FITCHBURG STATE UNIVERSITY

*These top fields will be completed by the SGOCE office.*

Academic Year: * 2021-2022 SGOCE#: * 37

# New Graduate Course Proposal

**Form Procedure**
**To share the form** with others prior to Submitting choose the **Save Progress** option at the bottom.
**Create a PDF** of the saved form go to Print and choose Save as PDF copy rather than print.
**To access the saved form** for editing or to finalize submission visit forms.fitchburgstate.edu to log in and view your Pending/Drafts under My Forms.

## Course Title

Course Title: * Modular Construction

Proposed Banner Abbreviation: * Modular Construction

*Banner limit of 30 characters, including punctuation, spaces, and special characters.*

## Department/Committee Information

The main contact person for the Graduate Curriculum Committee should fill out this form.

Requestor Name: * Nirajan Mani

Members of the Graduate Curriculum Committee: Dr. Nirajan Mani, Dr. Wayne Whitfield, Dr. Soumitra Basu, Dr. Abdel Gabar Mustafa, Dr. Hong Yu

Department / Unit Developing: * Engineering Technology

Chair of Department for Program: * Nirajan Mani Chair Email: * Nirajan Mani nmani@fitchburg

Academic Dean of Department or Program: * Margaret Hoey Academic Dean E-mail: * <Dr. Hoey> mhoey@fitchburg

Program Chair The Program Chair for this request is among the people listed above.

* (•) Yes
( ) No

## Course Information

Course Description

* This course provides knowledge of modular construction including, advantages, disadvantages, impediments, industry status, business case process, execution plan, critical success factors, and standardization strategy of modularization.

Rationale and expected outcomes of offering the Course

* This course will focus on a modular construction practices and techniques for constructing building offsite. It will also compare the modular construction with conventional building construction methods. Students will learn about the different types of modular construction, understand their limitations and advantages, and learn how to manage the modular construction process. This course also explains how onsite and pre-manufactured processes combine and describes how to leverage modular components in a traditional construction project in order to leverage benefits such as increased sustainability.

Expected Outcomes:
1. Describe module, prefabrication, preassembly, off-site construction, modularization, PPMOF, and accelerated bridge construction (ABC).
2. Explain the key advantages, disadvantages, barriers, drivers, and enablers of modularization;
3. Apply the modularization business case process and the PPMOF tool, calculate a net present value for modular project, compare total installation costs between modularization and stick-built projects, and determine go/no-go for modularization;
4. List modularization critical success factors for modularization and list execution plan differences for modularization
5. Describe standardization strategy for modularization;
6. Recognize the shipbuilding construction philosophy transformation and explain a path forward for construction.

Number of Credits: * 3

Discipline Prefix or Prefixes: * CMGT

Brief rationale if more than one prefix:

Level of Course: * 7000 / 8000 / 9000

Brief rationale for level choice:: * Graduate level course

The course will be: Requirement / Elective

Elective or Requirement Note/Special:

Is there a similar undergraduate course? * Yes / No

Does this course affect offerings in any other department or program? * Yes / No

**Course Enollment**

Expected Average Enrollment: * 12

This course is a replacement for: Course # / Name

Has the course been offered previously as a "Topics" course? * Yes / No

Is this an Extended Campus Course? * Yes / No

Which semester will this course be offered for the first time?: * Fall 2024

How often thereafter to be offered?: * In two years

**Course Requirements**

Prerequisite course(s) if any:

Additional Requirements

Laboratory Hours:

Fieldwork Hours:

Pre-Practicum Hours:

Practicum Hours:

Other Requirements (specify): Graduate Standing

**Syllabus Upload**

New Course Syllabus Upload: MSCM_Syllabus_Modular_Construction_Final.pdf

## Signatures

*Click on the **Submit Form** button at the bottom of the page after you have signed the form.*
*You should receive an email confirmation that your signature has been completed.*

...3936333731

Nirajan Mani — 03/21/2022

Requester Signature — Date

...3638393238

Nirajan Mani — 04/18/2022

Department Chair Approval — Date

Academic Dean Signature — Date

SGOCE Dean Signature — Date

Approval of the Graduate Council — Date

Approval of the President — Date

**Notification**

Reviewed by the Registrar: _____

Reviewed by the Library: _____

Retired form

| | |
|---|---|
| SGOCE Admin. Assistant Signature | Electronically signed by Denise Bertrand on 05/01/2022 12:57:43 PM |

FITCHBURG STATE UNIVERSITY

**School of Graduate Online and Continuing Education (SGOCE)**
**Department of Engineering Technology**
**SYLLABUS**
**FALL 2024**

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***Class Information:***

Course: CMGT 8XXX (Modular Construction)
Credits: 3
Class Modality: Online
Class Start Date: TBD
Class End Date: TBD

***Instructor Information:***

**Dr. Nirajan Mani**
Office: CNIC 209A
Phone: 978-665-4843
Email: nmani@fitchburgstate.edu
Office Hours: M/W (11:00 A. M. – 12:15 P. M.) (By Appointment)

***Textbook:***

Construction Industry Institute (CII). (2013). "Industrial Modularization: How to Optimize; How to Maximize." J. T. O'Connor, W. J. O'Brien, and J. O. Choi, eds., The University of Texas at Austin: Construction Industry Institute, Austin, TX. (It will be available on Blackboard)

***References:***

Design in Modular Construction (1st Edition)
Authors: Mark Lawson, Ray Ogden, Chris Goodier
Publisher: CRC Press
ISBN: 13: 978-0415554503

***Recommended Reference Books and Articles:***

- CII. (2002). Implementing the Prefabrication, Preassembly, Modularization, and Offsite Fabrication Decision Framework: Guide and Tool. The University of Texas at Austin: Construction Industry Institute, Austin, TX.
- CII. (2011). Transforming Modular Construction for the Competitive Advantage through the Adaptation of Shipbuilding Production Processes to Construction. The University of Texas at Austin: Construction Industry Institute, Austin, TX.
- McGraw-Hill (2011). "Prefabrication and Modularization: Increasing Productivity in the Construction Industry." SmartMarket Report.
- Choi, J. O., Chen, X. B., and Kim, T. W. (2017). "Opportunities and challenges of modular methods in dense urban environment." International Journal of Construction Management.

***Supplementary Materials:*** Handout materials will be provided by instructor

***Catalog Description:***

This course provides knowledge of modular construction including, advantages, disadvantages, impediments, industry status, business case process, execution plan, critical success factors, and standardization strategy of modularization.

***Prerequisite:*** *Graduate student standing required unless otherwise agreed upon by instructor.*

***Required Skills:*** *Understanding of conventional stick-built construction method, practices, and management*

***Course Objectives:***

This course will focus on a modular construction practices and techniques for constructing building offsite. It will also compare the modular construction with conventional building construction methods. Students will learn about the different types of modular construction, understand their limitations and advantages, and learn how to manage the modular construction process. This course also explains how onsite and pre-manufactured processes combine and describes how to leverage modular components in a traditional construction project in order to leverage benefits such as increased sustainability.

***Students Learning Outcomes:***

Student will be able to:

1. Describe module, prefabrication, preassembly, off-site construction, modularization, PPMOF, and accelerated bridge construction (ABC).
2. Explain the key advantages, disadvantages, barriers, drivers, and enablers of modularization;
3. Apply the modularization business case process and the PPMOF tool, calculate a net present value for modular project, compare total installation costs between modularization and stick-built projects, and determine go/no-go for modularization;
4. List modularization critical success factors for modularization and list execution plan differences for modularization
5. Describe standardization strategy for modularization;
6. Recognize the shipbuilding construction philosophy transformation and explain a path forward for construction.

***Learning Outcomes Assessment:***

Assessment tools for the above learning outcomes include homework & quizzes (outcomes: 1 to 6), project (outcomes: 3, 5), and exams (outcomes: 2, 3, 4).

***Instructor Availability:***

Instructor will be available during weekdays to respond your questions or concern via university email. Please contact instructor via university email if you have any questions or concern to avoid spam issue. However, this is an online class, we will use Google Meet / Hangouts for all student requested meetings.

***Instructional Strategies:***

The course will be conducted in an online format. This class may use lectures, demonstrations,

self-guided study, group discussions, collaborative learning groups, and presentations to cover the topics in this course. PowerPoint presentations, computer applications, etc. may be utilized. Some independent learning is expected of the students; they should complete assigned readings prior to each class session and actively engage in discussions and activities to facilitate their understanding of classroom presentations. Every effort will be made to meet the individual needs and various learning styles of the course participants. It is most important that you inform the instructor at the beginning of the semester of any particular unique needs.

***Course Topics:***

The following topics will be covered in the course. The following listing is a general indication of the order of their coverage. However, faculty instructor reserves the right to change the order of coverage and the topics to be covered based upon the class's performance and interests.

- Introduction of Modular Construction
- Advantage & Disadvantage of Modular Construction
- Industry Status on Modular Construction
- Module Types
- Opportunities and Challenges of Modular Methods in Dense Urban Environment
- Module Transportation
- CII Strategic Decision Tool for PPMOF
- Business Case Process and Analysis Execution Plan Differences
- Critical Success Factors and Enablers
- Automation in Modular Construction
- Standardization Strategy
- Industry-wide Maximization Enablers
- Modular Building
- Accelerated Bridge Construction
- Hospital Modularization
- Solar Decathlon Modularization
- Design Standardization
- Factory Production
- Learnings from Shipbuilding Industry

***Grading System:***

| Range | Letter Grade | Quality Points |
|---|---|---|
| 95 - 100 | A | 4.0 |
| 92 - 94 | A- | 3.7 |
| 89 - 91 | A- / B+ | 3.5 |
| 86 - 88 | B+ | 3.3 |
| 83 - 85 | B | 3.0 |
| 80 - 82 | B- | 2.7 |
| 77 - 79 | B- / C+ | 2.5 |
| 74 - 76 | C+ | 2.3 |
| 71 - 73 | C | 2.0 |
| 0 – 70 | C- | 0 |
| Withdrawn | | W |
| Incomplete | | IN |
| In-Progress | | IP |
| Audit | | AU |
| Satisfactory | | S |
| Unsatisfactory | | U |

** Grades that fall between intervals will be rounded to the higher number.*

***Evaluation Criteria:***

| | |
|---|---|
| Quizzes | 10% |
| Homework | 30% |
| Exam I | 20% |
| Exam II | 20% |
| Project | 20% |

** The instructor reserves the right and the responsibility for adjusting these items and their weights as necessary to meet specific situations as they may arise.*

***Student Responsibilities and Class Requirements:***

Each student is responsible for completing all course requirements and for keeping up with all activities of the course. Students are required to complete all assigned homework, quizzes, exams, and project work by the given deadline.

***Policy on Assignments:***

All assignments must be turned in on the blackboard on Sundays per the documented dates in the syllabus. Feedback to your submissions will be posted on the blackboard within 72 hours (96 hours for a class of 60 or more students) after the weekly submission due date and time. It means that if you chose to submit your assignment early, it will be graded at the scheduled time and not before. Work submitted after due date will receive a grade of zero. All assignments must conform to APA writing style and include a reference list (not a work cited or bibliography).

Students with extenuating circumstances, such as a medical emergency or other emergencies must

provide written proof of such event, and report such events within 24 hours and make arrangement to complete assignments in a timely manner. Failure to do so will result in a penalty up o 50%. Make up examinations (if part of course) will only be offered at the discretion of the instructor.

***Technology Initiatives:***
Users of the Fitchburg State University computer systems are subject to all applicable federal, state, and international computer laws. Questions regarding regulations may be directed to the office of Information Technology Systems.

*Students will utilize technology as:*

- A research tool; (a means of discovering current trends and substantive research articles in education)
- A communication method
- An enhancement tool for the design of PowerPoint presentations (for recorded presentations-individual/group)

*Fitchburg State University Library Online Services:*

The Fitchburg State University Library online services may be accessed through the Fitchburg State University Homepage https://library.fitchburgstate.edu/. Students may access any of several full-text online databases. Passwords are available to students by calling 978.665.3063. Students may access the Fitchburg State University Career Service and Counseling Services Center via the college's homepage at https://www.fitchburgstate.edu/student-support/career-support/career-resources.

***Disabilities Accommodation:***
Students requiring course alterations or accommodations due to a disability or emergency medical condition, should inform instructor as soon as possible. You should also work with the Disability Services Office (978-665-4020). They will provide you with the forms needed to determine the particular accommodations that your situation merits.

***University Academic Dishonesty Policy:***
Fitchburg State University's policy on Academic Dishonesty will be enforced in this course. Please refer to the university catalog on this policy. Plagiarism and cheating are inexcusable. Any instance of plagiarism or cheating will result in lowered grade and possible failing the course.

***Tentative Schedule:***

| Week | Topics | Remarks |
|---|---|---|
| Week 1 | Introduction of Modular Construction; Advantages & Disadvantage of Modular Construction | |
| Week 2 | Industry Status on Modular Construction; Module Types | *Homework 1 due* |
| Week 3 | Opportunities and Challenges of Modular Methods in Dense Urban Environment; Module Transportation | |
| Week 4 | CII Strategic Decision Tool for PPMOF; Business Case Process and Analysis Execution Plan Difference | *Homework 2 due* |
| Week 5 | Critical Success Factors and Enablers; Automation in Modular Construction | *Quiz 1 due* |
| Week 6 | Standardization Strategy | *Assign Final Project* |
| Week 7 | Industry-wide Maximization Enablers | ***Exam I due*** |
| Week 8 | Modular Building | |
| Week 9 | Accelerated Bridge Construction | *Homework 3 due* |
| Week 10 | Hospital Modularization | |
| Week 11 | Solar Decathlon Modularization; Final Project Discussion | Homework 4 due |
| Week 12 | Design Standardization | |
| Week 13 | Factory Production; Learning from Shipbuilding Industry | Quiz 2 |
| Week 14 | Project Week / Recorded Project Presentation | Project Report & Presentation due |
| Week 15 | Final Exam | ***Exam II due*** |

*Note: The instructor reserves the right to modify this syllabus and schedule.*