: Energy modeling in the Build Environment (Design Builder/EnergyPlus)

5. Building energy modeling with Design Builder / Energy plus

Part III: The building envelope.

6. Building orientation and shape (area/volume)
7. Specific variables: U, R, SHGC, etc.
8. Conduction, convection and radiation losses/gains
9. Windows
10. Infiltration

Part IV: Solar gain management

11. Solar gain
12. Strategies to minimize solar gain (cooling environment)
13. Strategies to maximize solar gain (heating environment)

Part V: Lighting. Daylighting strategies

14. Lighting and luminaire types, characteristics and selection
15. Daylighting principles

Part VI: HVAC and Central Plant Systems

16. Heating and cooling load calculation
17. System types and selection (VAV/CAV/air dist. systems)
18. "Free" Cooling system
19. Evaporative cooling systems
20. Air to air energy recovery systems
21. Central Plant Systems

    Part VII: Plumbing and Water Use
22. Indoor plumbing fixtures
23. Waste water recycling/reusing
24. Water consuming mechanical systems
25. Location specific considerations (i.e. rainwater harvesting system / desalination)

    Part VIII: Electrical power and building control systems

    Part IX: Energy Assessment and reporting
26. The energy assessment
27. How to report building energy performance

Grading:

Grading Basis:	Mid-term exams:	50%	A:	90-100%
	Assignments:	25%	B:	80-90%
	Final Exam:	25%	F:	0-60%

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

ABET Program Outcomes:
(a-2) an ability to apply knowledge of mathematics, science, and engineering
(c-3) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d-2) an ability to function on multidisciplinary teams
(e-3) an ability to identify, formulate, and solve engineering problems
(f-1) an understanding of professional and ethical responsibility
(g-2) an ability to communicate effectively
(h-2) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

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: ME650-653 | (•) Graded ( ) CR/NC

Contact Person: Asad Salem | Phone: 696-3207

NEW COURSE DATA:

New Course Title: Special Topics

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

Title Abbreviation: S p e c i a l T o p i c s

(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): None | First Term to be Offered: Fall-2015

Prerequisite(s): Graduate Status | Credit Hours: 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 4-6-15
Registrar 14901	Date 4/7/15
College Curriculum Chair	Date 4/9/15
Graduate Council Chair Christofero	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: CITE | Department/Division: ENGINEERING | Alpha Designator/Number: ME-675

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.

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.

None

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.

Not Applicable

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.

None

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

Will vary by course

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

Will vary by course

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

Will vary by course

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

Will vary by course

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

Will vary by course

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

None

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: Weisberg Division of Engineering
Course Number and Title: ME650-653 Special Topics
Catalog Description:
Subject matter to be selected from topics of current interest.

Prerequisite: Graduate Status
First year Offered: Fall 2015
Credit Hours: 1-4

Chair: Tracy Christofero | **GC#4: Major or Degree**

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: Weisberg Division of Enginering

Contact Person: Asad A. Salem

Phone: 304 - 696 - 3207

Degree Program: Master of Science in Mechanical Engineering (MSME)

Check action requested: ☒ Addition ☐ Deletion ☐ Change

Effective Term/Year: Fall 20 15 ☐ 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 3/30/2015
College Curriculum Chair	Date 4/8/2015
College Dean Wael Mokhtar	Date 04/08/2015
Graduate Council Chair JChristofero	Date 5-20-15
Provost/VP Academic Affairs	Date
Presidential Approval	Date
Board of Governors Approval	Date

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)

Please see attachment.

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)

Please see attachment.

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 see attachment.

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)

New degree program. Current Catalog has no description about the new program.

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 see attachment.

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: Weisberg Division of of Engineering
Major or Degree: Master of Science in Mechanical Engineering (MSME)
Type of Change: Addition
Rationale: Please see attachment

Graduate Degree Addition

Master of Science in Mechanical Engineering (MSME)

Weisberg Division of Engineering

Marshall University

Proposed Implementation Date: Fall 2015

Dr. Asad A. Salem

March 27, 2015

Graduate Degree Addition
Master of Science in Mechanical Engineering (MSME)
Weisberg Division of Engineering

Brief Program Description:
This is a Graduate Degree Addition for a Master's of Science in Mechanical Engineering Program (MSME) by the Weisberg Division of Engineering of the College of Information Technology and Engineering (CITE) to graduate mechanical engineers for meeting West Virginia's increasing technological demands. Graduates of this Program 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 mechanical engineering (MSME) 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 MSME 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 MSME at Marshall University once the program is in place. The MSME will enable the introduction of an Accelerated Master's Degree (AMD or 4+1) program in BSME. AMD allows outstanding undergraduate students to complete a traditional four-year Bachelor's degree in Mechanical Engineering and then, with one additional year, earn a Master's degree. AMD will help attract more highly motivated undergraduate students to Marshall University. The MSME degree program is essential to attract and retain qualified faculty members in ME. Also, research is an integral part of a faculty member's career to stay abreast in a rapidly evolving field such as ME. MSME program is critical to helping faculty members stay current and also contributes to keeping the BSME program current and relevant.

This proposed MSME program is to be established on the foundation of the currently under-review BSME program. Therefore, both programs are to share the same resources. The program will cost approximately $2.4 million during its first five years, of which about $150,000 will be used to develop needed laboratories. The program is expected to generate $3.6 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, 45 students will have graduated with a MSME degree and approximately 72 students will be actively pursuing a MSME degree at MU.

Contents

1. Rationale for the New Degree Program

1.1 Market Demand

This is an application for a Master's of Science in Mechanical Engineering Program MSME by the Weisberg Division of Engineering of the College of Information Technology and Engineering (CITE) to prepare mechanical engineers for meeting West Virginia's increasing technological demands. Graduates of this Program will contribute to West Virginia's economic development, advance its competitive edge globally and contribute to improvement in the quality of life.

Mechanical Engineering is an engineering discipline that requires an understanding of mechanics, kinematics, thermodynamics and energy, and involves the application of principles of physics and mathematics to develop mechanical systems. The American Society of Mechanical Engineers (ASME) defines mechanical engineering as: the branch of engineering that serves society through the analysis, design, and manufacture of systems, at all size-scales, that convert a source of energy to useful mechanical work. In 2004, the ASME noted in its publication, "A Vision of the Future of Mechanical Engineering Education," that mechanical engineering education was "changing" in order to address "societal concerns." The discipline is very broad, encompassing elements of these areas: energy science and technology, sustainability, propulsion, sensing and control, nanomaterials, nano- and micro-mechanics, design mechatronics, computational simulation, solid and fluid dynamics, manufacturing, micro-electromechanical systems (MEMS), and biomechanical engineering.

The U.S. Bureau of Labor projected a 5-8 percent increase in the national demand for mechanical engineers and closely related fields (manufacturing and materials) between 2012 and 2022. The demand for mechanical engineers with expertise in the design and development of mechanical systems for occupational safety and biomedical applications is projected to increase 13% nationally over the same period. The demand for engineers with expertise in the design of mechanical systems associated with alternative fuels and renewable energy is projected to increase 12% nationally in the next 10 years.

According to *U.S. News & World Report*, workers with master's degrees generally earn higher salaries than workers with less education (i.e bachelor). The Census Bureau data show us that typically mechanical engineers with master's degrees earn about $10,000-12,000 more a year (roughly, 15 percent) than those just having a bachelor's degree. Master's degree holders will generally start at a higher compensation level and progress faster in their careers. Data from ASME and ASCE for mechanical and civil engineers shows the increase above median annual income earned by a Bachelor's degree is 11-19 percent for a Master's. The U.S. Bureau of Labor Statistics (BLS) also noted that careers that require a master's degree to enter the field are projected to see the most job growth from 2012-2022. Advancement opportunities can include moving into managerial or administrative positions and obtaining licensure and certification.

A master's degree in mechanical engineering is often necessary to land certain jobs or for career advancement within certain disciplines of mechanical engineering. Many careers that require master's degrees are typically found in sectors such as research and product development. Mechanical 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, and leadership and communication skills.

A master's degree in mechanical 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 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 it 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 the USA in general and West Virginia in particular lags seriously in producing them. The 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 actions 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 of engineering in Master's degrees grew to about 113,000 in 2013, representing a 6 percent above the previous year. In the 2012-13 academic year, there were 23554 students enrolled in MSME programs and related fields nationwide (Engineering Enrollment 2012-13, www.asee.org/college) at a rate of 71 per million capita. The total enrollment in state supported MSME programs in West Virginia was estimated to be 85 students in Fall 2013 at a rate of 44 per million capita—27 per million lower than the national average.

1.2 Strategic Importance

Given the above backdrop and especially the opportunities unfolded by renewable energy, bio and hydro-carbon fuels, sustainability, nanomaterials and biotechnology, introducing a n MSME degree at Marshall University is of strategic importance for the following reasons:

- There is only one Mechanical Engineering Master's Degree program in the state of West Virginia], which is located at the West Virginia University. Given the high demand for Mechanical

Engineering (ME) graduate education and excellent job opportunities, there is a need for an additional master's programs to serve the southern West Virginia and Tri-State region population.

- The Marshall University Bachelor of Science in General 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. An MU MSME program will help to keep more of West Virginia ME students in the state.
- Given the rapid advances in the mechanical engineering (ME) discipline, an MSME degree program is essential for providing BSME students an educational experience that reflects current advances and practices in the field. The MSME program provides a research-oriented academic environment that helps to attract more students into the BSME program. BSME and MSME programs complement each other and they are like *Yin and Yang* as attested by their co-existence in almost all broad-based universities in the US.
- The MSME will enable the introduction of an Accelerated Master's Degree (AMD or 4+1) program in BSME. The AMD allows outstanding undergraduate students to complete a traditional four-year Bachelor's degree in Mechanical Engineering and then, with one additional year, earn a Master's degree. The AMD will help attract more highly motivated undergraduate students to Marshall University.
- The MSME 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 MSME at Marshall University once the program is in place. This is not surprising given the current and future ME job growth rates in the US and globally.
- The MSME degree program is essential to attract and retain qualified faculty members in ME. Also, research is an integral part of a faculty member's career to stay abreast in a rapidly evolving fields such as ME. The MSME program is critical to helping faculty members stay current and also contributes to keeping the BSME program current and relevant.
- Even at the current research activity level at Marshall University, MSME 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. The MSME 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. The MSME degree program will help in making proposals more competitive.

1.3 Five-Year Enrollment Projection

Assuming a Fall, 2015 start date, the Table below shows projected MSME 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 MSME 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. Another scenario is 9 hours of course work during each of the first three semesters, and completion of comprehensive 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 20. 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 15-20 students graduate every year. Offering 9 graduate courses per academic year requires 1.5 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.

MSME Program Five-Year Enrollment Projection

	New Students	Attrition	Graduation	Cumulative Head Count	Cumulative FTE
1st year 2015-16	18	0	0	18	18
2nd Year 2016-17	24	2	0	40	40
3rd Year 2017-18	25	3	10	52	52
4th Year 2018-19	30	3	15	56	56
5th Year 2019-20	40	4	20	72	72

1.4 Expenses and Revenue Projection

No additional faculty will be needed to support this program. As it was mentioned earlier, this proposed MSME program as well as the currently under-review BSME program will share faculty and resources and students as well (in case of the accelerated BSME/MSME program). It is neither practical nor possible to accurately assess the financial impact of the MSME program in the absence of the BSME program. Therefore, a pro-forma model analysis was done for both programs (Appendix B). It was assumed that

MSME anticipated cost and revenues are 25% of the total cost and revenues of combined programs. The listed table shows the MSME portion:

Five-Year Costs		Five-Year Funding	
Personnel[1]	$1,295,000	Reallocated Funds[2]	$545,000
Equipment	$150,000	Anticipated State Funding	$0.0
Program Start-up/ Development (Including Library Cost)	$329,000	Special Item Funding (Industry Support) Research	$150,000 $150,000
Annual Operating Expenses	$656,000	Tuitions &Fees	$2,793,000
Total Costs	$2,430,000	Total Funding	$3,638,000

1. Includes costs for new faculty hires, adjuncts, reallocated faculty time, program administration, and clerical and technical support personnel. For new faculty and reallocated faculty, individual salaries are prorated as a percentage of the time assigned to the program.
2. Reallocated funds are from faculty and staff salaries that will be assigned to the program.

2. Additional Resource Requirements

The proposed MSME program is to be established on the foundation of the currently under-review BSME program. Therefore, both programs are to share same resources. However, the MSME 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 Weisberg Division of Engineering will be housed in the Arthur Weisberg Family Applied Engineering Complex, a new building which is under construction (expected occupancy: Spring/Summer, 2015). Adequate space for faculty offices, classrooms, and computer labs has been provided in the new building for the current and near-term Engineering division needs.

Though the MSME program primarily targets INTO program students and local/regional full-time students, some MSME courses will be offered in the evenings to accommodate working professionals. The schedule for evening courses will be rotated in such a way to enable working professionals to earn a MSME degree. These courses will also help reduce contention for classrooms during peak hours. Therefore, no additional physical infrastructure is needed.

2.2 Research & Students Support

The Division has five laboratories that are associated with the existing engineering program. Most of these facilities can be utilized as associated mechanical engineering laboratories with the proper equipment complement. The needed labs for the BSME will require approximately 20,000 sq. ft. of additional teaching laboratory space as well as additional appropriate support staff. All needed space will be accommodated in the Weisberg Family Applied Engineering Complex and Weisberg Engineering Lab.

More specialized and research grade equipment will be needed to have state-of-the-art laboratories to support the research initiatives. Local industries and the community are expected to raise $600,000-1,000,000 for equipment, scholarships, and other start-up costs for the new mechanical engineering program.

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 MSME program requires finical 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 MSME program is to be established on the foundation of the currently under-review BSME 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.

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.

Name of Core Faculty and Faculty Rank	Highest Degree	Courses Assigned in Program	% Time Assigned To Program
Salem, Asad * Professor [Primary responsibility for administering the program]	PhD in Mechanical Engineering (Energy & Thermal Science)	ME520,530, 601,625,650, 685 & 690	25%
Chen, Gang Associate Professor	PhD in Mechanical	ME- 515, 604,635, 640, 685 & 690	25%

	Engineering (Dynamical Systems)		
Hijazi, Iyad Assistant Professor	PhD in Mechanical Engineering (Materials)	ME -550, 601,602, 620, 625,685 &690	25%
Sadique, Serdar Assistant Professor	PhD in Mechanical Engineering (Manufacturing)	ME- 601, 602, 615, 630, 685 &690	25%
New Faculty (I) in Year 2016	PhD in Mechanical Engineering (Design)	ENGR -570, ME:560, 601, 602, 604, 685 &690	25%
New Faculty (II) in Year 2016	PhD in Mechanical Engineering (Thermo-Fluids)	ME- 520, 530, 650, 685 & 690	25%
New Faculty (III) in Year 2016	PhD in Mechanical Engineering (Controls)	ME -601, 602, 604, 640, 685 &690	25%

Annual Course Schedule to Meet MSME Requirements

	Fall	Spring
Year I	ME-601* ME-604 ME-685** ME-690** Three Elective Courses	ENGR-570 ME-602* ME-685** ME-690** Three Elective Courses
Year II	ME-601* ME-604 ME-685** ME-690** Three Elective Courses	ENGR-570 ME-602* ME-685** ME-690** Three Elective Courses
*ME-601 & ME-602 are a sequence ** ME-685 (Design Project) & ME-690 (Thesis) will be offered based on students and faculty interests.		

The BSME/MSME Projected Faculty Course Load in 2016-2017

	Fall 2016					Spring 2017				
Faculty	ENGR	BSME	MSME	Total SCH	Total Cont. Hrs	ENGR	BSME	MSME	Total SCH	Total Cont. Hrs
Chen	3	3	3	9	9	0	5	3	8	9
Hijazi	3	3	3	9	9	4	3	0	7	9
Sadique	6	3	0	9	9	0	6	3	9	11
Salem	1	3	3	7	9	0	3	3	6	6
Mechatronics*	7	0	0	7	8	3	3	3	9	10
TOTAL (BSME/MSME)	20	12	9	41	44	7	20	12	39	45
*New faculty as a replacement to Dr. Bill Pierson in the area of Mechatronics- Active faculty search										

From the above listed table, it is noticed that during a typical academic year the average teaching load for a designated BSME faculty is 13.0 SCH of undergraduate related courses/ year (15.2 Contact Hours) and 5.0 SCH of graduate related course/ year to a total of 18.0 SCH/ year. Therefore, the faculty will have 25% time release to pursue their research interests

3 Non-Duplication

The new MSME degree program does not duplicate any existing graduate programs.

4 New Catalog Description

4.1 Program Description

The Master of Science in Mechanical Engineering (MSME) degree is designed to provide students with the knowledge, skill, and professional practices needed to develop and design mechanical 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 Mechanical 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 MSME 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 MSME degree. If the student has a minimum cumulative graduate GPA of 3.30 in his or her first 9 credit hours of CITE MSME courses, that student may re-apply to the university to be considered for admission to the MSME 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 MSME 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

Each degree candidate is required to complete at least 30-33 graduate credit hours, depending on the "option" chosen below (project, 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. Focus areas include sustainability, materials and manufacturing, bio-mechanical engineering, thermo/fluids, and mechanics/design. 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 "project option," the "thesis option," or the "coursework only option" after consultation with their academic advisor.

Project Option (30 hours). The comprehensive project involves the application of coursework completed as part of the degree to a practical problem. Students will work with their advisor to identify an appropriate project and scope. Students must prepare a formal written report and deliver an oral presentation to a committee. Students register for ENGR 699 Comprehensive Project (3 HR) during the semester in which their project will be completed and presented, but preliminary work on the project may commence before that semester.

ENGR 570	Finite Element Analysis	3 hrs
ME 601	Advanced Engineering Analysis I	3 hrs
ME 602	Advanced Engineering Analysis II (or ENGR 610 with advisor approval)	3 hrs
ME 604	Research Methods	3 hrs
Five (5) Elective Courses		15 hrs
ENGR 699	Comprehensive Project	3 hrs

Thesis Option (30 hours). The thesis option involves the completion of 6 HR of research (ENGR 681) under the direction of an advisor on an approved project. The student must prepare a formal thesis proposal (including a statement of work, extensive literature search, and proposed timeline) in consultation with their advisor and present the proposal to their graduate thesis committee, which is formed in consultation with their advisor. The thesis proposal must be defended and approved by the thesis committee prior to the final semester of study (typically completed during first semester of ENGR 682). Students must then summarize their research work in the form of a formal, written thesis and successfully defend it before their thesis committee in order to fulfill the requirements for the degree (typically completed during second semester of ENGR 682). Thesis work is typically conducted over two semesters.

ENGR 570	Finite Element Analysis	3 hrs
ME 601	Advanced Engineering Analysis I	3 hrs
ME 602	Advanced Engineering Analysis II (or ENGR 610 with advisor approval)	3 hrs
ME 604	Research Methods	3 hrs
Four (4) Elective Course		12 hrs
ENGR 682	Research	6 hrs

Coursework Only Option (33 hours). Students can complete 33 hours of coursework and then complete a comprehensive examination within the last two semesters of graduation to fulfill the requirements of their degree. Examinations will be administered once per semester for all students.

ENGR 570	Finite Element Analysis	3 hrs

ME 601 Advanced Engineering Analysis I ..... 3 hrs
ME 602 Advanced Engineering Analysis II (or ENGR 610 with advisor approval) ..... 3 hrs
Eight (8) Elective Courses ..... 24 hrs

Approved Elective Courses

Any ME (Mechanical Engineering) course approved in advance by the student's advisor
Any CE (Civil 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

5. Summary of Courses in MSME Degree

Existing Courses

ENGR 610- Applied Statistics
ENGR 685-88- Independent Study
ME 601- Advanced Engineering Analysis I
ME 604- Research Methods

Existing Courses being Modified (proposal submitted concurrently)

The following course modification has been submitted to the Graduate Council for Approval:

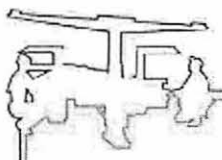
ENGR 570 – Finite Element Analysis (being changed from CE 615 Finite Element Applications)

New Courses (proposals submitted concurrently)

The following course additions have been submitted to the Graduate Council for Approval:

ME 515- Vehicle Dynamics
ME 520- Introduction to Computational Fluid Dynamics
ME 530-Renewable Energy
ME 545- Nano-Materials
ME 560 -Automation and Control
ME 602- Advanced Engineering Analysis II
ME 617 -Additive Manufacturing
ME 621 -Corrosion Engineering
ME 625- Tribology
ME 628- Applied Biomaterials
ME 630- Manufacturing Systems
ME 635- Advanced Vibrations
ME 640- System Modeling
ME 645- Nonlinear Dynamics
ME 649 -Sustainable Energy Management
ME 650-653- Special Topics
ENGR 682- Research
ENGR-699- Comprehensive Project

Appendix A
Letters of Support



J. H. FLETCHER & CO. Box 2167 — Huntington, WV 25722-2167 — 304-525-7811 — FAX 304-525-3770

September 8, 2014

Subject; Marshall Letter of Support

To whom it may concern,

My company is J. H. Fletcher & Company, (Fletcher®). Fletcher is located in Huntington, West Virginia. Fletcher is the world's leading supplier of underground mining roof bolters. We design and manufacture roof bolters and other specialized mining equipment that keeps miners safe. We have supplied equipment for mines all around the world.

Fletcher is located in the tri-state location of Northeast Kentucky, Southeast Ohio, and Western West Virginia. We are several hours from the nearest mechanical engineering schools.

We are in support of Marshall University to establish BSME and MSME program. We feel our company can benefit greatly by partnering with Marshall to establish a strong and accredited engineering program in our community. Not only does Fletcher benefit but so does our tri-state community giving our children options of gaining a quality engineering education close to home.

Please let it be known J. H. Fletcher & Co fully supports Marshall University as it establishes and advances its engineering program.

Sincerely,

Tim Burgess

Tim Burgess, PE
Vice President of Engineering
J. H. Fletcher & Co.

Cc Doug Hardman
Rod Duncan
Greg Hinshaw

Marathon Petroleum Company LP

11631 US 23
Catlettsburg, KY 41129
Telephone 606/921-3333
FAX 606/921-3290

September 22, 2014

Asad A. Salem, Ph.D
Professor and Chair
Weisberg Division of Engineering
College of Information Technology and Engineering
Marshall University
Huntington, WV 25755-2586

Re: Marathon's Support of Marshall University developing a Mechanical Engineering Program

Dear Dr. Salem:

On behalf of Marathon Petroleum Corporation, I would like to express support for the development and accreditation of a Mechanical Engineering program at Marshall University. Marathon maintains a strong presence in the tri-state area in the form of our Catlettsburg (KY) Refinery, and other local facilities. 81 Marshall graduates are currently employed at the Catlettsburg site, but only two of those are recent engineering graduates. Having a vibrant Mechanical Engineering presence locally would provide an excellent source of engineers for Marathon and a source of jobs for Marshall graduates. Marathon employs a large number of engineers throughout our seven-refinery system and support groups. The Catlettsburg Refinery currently employs 113 degreed chemical, mechanical, electrical, and civil engineers. We utilize Mechanical Engineers in a variety of roles including project engineering, project management, maintenance support, and equipment reliability in addition to supervisory positions. We also utilize a robust co-op student program that involves the employment of engineering students to fill over 80 year-round positions. Marathon would welcome a quality, local source of engineers to fill these full-time and co-op positions.

Currently we recruit at a number of universities within reasonable proximity to our refineries including several that surround Marshall University (Virginia Tech, West Virginia Tech, The Ohio State University, University of Toledo, University of Cincinnati, University of Louisville, and The University of Kentucky). Marshall University would make a nice fit into our recruiting network and Marathon would provide an attractive source of employment opportunities for Marshall University ME graduates.

In summary, Marathon wholeheartedly supports the continued development of Marshall's Engineering Department in general and the Mechanical Engineering Department in particular. A recent forecast by Kelly Services quoted in Civil Engineering magazine (September 2014) predicts an increase of almost 250,000 engineering jobs in the US economy in the next ten years of which over 25,000 of those will be mechanical engineers. With the continued growth in the oil and gas sector including the Utica and Marcellus shale areas in West Virginia, Ohio, Pennsylvania, and New York, many of those jobs will be very reachable for Marshall graduates. Now is an excellent time to begin meeting the needs of the engineering market.

Sincerely,

Dan Schlaeppi
Engineering Manager
Catlettsburg Refining, LLC

CC: J. Lane
R. Hernandez
G. Jackson
M. Churton

GRW | engineering | architecture | geospatial
801 Corporate Drive | Lexington, KY 40503
859.223.3999 | www.grwinc.com

October 22, 2014

Asad A. Salem, Ph.D
Chair of the Weisberg Division of Engineering
College ofInformation Technology and Engineering
Marshall University
Huntington, WV 25755-2586

Dear Dr. Salem:

I have reviewed and studied the Intent to Plan for both the Bachelor of Science -Mechanical Engineering and the Master of Science in Mechanical Engineering Programs proposed for Marshall University.

As an employer of mechanical engineers, I have first-hand knowledge of the difficulty in recruiting mechanical engineers. The available pool is scarce and that difficulty will increase significantly when the "baby boomer" generation begins to retire. I recently read that it is estimated that over 33% of the engineers employed in architectural/engineering firms in the United States are over 55 years old.

Marshall University is situated in a region that is heavily industrialized as well as a major energy producing area. The demand for mechanical engineers in these markets far exceeds the availability, resulting in increased costs to employers in the recruitment and retaining graduate mechanical engineers to meet this ever-growing demand.

The need for these two programs outlined in the Intent to Plan is compelling and irrefutable. I strongly support the development of these two programs at Marshall University.

Very truly yours,

Ron D. Gilkerson, PE
President

RDG/rf

January 2, 2015

Asad A. Salem, Ph.D
Professor and Chair
Weisberg Division of Engineering
College of Information Technology and Engineering
One John Marshall Drive
Huntington, WV 25755-2586

Dear Dr. Salem:

I wanted to take a moment and to tell you that I am pleased that Marshall University is expanding their engineering program to include a Bachelor and Masters of Science in Mechanical Engineering. As you are aware I have been associated with the engineering program at Marshall during my forty year career at the U.S. Corps of Engineers in Huntington, West Virginia and now during my career at Triad Engineering, Inc. Although my professional work is more directly related to the civil engineering profession, I often work on projects that require the services of a mechanical engineer. From my experience at the Corps and working with other firms that provide mechanical engineering services, the addition of the Mechanical Engineering program at Marshall University will help to fulfil a shortage of mechanical engineers in this area.

I fully support the addition of a Bachelor and Masters of Science in Mechanical Engineering at Marshall University.

Sincerely;

David F. Meadows, P.E., P.S.
Southwest Regional Manager

10541 Teays Valley Road | Scott Depot, WV 25560
p: 304.755.0721 f: 304.755.1880 w: www.triadeng.com

From: David.S.Webb@dupont.com [mailto:David.S.Webb@dupont.com]
Sent: Wednesday, January 21, 2015 3:58 PM
To: Salem, Asad
Subject: David Webb - DuPont

Dr. Assad Salem,

Thank you very much for your time and explaining the status of the engineering program at Marshall University. I believe that a Mechanical and Engineering school at Marshall is an absolute necessity for the region. This will help drive businesses to expand and develop faster with a larger pool of skilled engineers to choose from in the Tri-State Area. Recruiting of engineers from outside the state that did not grow up here is very difficult. A local engineering University in the Huntington vicinity solves the problem long-term for companies and corporation. It allows us grow more easily with stable work force that want to live in this are...

I believe this will also drive entrepreneurship in starting and building high-tech new businesses not only in Hunting but the Tri-State area in general. In addition, it will also help attract large corporations to locate in the area and/or expand more easily.

The FACT the Marshall University already has a Civil engineering program that is ABET certified and is on its way to this certification in Mechanical Engineering. I would like to announce my support for the coop program for Mechanical Engineering program at Marshall University. I would like to begin recruitment of the first coops in the program in February 2015 for the Summer and Fall Semesters of 2015.

Please advise to a target date in February for me to come an interview student candidates.

I look forward to meeting your new potential engineers.

Regards,

David Webb
Belle MIQA Leader
901 West Dupont Road.
Belle, WV. 25015
P: (304) 357-1376
F: (304) 357-1022
C: (304) 521-3037
e-mail: david.s.webb@dupont.com

APPENDIX B
Attached Spread Sheet
FIVE-YEAR COST and FUNDING

MSME PROGRAM BUDGET PRO FORMA

	Base Salary (Year 1)	Benefits 27%	Year of Hire	Year of Prom	FISCAL YEAR EXPENSES Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	Annual Salary Increase:		3%							
Adim:Faculty Position 0 - Chair-1/4 time Existing	$ 30,000	$ 8,100	-	99	$ 36,990	$ 38,100	$ 39,243	$ 40,420	$ 41,633	$ 42,882
Faculty Position 1- Asst. Professor (0.25FTE)	$ 28,750	$ 7,763	3	99	$ -	$ -	$ -	$ 38,736	$ 39,898	$ 41,095
Faculty Position 2 -Asst. Professor (0.25 FTE)	$ 28,750	$ 7,763	3	99	$ -	$ -	$ -	$ 38,736	$ 39,898	$ 41,095
Faculty Position 3 -Asst. Prof(0.25 FTE)	$ 28,750	$ 7,763	3	7	$ -	$ -	$ -	$ 38,736	$ 39,898	$ 41,095
Faculty Position 1- Asst. Prof Existing (0.25 FTE)	$ 18,750	$ 5,063	-	8	$ 23,119	$ 23,813	$ 24,527	$ 25,263	$ 26,021	$ 26,801
Faculty Position2 - Asst.Prof Existing (0.25 FTE)	$ 19,375	$ 5,231	-	8	$ 23,890	$ 24,606	$ 25,344	$ 26,105	$ 26,888	$ 27,695
Faculty Position 3 - Assoc. Prof Exist (0.25 FTE)	$ 21,375	$ 5,771	-	7	$ 26,356	$ 27,146	$ 27,961	$ 28,799	$ 29,663	$ 30,553
Equivalent Faculty Position - (BSE)(0.25 FTE)	$ 21,750	$ 5,873	-	7	$ 26,818	$ 27,623	$ 28,451	$ 29,305	$ 30,184	$ 31,089
Faculty Position 0 - Asst Prof	$ -	$ -	2	8	$ -	$ -	$ -	$ -	$ -	$ -
Faculty Position 0- Asst Prof	$ -	$ -	3	9	$ -	$ -	$ -	$ -	$ -	$ -
Classified Employee 1 (1/4 time)	$ 18,750	$ 5,063	-		$ 25,431	$ 26,194	$ 26,980	$ 27,789	$ 28,623	$ 29,481
Classified Employee0 (1/4 time)	$ 6,250	$ 1,688	1		$ -	$ 8,731	$ 8,993	$ 9,263	$ 9,541	$ 9,827
Classified Employee 0	$ -	$ -	1		$ -	$ -	$ -	$ -	$ -	$ -
PERSONNEL TOTAL					**$ 162,603**	**$ 176,213**	**$ 181,499**	**$ 303,152**	**$ 312,247**	**$ 321,614**
es: Update positions, salaries, year of hire and year of promotion. Annual costs will automatically calculate. Set salary of position to zero if not needed.										
onrecurring Expenses (PROGRAM START-UP/DEVELOPMENT)						$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000
New Program Application					$ -	$ -				
Annual Accreditation Fees						$ -	$ -	$ 1,500	$ 1,575	$ 1,654
Accreditation Comprehensive Visit						$ -		$ 4,000		
Annual Sustaining Fees						$ -	$ -	$ 1,000	$ 1,000	$ 1,200
New Program Consultation Expenses					$ -	$ -	$ -			
Travel and Profession Conferences					$ 5,000	$ 4,000	$ 6,000	$ 6,000	$ 6,000	$ 6,500
Staff Development					$ 460	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Recruiting Expenses					$ 35,000	$ 20,000	$ 25,000	$ 25,000	$ 20,000	$ 20,000
Professional Fees						$ 6,000	$ 6,360	$ 6,742	$ 7,146	$ 7,575
Faculty Start-Up Allowances/Relocation							$ 35,000	$ 35,000	$ -	$ -
onrecurring Expenses (PROGRAM START-UP/DEVELOPMENT)					**$ 40,460**	**$ 31,000**	**$ 73,360**	**$ 80,242**	**$ 36,721**	**$ 37,929**

ANNUAL OPERATING EXPENSES													
Office Supplies			$	5,000	$	5,000	$	6,000	$	6,000	$	6,500	$	6,500
Faculty Recruitment					$	15,000	$	15,000	$	5,000	$	3,000	$	3,000
Adjunct & Part-Time Faculty Positions					$	-	$	-	$	-	$	-	$	-
Equipment Maintenance					$	-	$	20,000	$	25,000	$	50,000	$	55,000
Equipment Replacement Fund (Increase in Year 5)			$	50,000	$	-	$	50,000	$	50,000	$	-	$	-
Library Resources					$	30,000	$	30,000	$	35,000	$	40,000	$	50,000
Contingency					$	30,000	$	30,000	$	30,000	$	30,000	$	30,000
Employee-based expenses													
Number of Employees				4		7		9		9		9		9
ɔst (Phone/Network, Internet, Software,Computer Replacement)	$	900	$	7,200	$	6,000	$	7,200	$	8,100	$	8,100	$	8,100
ANNUAL OPERATING EXPENSES TOTAL			**$**	**55,000**	**$**	**80,000**	**$**	**151,000**	**$**	**151,000**	**$**	**129,500**	**$**	**144,500**
lotes: Itemized lines are examples. Update lines and annual amounts as necessary. Employee count is automatic for any employee line with a salary.													
PROGRAM OPERATING EXPENSE TOTAL			**$**	**95,460**	**$**	**111,000**	**$**	**224,360**	**$**	**231,242**	**$**	**166,221**	**$**	**182,429**
TOTAL EXPENDITURE ESTIMATES			**$**	**258,063**	**$**	**287,213**	**$**	**405,859**	**$**	**534,394**	**$**	**478,468**	**$**	**504,043**
						REVENUE ESTIMATES							
Total students - Resident				-		9		20		26		28		36
Total students - Nonresident				-		9		20		26		28		36
Total E&G Fees Resident			$	-	$	49,811	$	116,226	$	158,648	$	179,394	$	242,182
Total E&G Fees Nonresident			$	-	$	123,932	$	289,175	$	394,723	$	446,341	$	602,561
Total Program/College Fees Resident			$	-	$	7,200	$	16,000	$	20,800	$	22,400	$	28,800
Total Program/College Fees Nonresident			$	-	$	7,200	$	16,000	$	20,800	$	22,400	$	28,800
lotes: Amounts above are all driven by formulae. Adjust fee and students counts below to set expected/goal amounts													
TOTAL REVENUE ESTIMATES						**$188,143**		**$437,400**		**$594,971**		**$670,535**		**$902,343**
ANNUAL NET REVENUE						**($99,070)**		**$31,541**		**$60,578**		**$192,067**		**$398,300**
CUMULATIVE RETURN						**($99,070)**		**($67,528)**		**$92,119**		**$252,645**		**$590,367**

		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Program Fee -Res		800	800	800	800	800
Program Fee - Nonres		800	800	800	800	800
Fee Incr Res (E&G)			5.00%	5.00%	5.00%	5.00%
Fee Incr Nonres (E&G)			5.00%	5.00%	5.00%	5.00%
E&G Res	1st year	$ 5,535	$ 5,811	$ 6,102	$ 6,407	$ 6,727
E&G Nonres	1st year	$ 13,770	$ 14,459	$ 15,182	$ 15,941	$ 16,738
Total Res Students	1st year	9	20	26	28	36
Total Nonres Students	1st year	9	20	26	28	36
Total Res Students	2nd year		7	15	20	21
Total Nonres Students	2nd year		6	13	17	18
Total Res Students	3rd year		-	5	12	16
Total Nonres Students	3rd year		-	5	10	14
Total Res Students	4th year		-	-	5	11
Total Nonres Students	4th year		-	-	4	9
Retention - Resident Yr 1 to Yr 2			75%	75%	75%	75%
Retention - Nonresident Yr 1 to Yr 2			65%	65%	65%	65%
Retention - Resident Yr 2 to Yr 3			80%	80%	80%	80%
Retention - Nonresident Yr 2 to Yr 3			80%	80%	80%	80%
Retention - Resident Yr 3 to Yr 4			90%	90%	90%	90%
Retention - Nonresident Yr 3 to Yr 4			90%	90%	90%	90%

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: COS | Dept/Division: MATHEMATICS | Alpha Designator/Number: MTH 570 | (•) Graded ( ) CR/NC

Contact Person: Dr. Alfred Akinsete | Phone: 3046966010

NEW COURSE DATA:

New Course Title: Applied Survival Analysis

Alpha Designator/Number: M T H 5 7 0

Title Abbreviation: A p p l i e d S u r v i v a l A n a l y s i s

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Survival and hazard functions, parametric and non-parametric methods, models and inferences for survival data, proportional hazard, and regression diagnosis. (PR. MTH 545, or permission)

AAA

Co-requisite(s): NONE | First Term to be Offered: Fall 2015

Prerequisite(s): AAA MTH 545, or permission | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): NONE

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

Dept. Chair/Division Head	Date 1-27-15
Registrar	Date 1/27/15
College Curriculum Chair	Date 1/28/15
Graduate Council Chair	Date 5-20-15

Request for Graduate Course Addition - Page 2

College: COS | Department/Division: MATHEMATICS | Alpha Designator/Number: MTH 570

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.

Drs. Laura Adkins, Raid Al-Aqtash, Alfred Akinsete, Avishek Mallick, Gerald Rubin

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.

Not Applicable

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.

Not Applicable

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

- Understand the basic foundational theory of survival analysis and identify characteristics of survival data.
- Define and understand the relationship between the survival function, distribution function, hazard function, relative hazard, and cumulative hazard function.
- Summarize and interpret univariate analyses of survival data using the Kaplan-Meier estimator.
- Perform and interpret two-sample analyses of survival data using common statistical procedures such as the logrank test.
- Formulate research questions involving survival data as regression problems and fit the parametric regression model and the proportional hazards model to survival data and assess the scientific significance, precision, and interpretation of regression coefficients

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

Introduction to Survival Analysis. Definitions and examples of survival and hazard functions and the relationship between them. Discussion of common parametric models for survival data. KM Chapters: 1 and 2

Discussion of censoring and truncation, likelihood construction and the development of maximum likelihood. KM Chapter: 3.

Nonparametric inferences for survival and hazard functions based on single sample data, Kaplan-Meier estimate, Nelson Aalen estimate. Nonparametric methods for testing equality of survival/hazard curves. Computer assisted analysis of survival data. KM Chapters: 4, 6 and 7.

Proportional hazards model including discussion of partial likelihood, large sample inferences, and time dependent covariates. Discussion of computer package implementation of the analysis of data, etc. KM Chapter: 8.

Methods for determining parametric and nonparametric model adequacy including calculation of various kinds of residuals, determination of various plotting techniques, embedding a selected model into a larger model for testing. Regression diagnostics. KM Chapter: 11.

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

Title : Survival Analysis: Techniques for Censored and Truncated Data, 2nd edition.
Author : John P. Klein and Melvin L. Moschberger
ISBN-10 : 038795399X
ISBN-13 : 978-0387953991
Publisher : Springer, New York, NY.
Year : 2003

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

LECTURES

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

HOMEWORK, MIDTERM EXAM, PROJECTS and FINAL EXAM

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

Additional topics, more homework and challenging problems, additional project works, and additional and more rigorous examination questions.

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

D. Hosmer, S. Lemeshow, and S. May (2008). Applied Survival Analysis: Regression Modeling of Time to Event Data, Wiley.

J.D. Kalbfleisch and R.L. Prentice (2002). The Statistical Analysis of Failure Time Data, Wiley.

J.F. Lawless (1982). Statistical Models and Methods for Lifetime Data, Wiley. (this is a more technical reference)

T.M. Therneau and P.M. Grambsch (2000). Modeling Survival Data: Extending the Cox Model, Springer.

X. Liu (2012). Survival Analysis: Models and Applications, Wiley.

E. T. Lee and J. W. Wang (2003). Statistical Methods for Survival Data Analysis, Wiley.

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: MATHEMATICS

Course Number and Title: MTH 570 APPLIED SURVIVAL ANALYSIS

Catalog Description: Survival and hazard functions, parametric and non-parametric methods, models and inferences for survival data, proportional hazard, and regression diagnosis. (PR. MTH 445, or permission)

Prerequisites: MTH 445, or permission

First Term Offered: Fall 2015

Credit Hours: 3

MARSHALL UNIVERSITY
DEPARTMENT OF MATHEMATICS
STUDENT INFORMATION SHEET AND SYLLABUS

Course Title/Number	MTH 570 – Applied Survival Analysis
Section	TBD
CRN	TBD
Semester/Year	TBD
Days/Time	TBD
Location	TBD
Instructor	TBD
Office	TBD
Phone ext.	TBD
E-Mail	TBD
Office/Hours	TBD
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 and Overview

Statistical methods for analyzing survival data from cohort studies. Topics include introduction to the hazard and survival functions, censoring mechanisms, parametric and non-parametric estimation methods, the Kaplan-Meier estimator, methods for estimating patient survival (life table and Kaplan-Meier methods), comparing survival between patient subgroups (log-rank test), modeling survival (primarily Poisson regression, the Cox proportional hazards model and accelerated failure time models), efficient sampling designs and discrete survival models.

This course will provide an introduction to the principles and methods for the analysis of time-to-event data. This type of data occurs extensively in both observational and experimental biomedical and public health studies, as well as in industrial applications. While the primary focus will be on data analysis, theoretical developments are also included for graduate students.

Course Objectives and Learning outcomes

At the end of the course, students should be able to:

- **Understand** the basic foundational theory of survival analysis and identify characteristics of survival data.
- **Define** and **understand** the relationship between the survival function, distribution function, hazard function, relative hazard, and cumulative hazard function.
- **Summarize** and **interpret** univariate analyses of survival data using the Kaplan-Meier estimator.
- **Perform** and **interpret** two-sample analyses of survival data using common statistical procedures such as the logrank test.
- **Formulate** research questions involving survival data as regression problems and **fit** the parametric regression model and the proportional hazards model to survival data and assess the scientific significance, precision, and interpretation of regression coefficients
- **Use** graphical methods and other methods to **assess** the adequacy of fitted models and **propose** alternate solutions when common assumptions are violated
- **Incorporate** time-dependent covariates in the proportional hazards model and **interpret** the regression coefficients
- **Interpret** and critically **evaluate** survival analyses in biomedical or epidemiologic set up and describe survival analysis methods and results to a non-statistical audience

Required Texts

Title	: *Survival Analysis: Techniques for Censored and Truncated Data, 2nd edition.*
Author	: John P. Klein and Melvin L. Moschberger [KM]
ISBN-10	: 038795399X
ISBN-13	: 978-0387953991
Publisher	: Springer, New York, NY.
Year	: 2003

Additional references

- D. Hosmer, S. Lemeshow, and S. May (2008). Applied Survival Analysis: Regression Modeling of Time to Event Data, Wiley.
- J.D. Kalbfleisch and R.L. Prentice (2002). The Statistical Analysis of Failure Time Data, Wiley.
- J.F. Lawless (1982). Statistical Models and Methods for Lifetime Data, Wiley. (this is a more technical reference)
- T.M. Therneau and P.M. Grambsch (2000). Modeling Survival Data: Extending the Cox Model, Springer.
- X. Liu (2012). Survival Analysis: Models and Applications, Wiley.
- E. T. Lee and J. W. Wang (2003). Statistical Methods for Survival Data Analysis, Wiley.

Additional Requirements: Software/Computing

The R and SAS statistical packages shall be used for demonstration of some topics in class. It is recommended that both R and SAS be used for homework assignments and exams. R is free software that can be downloaded from the web at http://www.r-project.org/. It can be installed/compiled on Windows, Mac, and Linux/UNIX machines. You are encouraged to use the Computer Lab in SH532. In addition, the SAS software is installed on those computers for those of you who would like to use SAS.

Academic Dishonesty: Plagiarism and/or Cheating

Note that plagiarism (the submission as one's own work of any oral, graphic, or written material wholly or in part created by another), is a form of academic dishonesty. Sanctions for academic dishonesty shall be imposed in accordance with university's guidelines on such matter. Also note that in a case where a student is suspected to have cheated, the student may be asked to re-take the test. And where the student is found or confirmed to have cheated, a zero grade will be awarded to the student.

You may wish to refer to other university policies concerning academic dishonesty at, http://www.marshall.edu/wpmu/academic-affairs/policies/#AcademicDishonesty

Attendance Policy

Students are expected to attend all scheduled classes. It is the student's responsibility to find out what was discussed in a missed class. Although, attendance records will not be used to compute grades (except possibly in borderline cases), however, missing class can be expected to significantly reduce your chances of success. Note also that it is the student's responsibility to present approved notice of any absence that would be excused under the terms and regulations stipulated by the university.

Student behavior

Students are advised to turn their cell phones and other noise generating devices off prior to entering the class. In the case where a student awaits any emergency call, the noise should be restricted and made personal. And in this case, I should be notified as soon as the student enters the class. Food items, apart from water or soft drink, are not allowed in the class. The reading of newspapers and other unrelated materials while the class is in session is prohibited. Please ensure that other students are respected.

Grading Policy and Exam dates

The final grade will be based on the following components:

Homework	25%
2 Regular Exams	30% (15% each)
Final Project	25%
Final Examination	20% (Comprehensive)
Total	**100%**

The semester grade will be based on the percentage of the total possible points, using the following scale.

90 -100% -- A
80 - 89% -- B
70 - 79% -- C
60 - 69% -- D
00 - 59% -- F

Topics covered

- Introduction to Survival Analysis. Definitions and examples of survival and hazard functions and the relationship between them. Discussion of common parametric models for survival data. KM Chapters: 1 and 2

- Discussion of censoring and truncation, likelihood construction and the development of maximum likelihood. KM Chapter: 3.

- Nonparametric inferences for survival and hazard functions based on single sample data, Kaplan-Meier estimate, Nelson Aalen estimate. Nonparametric methods for testing equality of survival/hazard curves. Computer assisted analysis of survival data. KM Chapters: 4, 6 and 7.

- Proportional hazards model including discussion of partial likelihood, large sample inferences, and time dependent covariates. Discussion of computer package implementation of the analysis of data, etc. KM Chapter: 8.

- Methods for determining parametric and nonparametric model adequacy including calculation of various kinds of residuals, determination of various plotting techniques, embedding a selected model into a larger model for testing. Regression diagnostics. KM Chapter: 11.

Combs, Melinda

From: Combs, Melinda
Sent: Wednesday, January 28, 2015 1:48 PM
To: Christofero, Tracy M.
Cc: Combs, Melinda; Bora, Dhruba; Akinsete, Alfred
Subject: MTH Graduate Course Addition
Attachments: MTH 570 [SIGNED]_20150128132101.pdf

Importance: High

Attached is a copy of MTH 570 - Request for Graduate Course Addition - to be considered at your upcoming meeting. I will send the original via campus mail.

Thanks,

Melinda

Melinda Combs
Administrative Secretary, Sr.
Dean's Office, College of Science
Room S270
Telephone (304) 696-2371
combsme@marshall.edu