

2013-2014 LONG SIGNATURE SHEET



UNC CHARLOTTE

Proposal Number: ETCM 08-22-13

Proposal Title: Modifications to MS in Construction and Facilities Management

Originating Department: Engineering Technology and Construction Management

TYPE OF PROPOSAL: UNDERGRADUATE _____ GRADUATE UNDERGRADUATE & GRADUATE _____
 (Separate proposals sent to UCCC and Grad. Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
8/22/13		11/1/13	Approved	<u>DEPARTMENT CHAIR</u> Anthony L. Brizendine
		11/18/13	Approved	<u>COLLEGE CURRICULUM COMMITTEE CHAIR</u> Ed Morse
		11/18/13	Approved	<u>COLLEGE FACULTY CHAIR (if applicable)</u> Arindam Mukherjee
11/15/13		11/18/13	Approved	<u>COLLEGE DEAN</u> Robert E. Johnson
			Approved	<u>GENERAL EDUCATION</u> (if applicable; for General Education courses) [print name here:]
			Approved	<u>UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR</u> (for undergraduate courses only)
12-10-13	1-14-14	3-12-14	Approved	<u>GRADUATE COUNCIL CHAIR</u> (for graduate courses only) ALAN R. FREITAG
				<u>FACULTY GOVERNANCE ASSISTANT</u> (Faculty Council approval on Consent Calendar)
				<u>FACULTY EXECUTIVE COMMITTEE</u> (if decision is appealed)



UNC CHARLOTTE

LONG FORM COURSE AND CURRICULUM PROPOSAL

*To: Dr. Alan Freitag, Chair of Graduate Council

From: Dr. John Hildreth

Date: 31Oct13

Re: Modifications to Master of Science in Construction and Facilities Management

Please find the attached proposal to modify the Master of Science in Construction and Facilities Management program.

Revised Graduate

Course and Curriculum Proposal from Department of Engineering Technology and Construction Management

Modification to Master of Science in Construction and Facilities Management**II. CONTENT OF PROPOSAL****A. PROPOSAL SUMMARY**

The Department of Engineering Technology and Construction Management proposes to make the following revisions to the M.S. Construction and Facilities Management curriculum and the Graduate Catalog:

- i. Create four new courses:
 - a. CMET 5150 Green Building
 - b. CMET 5160 Advanced Construction Materials
 - c. CMET 6165 Transportation Asset Management
 - d. CMET 6275 Advanced Construction Means and Methods
- ii. Revise the course numbering for multiple existing courses:
 - a. CMET 6240 Safety & Risk Management
 - b. CMET 6270 Operation of Constructed Facilities
 - c. CMET 5130 Building Information Modeling
 - d. CMET 5290 Temporary Structures in Construction
- iii. Revise the MSCFM catalog description regarding:
 - a. Faculty list
 - b. List of required core courses
 - c. List of elective courses
 - d. Capstone options

B. JUSTIFICATION**1. Identify the need addressed by the proposal and explain how the proposed action meets the need.**

The need addressed by this proposal is to increase the breadth of course topics available to MSCFM students and to provide opportunity for students to tailor their plan of study in support of their research.

- i. The creation four new courses will increase educational opportunities for students and incorporate contemporaneous topics related to construction and facilities management.
- ii. Revised course numbering of existing courses will appropriately align existing courses with the level of academic advancement of students for whom it is intended and create opportunity to cross-list the CMET 5130 and CMET 5290 courses with comparable undergraduate courses when, and if, the need arises.
- iii. Revise the MSCFM catalog description regarding:
 - a. Update the list of graduate faculty to include new faculty
 - b. Update the list of “Required Common Construction / Facilities Management Core Courses” to reflect proposed changes in course numbering and move some existing core courses to elective courses
 - c. Update the list of “Electives” to reflect proposed changes in course numbering and include existing graduate level ETGR and ENER courses.
 - d. Update the “Capstone Options” to reflect proposed changes in the required core and include CMET 6160 Research and Analytical methods for students pursuing the Thesis and Research option.

2. **Discuss prerequisites/corequisites for course(s) including class-standing, admission to the major, GPA, or other factors that would affect a student's ability to register.**

The proposed courses do not have prerequisite/corequisite requirements.

3. **Demonstrate that course numbering is consistent with the level of academic advancement of students for whom it is intended.**

The UNC Charlotte course numbering guidelines have been followed, both for proposed courses and for revision of existing course numbers and are appropriate for graduate level coursework.

4. **In general, how will this proposal improve the scope, quality and/or efficiency of programs and/or instruction?**

The proposed changes will enhance the quality of the MSCFM program. The increased scope of course offerings will attract prospective students and the flexibility to tailor the plan of study will improve the efficiency and quality of student research.

5. **If course(s) has been offered previously under special topics numbers, give details of experience including number of times taught and enrollment figures.**

The proposed courses have not been previously offered as special topics. The Green Building course will be offered as CMET 6000 in Spring 2014 and enrollment is projected to be approximately 20 students.

C. IMPACT

1. **What group(s) of students will be served by this proposal? (Undergraduate and/or graduate; majors and/or non-majors, others? Explain). Describe how you determine which students will be served.**

The primary audience for the proposed courses is MSCFM students. All courses are available to engineering graduate students.

2. **Effect on existing courses and curricula:**

- a. **When and how often will added course(s) be taught?**

The proposed courses will be offered on-demand. The courses are anticipated to be offered on the same three semester rotation as existing MSCFM courses.

- b. **How will the content and/or frequency of offering of other courses be affected?**

The content and scheduling of other courses will not be affected.

- c. **What is the anticipated enrollment in course(s) added (for credit and auditors)?**

Enrollment in the proposed courses is anticipated to be 15 to 20 students.

- d. **How will enrollment in other courses be affected? How did you determine this?**

The enrollment in other courses is not expected to be greatly affected. The number of courses offered each semester will remain at 4 to 5 courses. Courses currently in the required core are likely to see a slight decrease in enrollment when moved to elective courses as a result of student flexibility in selecting electives.

- e. **Identify other areas of catalog copy that would be affected, including within other departments and colleges (e.g., curriculum outlines, requirements for the degree, prerequisites, articulation agreements, etc.).**

The catalog copy of other departments and colleges will not be affected

III. RESOURCES REQUIRED TO SUPPORT PROPOSAL

- A. **PERSONNEL.** Specify requirements for new faculty, part-time teaching, student assistants and/or increased load on present faculty. List by name qualified faculty members interested in teaching the course(s).

No new personnel resources are required to implement the proposed changes. The following faculty have expressed interest and are qualified in teaching the proposed courses:

- a. CMET 5150 Green Building - Dr. Hyunjoo Kim
- b. CMET 5160 Advanced Construction Materials – Dr. Tara Cavalline
- c. CMET 6165 Transportation Asset Management - Dr. Don Chen
- d. CMET 6275 Advanced Construction Means and Methods – Dr. John Hildreth

B. PHYSICAL FACILITY. Is adequate space available for this course?

The ETCM department has adequate classroom and laboratory space to implement these proposed changes.

C. EQUIPMENT AND SUPPLIES. Has funding been allocated for any special equipment or supplies needed?

No special equipment or supplies are required to implement these proposed changes.

D. COMPUTER. Specify any computer usage (beyond Moodle) required by students and/or faculty, and include an assessment of the adequacy of software/computing resources by available for the course(s).

The existing Mosaic computing system is adequate for implementation of these proposed changes.

E. AUDIO-VISUAL. If there are requirements for audio-visual facilities beyond the standard classroom podiums, please list those here.

Audio-visual equipment and facilities are adequate to support the implementation of these proposed changes.

F. OTHER RESOURCES. Specify and estimate cost of other new/added resources required, e.g., travel, communication, printing and binding.

No other resources are required to implement these proposed changes.

G. SOURCE OF FUNDING. Indicate source(s) of funding for new/additional resources required to support this proposal.

No new/additional resources are required.

IV. CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS

A. LIBRARY CONSULTATION. Indicate written consultation with the Library Reference Staff at the departmental level to ensure that library holdings are adequate to support the proposal prior to its leaving the department.

A copy of the library consultation is attached.

B. CONSULTATION WITH OTHER DEPARTMENTS OR UNITS. List departments/units consulted in writing regarding all elements outlined in IIC: Impact Statement, including dates consulted. Summarize results of consultation and attach correspondence. Provide information on voting and dissenting opinions (if applicable).

The MSCFM Program is fully autonomous and consultation with other departments or units was unnecessary.

V. INITIATION, ATTACHMENTS, AND CONSIDERATION OF THE PROPOSAL

A. ORIGINATING UNIT. Briefly summarize action on the proposal in the originating unit including information on voting and dissenting opinions.

Discussion regarding the modifications contained in this proposal initiated during the 2012-2013 academic year. The concept was presented to MSCFM faculty at the FAIT meeting held on January 28, 2013. A draft proposal was presented at unanimously approved by the MSCFM faculty at the FAIT meeting held on August 20, 2013. The proposal was unanimously approved by the ETCM faculty at the department meeting on August 22, 2013.

B. CREDIT HOUR. (Mandatory if new and/or revised course in proposal)

Review statement and check box once completed:

- The appropriate faculty committee has reviewed the course outline/syllabus and has determined that the assignments are sufficient to meet the University definition of a [credit hour](#).

C. ATTACHMENTS

1. CONSULTATION: Attach relevant documentation of consultations with other units.

Consultation with other departments or units was unnecessary.

2. COURSE OUTLINE/SYLLABUS: For undergraduate courses attach course outline(s) including basic topics to be covered and suggested textbooks and reference materials with dates of publication. For Graduate Courses attach a course syllabus. Please see Boiler Plate for Syllabi for New/Revised Graduate Courses.

Outlines/syllabi for proposed courses are attached.

3. PROPOSED CATALOG COPY: Copy should be provided for all courses in the proposal. Include current subject prefixes and course numbers, full titles, credit hours, prerequisites and/or corequisites, concise descriptions, and an indication of when the courses are to be offered as to semesters and day/evening/weekend. Copy and paste the [current catalog copy](#) and use the Microsoft Word “track changes” feature (or use **red text with “~~striketrough~~” formatting for text to be deleted, and adding **blue text with “underline”** formatting for text to be added).**

a. For a new course or revisions to an existing course, check all the statements that apply:

_____ This course will be cross listed with another course.

_____ There are prerequisites for this course.

_____ There are corequisites for this course.

_____ This course is repeatable for credit.

_____ This course will increase/decrease the number of credits hours currently offered by its program.

_____ This proposal results in the deletion of an existing course(s) from the degree program and/or catalog.

For all items checked above, applicable statements and content must be reflected in the proposed catalog copy.

Current 2013-2014 Graduate Catalog:

Construction and Facilities Management

- M.S. in Construction and Facilities Management

Department of Engineering Technology and Construction Management

et.uncc.edu

Department Chair and Graduate Program Director

Dr. Anthony L. Brizendine

Graduate Faculty

Anthony L. Brizendine, PhD, PE, Professor

Nan Byars, PE, Professor

Tara Cavalline, PhD, PE, Assistant Professor

Don Chen, PhD, LEED AP, Assistant Professor

Chung Suk Cho, PhD, Assistant Professor

G. Bruce Gehrig, PhD, PE, Associate Professor

Rodney Handy, PhD, Professor

John Hildreth, PhD, Assistant Professor

Parminder Juneja, PhD, Assistant Professor
Hyunjoo Kim, PhD, Assistant Professor
Jeff Kimble, Associate Professor
Steve Kuyath, PhD, Associate Professor
Na Lu, ~~PhD~~[PhD Ed.D.](#), AIC, Assistant Professor
David Murphy, Associate Professor
Thomas Nicholas, PhD, PE, Assistant Professor
Maciej Noras, PhD, Associate Professor
Carlos Orozco, PhD, PE, Associate Professor
Peter Schmidt, PhD, PE, Associate Professor
Deborah Sharer, PhD, Associate Professor
Barry Sherlock, PhD, Professor
Patty Tolley, PhD, PE, Associate Professor
[Nicholas Tymvios, PhD, Assistant Professor](#)
Jozef Urbas, PhD, Associate Professor
Sheng-Guo Wang, PhD, Professor
Wesley Williams, PhD, Assistant Professor
Aixi Zhou, PhD, Associate Professor

M.S. IN CONSTRUCTION AND FACILITIES MANAGEMENT

Construction Management is a program that prepares individuals to manage, coordinate, and supervise the construction process from concept development through project completion on timely and economic bases. Such programs include instruction in commercial, residential, mechanical, highway/heavy civil, electrical, environmental, industrial, and specialty construction; facilities management; project planning; budgeting and cost control; logistics and materials management; personnel management and labor relations; site safety; construction contracting; construction processes and techniques; organization and scheduling; and applicable codes and regulations.

Facility Management is a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology. The body of knowledge required for facility management degree programs includes facility function (professional practice), human and environmental factors, planning and project management, finance, operation and maintenance, real estate, written and oral communication, information technology, quality management and assessment procedures (research and analytical methods), and integrative and problem solving skills.

Construction and facility management professionals work with owners, engineers, architects, specialty and sub-contractors, government agencies, and others to deliver, operate and maintain constructed projects and facilities. This MSCFM program provides the advanced professional development and graduate education necessary for construction and facility management professionals to work in the increasing high tech, rapidly changing construction industry and related careers such as real estate and land development, infrastructure development, code enforcement, and insurance. The program also has a special relationship with and focus on sustainability and energy infrastructure as part of the Energy Production and Infrastructure Center (EPIC) and Innovative Design, Engineering, and Sustainability (IDEAS) Center initiatives at UNC Charlotte.

Application Deadline

Applications can be received by the Graduate Admission Office any time prior to the published deadlines. In order to be considered for assistantships and tuition grants for the following academic year, students should apply by March 1 for priority consideration. The first round of award decisions typically occurs by March 15. However, the Department will evaluate admission applications at any time complete applications are received by the Graduate School.

Assistantships

Research and teaching assistantships are available from the Department on a competitive basis to highly qualified applicants/students.

Tuition Grants

Tuition grants, including out-of-state tuition differential waivers and in-state tuition support, are available on a competitive basis for both out-of-state and in-state students, respectively.

Admission Requirements

Admission requirements are found at <http://graduateschool.uncc.edu/future-students/admissions>.

The minimum admission requirements for the program are:

- a. ~~An earned undergraduate degree in construction management, facility management, engineering technology, engineering, architecture, or a closely related field~~
- b. ~~An undergraduate GPA of 2.75 or better~~
- c. ~~Acceptable scores on the verbal, quantitative, and analytical sections of the GRE~~
- d. ~~Positive recommendations~~
- e. ~~A combined TOEFL score of 220 (computer based) or 557 (paper based) is required if the previous degree was from a country where English is not the common language~~
- f. ~~Integral and differential calculus (MATH 1120 or 1121 or ETGR 3171 at UNC Charlotte or equivalent)~~
- g. ~~Statistics (STAT 1220 or STAT 3128 at UNC Charlotte or equivalent)~~
- h. ~~Other credentials as required by the Graduate School~~

Documents to be Submitted for Admission

- a. Official transcripts from all colleges and universities attended
- b. Official GRE scores
- c. Official TOEFL scores
- d. The UNC Charlotte application for graduate admission online
- e. Three professional recommendations
- f. Others as required by the Graduate School

Degree Requirements

The program leading to the Master of Science degree in Construction and Facilities Management is a 30 semester-hour program. The program consists of ~~an 18-a 9~~ credit hour common core, ~~a 6-credit hour elective technical core in either construction management or facility management~~, and a capstone experience including either a non-research focused sequence of ~~21~~6-credit hours of electives or a research focused sequence of 15-credit hours of electives with a formal 6-credit hour graduate research thesis and completion of the 3-credit hour CMET 6160 Research and Analytical Methods course. At least 15 semester hours must be in courses numbered 6000 or above. The 30-credit hour degree program is outlined below:

Required Common Construction / Facilities Management Core Courses (18 hours)

- CMET ~~5240~~ 6240 Safety and Risk Management (3)
CMET ~~5270~~ 6270 Operation of Constructed Facilities (3)
~~CMET 6130 Building Information Modeling (3)~~
CMET 6135 Advanced Construction Planning & Management (3)
~~CMET 6140 Building Energy Management (3)~~
~~CMET 6160 Research and Analytical Methods (3)~~

Technical Cores (6 hours)

(Students select one of the following)

1. ~~Construction Management Core~~
 - ~~CMET 6180 Alternative Project Delivery Methods (3)~~
 - ~~CMET 6285 Quality Assurance in Construction (3)~~
2. ~~Facilities Management Core~~
 - ~~CMET 6145 Facilities Management Financial Analysis (3)~~
 - ~~CMET 6250 Asset Management for Facility Managers (3)~~

Capstone Options (6 21 hours)

(Students select one of the following)

1. Non-Thesis Option (~~6~~ 21 credit hours)
 - Major Elective (~~3~~ 21 credit hours total)
 - ~~Major Elective (3)~~
2. Thesis and Research Option (6 credit hours)
 - CMET 6160 Research and Analytical Methods (3)

Major Electives (12 credit hours total)

CMET 6900 Master's Thesis & Research (6)

Electives

(Students select from the following or others with director approval)

[CMET 5130 Building Information Modeling \(3\)](#)

[CMET 5140 Building Energy Management \(3\)](#)

[CMET 5150 Green Building \(3\)](#)

[CMET 5160 Advanced Construction Materials \(3\)](#)

CMET ~~5290~~ ~~6290~~ Temporary Structures in Construction (3)

CMET 6000 Special Topics in Construction and Facilities Management (3)

[CMET 6145 Facilities Management Financial Analysis \(3\)](#)

CMET 6155 Facility Instrumentation and Controls (3)

[CMET 6160 Research and Analytical Methods \(3\)](#)

[CMET 6165 Transportation Asset Management \(3\)](#)

[CMET 6180 Alternative Project Delivery Methods \(3\)](#)

[CMET 6250 Asset Management for Facility Managers \(3\)](#)

CMET 6255 Advanced Plant Layout and Design (3)

[CMET 6275 Advanced Construction Means and Methods \(3\)](#)

[CMET 6285 Quality Assurance in Construction \(3\)](#)

CMET 6295 Design and Improvement of Construction Operations (3)

CMET 6800 Independent Study in Construction and Facilities Management (3)

[ENER 5250 Analysis of Renewable Energy Systems \(3\)](#)

[ENER 5275 Air Conditioning Systems \(3\)](#)

[ENER 5285 Applied Noise and Vibration Control \(3\)](#)

[ENER 6120 Energy Generation and Conversion \(3\)](#)

[ENER 6135 Energy Transmission & Distribution \(3\)](#)

[ENER 6150 System Dynamics \(3\)](#)

[ENER 6170 Applied Mechatronics \(3\)](#)

[ENER 6220 High Voltage Technology \(3\)](#)

[ENER 6250 Advanced Instrumentation \(3\)](#)

[ETGR 5272 Advanced Engineering Analysis \(3\)](#)

Additional new major electives courses may be created based on industry needs and faculty research interest. In addition, appropriate existing graduate level courses from other programs may be approved by the program director.

Capstone Experiences

Students pursuing the Master of Science in Construction and Facilities Management have two options to complete the 30-credit hour program as follows:

1. 24 hours of coursework plus 6 hours of thesis project
2. 30 hours of coursework and a comprehensive examination.

Both options require the formation of a program committee. The thesis option is reserved for students who are attending the on-campus program and are performing research under formal graduate research or teaching assistantships. Students receiving such assistantships may be required to pursue the thesis option. The thesis option requires students to submit a written thesis and orally defend their work before their program committee.

All non-thesis students must complete 30 credits of coursework and successfully complete a formal comprehensive examination. The comprehensive examination is a written exam. A student's exam will be scheduled when he/she has at least 24 hours of course credit completed or in progress. The student's graduate advisor and the examining committee will coordinate the examination (to be offered once in the fall and once in the spring semesters), preparing the exam with the assistance of members of the student's program committee. The exam will measure the student's mastery of theories and applications in the selected area of specialization within the discipline. Students will have only two opportunities to receive passing marks on the examination.

Advising

Each student is supervised by his/her graduate advisor and a program committee.

Plan of Study Requirements

Each student is required to submit a Plan of Study to the Department's Graduate Director before completing 18 hours of graduate credits.

Application for Degree

Each student should submit an Application for Degree prior to graduation. If a student does not graduate in the semester identified on the Application, the student must complete a new form and repay the application fee to be considered for graduation in a subsequent semester.

Transfer Credit

The Department, at its discretion, may accept transfer of graduate courses (6 credits maximum) taken at another institution or from another program prior to admission to the Master's program in Construction and Facilities Management. Only courses in which the student earned a grade of B or above may be transferred.

Grades Requirement

All candidates must earn an overall 3.0 GPA to graduate. Accumulation of one U grade [or three C grades](#) will result in the suspension of the student's enrollment in the program.

Other Requirements

The program has both a thesis and non-thesis track. After admission to candidacy, thesis students will complete a comprehensive oral exam while non-thesis students will complete a comprehensive written exam. Residence will be per Graduate School rules. There is no language requirement. While full-time students will typically take three semesters to complete the program, part-time students are expected to take no more than six years to complete the program as per Graduate School rules.

Proposed Catalog Copy of Courses:

(Only affected course descriptions are listed)

CMET 65130. Building Information Modeling. (3) ~~Prerequisites: ETCE 1104, ETGR 1104, or permission of instructor.~~ The creation, management, and application of building information models to the construction, operation, and maintenance of a facility. Focus will be on 2D and 3D computer models of building components, renderings, animations, and interfacing with analysis tools. (On demand)

CMET 65140. Building Energy Management. (3) Prerequisites: ETCE 3271, ETME 3143, or permission of instructor. Integrated planning of energy efficient technologies for building environmental control systems. Introduction to the design, planning, and optimization of HVAC systems and technology needed to integrate the heating, cooling, natural ventilation, lighting, electricity, and building energy management systems into a building's structure and design. (On demand)

CMET 5150. Green Building (3) [Sustainable design and construction. Topics include sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation in design, and regional priority. \(On demand\)](#)

CMET 5160. Advanced Construction Materials (3) [Materials utilized in concrete, concrete construction, and quality control. Study of concrete properties and the variables that affect them. Topics also include destructive and non-destructive testing of structural concrete, service life prediction models, and preventative measures, as well as recent advances in concrete materials, construction, and technology. \(On demand\)](#)

CMET 65290. Temporary Structures in Construction. (3) Prerequisite: ETCE 3163 or permission of instructor. Temporary structures used to support construction operations such as concrete formwork, scaffolding systems, shoring systems, cofferdams, underpinning, slurry walls, and construction dewatering systems. (On demand)

CMET 6165 Transportation Asset Management (3) [Management and planning techniques for transportation infrastructure assets. Focus on recent advances for maintaining and managing transportation assets, including performance management, prioritization of maintenance strategies, network and project level optimization. \(On demand\)](#)

CMET 56240. Safety and Risk Management. (3) ~~Prerequisite: CMET 4228 or permission of instructor.~~ Causes and prevention of industrial accidents, hazardous processes and material, OSHA regulations and requirements, and design of accident prevention programs. (On demand)

CMET 56270. Operation of Constructed Facilities. (3) ~~Prerequisites: CMET 3224 and ETCE 3271 or permission of instructor.~~ Acquisition, operation, maintenance, and disposal of building systems, structures, permanent interiors, furniture, and equipment; grounds and other exterior elements. (On demand)

CMET 6275. Advanced Construction Means and Methods (3) Construction means, methods, and equipment used to transform a particular design concept into a completed usable structure or facility. Emphasis is placed on current and innovative construction techniques and equipment. (On demand)

- b. If overall proposal is for a new degree program that requires approval from General Administration, please contact the facultygovernance@uncc.edu for consultation on catalog copy.**

Approval from General Administration is not required.

- 4. ACADEMIC PLAN OF STUDY (UNDERGRADUATE ONLY): Does the proposed change impact an existing Academic Plan of Study?**
- Yes. If yes, please provide updated [Academic Plan of Study](#) in template format.
 - No.
- 5. STUDENT LEARNING OUTCOMES: Does this course or curricular change require a change in SLOs or assessment for the degree program?**
- Yes. If yes, please detail below.
 - No. The proposed changes, specifically the reduction of the common core credits from 18 to 9 hours, do not affect the established SLOs or assessment for the degree program.
- 6. TEXTBOOK COSTS: It is the policy of the Board of Governors to reduce textbook costs for students whenever possible. Have electronic textbooks, textbook rentals, or the buyback program been considered and adopted?**
- Yes. Briefly explain below.
 - No. Briefly explain below.

Electronic textbooks, textbook rentals, and the buyback program have been considered in this proposal.

VI. ATTACHMENTS

1. Attachment A – Graduate Course Descriptions and Syllabi
2. Attachment B – Consultation Documentation

Attachment A – Graduate Course Descriptions and Syllabi

CMET 5150 - GREEN BUILDING DESIGN & CONSTRUCTION

Credits: 3

Prerequisite/ Co-requisites: None

CMET 5150. Green Building (3) Sustainable design and construction. Topics include sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation in design, and regional priority. (On demand)

Text Books:

- LEED Reference Guide for Green Building Design and Construction, USGBC, 2009
- Sustainable Construction-Green Building Design and Delivery, Kilbert, Wiley

Course Objectives:

- Learn fundamentals/principles of sustainable building design and construction practices
- Identify and discuss the key practices of sustainable building.
- Apply LEED™ and other relevant criteria or established guidelines.
- Analyze the costs and benefits of incorporating sustainable building measures.
- Identify different alternatives to improve a building's performance.
- Learn how to participate in sustainable design/construction projects.

Instructional Method:

Two lectures per week, augmented with laboratory exercises and field trip experiences.

Means of Student Evaluation:

Final grades for the course will be based on the following:

Participation	5%
Exam #1	25%
Exam #2	25%
Semester Project	10%
Final Exam	35%

It is anticipated that final letter grades will awarded as follows:

A = 90 to 100%, B = 80% to 89%, C = 70 to 79%, U = <70%

Class Preparation and Assignments:

- Attendance, and participation during class, is expected.
- All assignments are due at the beginning of the period assigned and those turned in late will count off 10% per day.
- Punctual attendance at every class session is mandatory
- Documentation for excused absences must be submitted within one week of the absence.
- Cell phones, music players, and other similar electronic devices are not allowed during class. Laptops and electronic tablets may be used during class for taking notes, however, wireless and internet connections must be turned off. Repeated misuse of electronic devices will result in a student being administratively dropped from the course
- Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Office of Disabled Student Services at 687-4355 as soon as possible to request an official letter outlining authorized accommodations.

Academic Integrity:

All students are required to read and abide by the Code of Student Academic Integrity. The Code is available from the Dean of Students Office or online at <http://www.legal.uncc.edu/policies/ps-105.html>

Topical Outline of Course Content (Tentative, subject to revisions):

1. Introduction
 - LEED Process**
2. Comparison Among Green Building Rating Systems
3. Sustainable Sites I
4. Sustainable Sites II
5. Field Trip
6. Water Efficiency I
 - Exam I**
7. Water Efficiency II

8. Energy and Atmosphere I
9. Energy and Atmosphere II
10. Economic Analysis of Green Buildings
11. Materials and Resources I
12. Materials and Resources II

Exam II

13. Indoor Environmental Quality I
14. Indoor Environmental Quality II
15. Innovation In Design/Regional Priority
16. The Cutting Edge and Beyond

CMET 5160 – Advanced Construction Materials

Credits: 3

Prerequisite/ Co-requisites: None

CMET 5160. Advanced Construction Materials (3) Materials utilized in concrete, concrete construction, and quality control. Study of concrete properties and the variables that affect them. Topics also include destructive and non-destructive testing of structural concrete, service life prediction models, and preventative measures, as well as recent advances in concrete materials, construction, and technology. (On demand).

Required Text:

- Mindess, S., Young, J.F., and Darwin, D. (2003). Concrete, 2nd Ed. Prentice Hall. ISBN-10: 0130646326.

Supplemental Texts:

- Mehta, P., and Monteiro, P.J.M. (2006). Concrete: Microstructure, Properties, and Materials. McGraw-Hill Companies. ISBN-10: 0071462899.
- Kosmatka, S.H., Kerkhoff, B., and Panarese, W.C. (2002). Design and Control of Concrete Mixtures, 15th edition. Portland Cement Association. Skokie, IL.
- Neville, A.M. (1995). Properties of Concrete, 4th ed. Pearson Education.

Course Objectives:

In this course, students will study materials utilized in concrete, concrete construction, and quality assurance and control. Students will learn about the properties of concrete, and variables that affect concrete properties and performance. Topics also include destructive and non-destructive testing of concrete, service life prediction models, and recent advances in concrete materials, construction and technology.

Upon completion of the course, the student will be able to:

- Explain the role of concrete in civil engineering systems.
- Explain the chemistry of cementitious systems and apply this knowledge to development of concrete properties and performance.
- Identify materials utilized in concrete mixtures, and select the appropriate materials for specific types of concrete construction and desired performance.
- Explain concrete construction techniques and considerations, including those used in hot weather, cold weather, specialty construction, mass concrete, and repair applications.
- Understand the performance of early age concrete, and evaluate test results.
- Perform calculations related to maturity and concrete strength, creep/shrinkage, and durability performance.
- Develop and utilize prediction models associated with concrete maturity, thermal properties, creep/shrinkage, durability, and service life.
- Explain the mechanisms associated with corrosion, and evaluate techniques that can be utilized for prevention, assessment, and active and passive protection.
- Discuss advances in concrete technology, including new cementitious systems, high-performance concrete, new materials and admixtures, recent advancements in testing/evaluation, and construction. Develop a quality assurance program for concrete construction applications.

Instructional Method:

Two lectures per week, augmented with laboratory exercises and field trip experiences.

Means of Student Evaluation:

Final grades for the course will be based on the following:

Homework	20%
Midterm Exam	20%
Project #1	20%
Project #2	20%
Final Exam	20%

It is anticipated that final letter grades will awarded as follows:

A = 90 to 100%, B = 80% to 89%, C = 70 to 79%, U = <70%

Class Preparation and Assignments:

- All assignments are due on the announced date, and no late submissions will be accepted.
- If a student must be absent, it is the student's responsibility to obtain materials from the missed lecture from others in the class.

- Attendance at guest lectures and field trips is mandatory unless prior arrangements have been made with the instructor. Students can either provide their own transportation to the field trip sites or can arrange to ride with other classmates. A limited number of students can pre-arrange to travel with the Instructor, if necessary. **Appropriate attire (long pants, closed-toed shoes, hard hat, and safety glasses) is required for each field trip and/or laboratory exercise.**
- Cell phones, music players, and other similar electronic devices are not allowed during class. Laptops and electronic tablets may be used during class for taking notes, however, wireless and internet connections must be turned off. Repeated misuse of electronic devices will result in a student being administratively dropped from the course.

Academic Integrity:

All students are required to read and abide by the Code of Student Academic Integrity. The Code is available from the Dean of Students Office or online at:

<http://www.legal.uncc.edu/policies/ps-105.html>

Topical Outline of Course Content (Tentative, subject to revisions):

- Week 1. Course introduction; History of concrete and technological advances; concrete industry today
- Week 2. Chemistry of portland cements; blended cements; portland limestone cements; aluminates cements; alternative cementitious systems
- Week 3. Early age concrete: rheology, segregation, workability
- Week 4. Concrete construction: basics, hot weather concrete, cold weather concrete, specialty concrete construction, repair applications.
- Week 5. Mass concrete: heat of hydration, temperature gradients
- Week 6. Maturity and concrete strength, prediction models
- Week 7. Thermal properties, prediction models
- Week 8. Creep and shrinkage, prediction models
- Week 9. Entrained-air structure, freeze-thaw durability
- Week 10. Chemical attack: sulfates, chlorides, other aggressive agents
- Week 11. Alkali-silica reaction, preventative specifications, aggregate selection
- Week 12. Corrosion: prevention, assessment, active and passive protection methods
- Week 13. Service life prediction models
- Week 14. High performance concrete, advances in materials used in concrete
- Week 15. Non-destructive evaluation of concrete

CMET 6165 -Transportation Asset Management

Credits: 3

Prerequisite/ Co-requisites: None

CMET 6165 Transportation Asset Management (3) Management and planning techniques for transportation infrastructure assets. Focus on recent advances for maintaining and managing transportation assets, including performance management, prioritization of maintenance strategies, network and project level optimization. (On demand)

Text Books:

- AASHTO Transportation Asset Management Guide: A Focus on Implementation, 1st Edition.
- Transportation and Strategic Asset Management: A Sustainable Approach to Maintain Critical Infrastructure, by Erik Stromberg and Thomas H., III Wakeman.

Course Objectives:

Upon successful completion of the course, students will be able to:

- Understand Transportation Asset Management concepts;
- Manage condition data using Geographic Information Systems (GIS);
- Manage inventory data using parametric modeling technologies (e.g., Bridge Information Modeling);
- Perform constructability analysis using parametric models;
- Analyze condition data and predict performance and distress indices;
- Select and schedule maintenance strategies using cost-benefit analysis; and
- Analyze network and project level resource needs using decision trees.

Instructional Method:

The course is presented in a lecture format, including the following elements as appropriate: standard lecture format, interactive demonstrations of methods to be applied in assignments, opportunities for student questions, discussion, and presentations by students, as well as students' independent study.

Means of Student Evaluation:

Students will be evaluated on their ability to answer factual questions regarding material presented in the class and assigned texts, to correctly solve problems using methods presented in the class, and to participate productively in critical discussion of course material. Student performance in the course will be evaluated on the following basis:

Assignments and team projects:	40%
Mid-term exams:	30% (15% each)
Final exam:	20%
Class Participation:	10%

It is anticipated that final letter grades will awarded as follows:

A = 90 to 100%, B = 80% to 89%, C = 70 to 79%, U = <70%

Class Preparation and Assignments:

- Attendance at lecture is required, although exceptions will be made for reasons such as illness or family emergency. Excessive absences will result in a reduced classroom participation score at the instructor's discretion, and will negatively impact the overall course grade.
- All assignments are due on the dates determined by the instructor. No late submissions will be accepted. Students must have a cumulative overall score of at least 80% on assignments in order to receive a passing grade for the course.
- The use of cell phones, beepers, or other communication devices is disruptive, and is therefore prohibited during class. Except in emergencies, those using such devices must leave the classroom for the remainder of the class period. Students are permitted to use computers during class for note-taking and other class-related work only. Those using computers during class for non-class related work will asked to leave the classroom for the remainder of the class period.
- Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Office of Disabled Student Services at 687-4355 as soon as possible to request an official letter outlining authorized accommodations.

Academic Integrity:

All students are required to read and abide by the Code of Student Academic Integrity. The Code is available from the Dean of Students Office or online at: <http://www.legal.uncc.edu/policies/ps-105.html>

Topical Outline of Course Content (Tentative, subject to revisions):

- Week 1. Introduction to Transportation Asset Management
- Week 2. Pavement management systems
- Week 3. Bridge management systems
- Week 4. Maintenance management systems
- Week 5. Condition data collection techniques
- Week 6. Condition data collection training and field data collection
- Week 7. Geographic Information Systems
- Week 8. Parametric modeling technologies
- Week 9. Preparation of condition data
- Week 10. Performance modeling
- Week 11. Distress modeling
- Week 12. Cost-benefit analysis
- Week 13. Selection and scheduling maintenance strategies
- Week 14. Decision trees
- Week 15. Project level asset management analysis
- Week 16. Network level asset management analysis

CMET 6275. Advanced Construction Means and Methods

Credits: 3

Prerequisite/ Co-requisites: None

CMET 6275. Advanced Construction Means and Methods (3) Construction means, methods, and equipment used to transform a particular design concept into a completed usable structure or facility. Emphasis is placed on current and innovative construction techniques and equipment. (On demand)

Text Books:

- Peurifoy, R., Schexnayder, C., Shapira, A., and Schmitt, R. (2006). Construction Planning, Equipment, and Methods. 8th ed., McGraw Hill.
- Nunnally, S. (2007). Construction Methods and Management. 7th ed., Pearson-Prentice Hall.

Course Objectives:

The course is designed to provide the student with detailed knowledge of construction processes and the resources required to perform them. Upon successful completion of the course, the student will be able to:

1. Research and report on contemporary practices regarding the selection and use of construction equipment and the various construction processes on which it is used
2. Identify the essential features of construction equipment and understand how these impact the selection, operation and use of the equipment in normal production operations.
3. Apply engineering principles to the selection and optimization of the equipment and methods used to construct a variety of projects.
4. Assure that chosen systems will comply with the safety and quality requirements of the work performed.

Instructional Method:

The course relies heavily on students working in teams to study and present carefully structured assignments. A challenging three-step process of preparation, presentation and reporting will be used to ensure that all students are involved in each of the set assignments. Students will make substantial use of texts, journals, trade magazines and standard industry practices to compliment the text which will provides necessary background material.

Means of Student Evaluation:

Students will be evaluated on their ability to answer factual questions regarding material presented in the class and assigned texts, to correctly solve problems using methods presented in the class, and to participate productively in critical discussion of course material. Student performance in the course will be evaluated on the following basis:

Assignments, reports, and presentations:	60%
Final exam:	40%

It is anticipated that final letter grades will awarded as follows:

A = 90 to 100%, B = 80% to 89%, C = 70 to 79%, U = <70%

Class Preparation and Assignments:

- Attendance at lecture is strongly encouraged. Students are solely responsible for material missed due to absence.
- All assignments are due on the dates determined by the instructor. No late submissions will be accepted.
- The use of cell phones, tables, computers, etc. devices is disruptive and is prohibited during class.
- Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Office of Disabled Student Services at 687-4355 as soon as possible to request an official letter outlining authorized accommodations.

Academic Integrity:

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Proposed Course Outline

The course is structured to include traditional instruction methods for the first quarter semester, followed by student led instruction via inquiry, reporting, and presentation. Course topics to be covered via traditional instruction include:

1. Overview of Equipment Types
2. Physics and Performance of Equipment
3. Equipment Management
4. Equipment Economics

Topics for student inquiry, research, reporting, and presentation will be selected from contemporary equipment issues and modern construction methods. Students will be formed into groups, assigned topics, and tasked with developing QRS documents, which are:

1. Inquiry (Q) – the first assigned team will develop questions regarding areas of interest pertinent to the designated topic. This is a preliminary study of the topic resulting in a one to two page document to guide the reporting team.
2. Report (R) – the second assigned team will fully research the topic and provide a comprehensive written report and presentation to the class. The questions raised in the Q document are to be covered, but in no way limit the scope and quality of the report.
3. Summary (S) – the third assigned team will review the report and presentation and prepare a one to two page analysis, review, and summary of the highlights, errors, and omissions (if any) in both the report and presentation.

Course topics are expected to vary somewhat with each offering of the course, but may include modern topics such as:

1. Mobile Cranes and lifting devices
2. Stationary cranes and lifting devices
3. Formwork and shoring systems
4. Drilling and blasting
5. Crushing and aggregate production
6. Concrete production
7. Concrete transportation and placement
8. Concrete reinforcement, rebar and conventional means
9. Concrete reinforcement, pre-tensioning and post tensioning
10. Asphalt production
11. Compaction
12. Production planning software tools
13. Steel bridge construction
14. Concrete bridge construction
15. Asphalt paving
16. Concrete paving in highway construction
17. Concrete slabs for buildings and bridge decks
18. Piled foundations
19. Earth retaining structures
20. Tunneling
21. Landfill construction
22. Off shore structures

Attachment B – Consultation Documentation



J. Murrey Atkins Library

Consultation on Library Holdings

To: John Hildreth
From: Alison Bradley
Date: 4/10/13
Subject: M. S. Construction and Facilities Management Curriculum Revisions

Summary of Librarian's Evaluation of Holdings:

Evaluator: Alison Bradley Date: 4/10/13

Check One:

- 1. Holdings are superior _____
- 2. Holdings are adequate _____ **x**
- 3. Holdings are adequate only if Dept. purchases additional items. _____
- 4. Holdings are inadequate _____

Comments:

Library holdings should be adequate to support student research for this course (see list of items held by subject heading below). Students will have access to relevant databases including ASCE digital library, Compendex, INSPEC, Environment Complete, and many others.

LC Subject Heading	Total items held
Concrete	821
Concrete construction	219
Traffic engineering	855
Construction industry -- Management.	120
Sustainable Construction/Buildings	181

Alison Bradley

Evaluator's Signature

4/10/13

Date