Master of Science in Engineering - MSE (CE&M)

Construction Engineering and Management

Guidelines for Newly Admitted Students

[Last Edited 02 August 2021 by Professor Vineet R. Kamat]

Welcome to the Tishman Construction Management Program and congratulations on your admission to the MSE (CE&M) program. You are required to obtain approval from your adviser for all course selections before you register each semester, to ensure that you are meeting your own objectives as well as all degree requirements. Please fill out the *Course Enrollment Worksheet* at the end of this document using pencil, to plan your program before you see your adviser for advice and approval. You may also fill the electronic worksheet and email it to your adviser.

The following list of courses complements the Tishman Construction Management Program (TCMP) website (http://tcmp.engin.umich.edu/courses). Consult the university registrar's *Schedule of Classes* (http://www.ro.umich.edu/schedule/) for more information regarding the times and locations at which courses will be offered. To help you design a course package that meets the MSE requirements, each course is designated with the following labels:

P = pre-requisite for students who do not have background in Civil Engineering or Construction
R = required course for MSE
R* = one course marked R* is required for MSE
C = graduate credit as construction elective or program elective
E = graduate credit as program elective; many courses not listed are also acceptable
S = one credit seminar course

The MSE program is designed for students who want to conduct research as part of their graduate program, and are intent on pursuing either a professional career in the construction industry or continuing into the Ph.D. program to pursue a research career after completing their Master's program. With proper planning, the MSE degree can be completed within one calendar year. However, most students choose to spend 3 full semesters completing their degree program (Fall, Winter, Fall). MSE students are required to do at least 3 credits worth of research (CEE 530 or CEE 630) as part of their graduate program of study. The research is conducted under the supervision of one or more TCMP faculty members.

MSE students must take 30 credits (CR) as follows:

9 CR Required Courses: CEE531, CEE532, CEE536
3 CR Required Research: CEE530 or CEE630
9 CR Construction Electives: courses designated below as "C"
3 CR Mathematics, probability, statistics, or mathematical programming elective
3 CR Business, Industrial and Operations Engineering, or other management elective
3 CR Program Elective: Students may select any Program Elective related to CE&M (e.g., additional "C" courses, additional business or math courses, and many others).
Note: Students who have already taken some of the above classes or their equivalent before enrolling in the MSE will be able to take other CE&M electives in consultation with their adviser.

The grading system used for graduate studies follows the following 4-point scale:

A+ = 4.3; A = 4; A- = 3.7; B+ = 3.3; B = 3.0; B- = 2.7; C+ = 2.3; C = 2; C- = 1.7

A minimum cumulative graduate grade point average (GPA) of 3 on this 4-point scale is required for all graduate courses taken for credit and applied toward MSE (CE&M) Degree.

CE&M Courses

CEE 331 - Construction Management (4 CR) P

Introduction to a construction management process for engineers in which the project life-cycle is broken into organizing, evaluating, planning, monitoring and controlling. Students will learn about the project delivery, financial and procurement systems; legal issues; cost estimation; scheduling; bonding and insurance; and project resource planning and control.
Offered Winter Term Only (Menassa)

CEE 435 – Building Information Modeling (3 CR) C

Fundamentals of Building Information Modeling (BIM) methods and their significance in project management and collaboration; Application of BIM in primary construction management functions such as coordination, design clash detection, sequencing, safety, logistics, and communication; BIM-based Integrated Project Delivery (IPD) approach and the project lifecycle; Reality capture methods for as-built documentation in BIM; BIM in facility and asset management; BIM standards and interoperability.
Offered Fall Term Only (Kamat)

CEE 501 (Sec 930) - Construction Industry Institute (CII) Best Practices (3 CR) C

Introduction to the Construction Industry Institute (CII) Best Practices defined and developed by CII over the last 25 years. Current professional and practice issues in the construction industry. The course covers the majority of CII Best Practices, such as Front-End Planning, Zero Accident Techniques, Constructability and Materials Management. Lectures focus on Best Practices or practice, and critical issues facing the construction industry.
Offered Fall Term Only (Lee)

CEE 530 - Construction Professional Practice (3 CR) R*

Industry speakers, field trips, team projects. Teams work with contractor or owner client addressing industry problem as volunteer consultants, prepare/present written and oral reports to class and client. Prerequisite: permission of instructor, mandatory satisfactory/ unsatisfactory.
Offered Winter Term Only (Menassa)

CEE 531 - Construction Cost Engineering (3 CR) R

Cost engineering for construction organizations, projects, and operations. Construction financing; break even, profit, and cash flow analyses; capital budgeting. Equipment cost and procurement decisions. Construction financial accounting, cost accounting, cost control systems, data bases. Cost indices, parametric estimates, unit price proposals, measuring work and settling claims.
Offered Fall Term Only (Kamat)

CEE 532 - Construction Project Engineering (3 CR) R

The course covers the fundamentals of project-based organization, project delivery systems, resource management focusing primarily on human aspects, organizational behavior and culture, change and interface management, productivity measurement and analysis, and construction safety and ergonomics. Examples and case studies from construction are used to help students' learning.
Offered Fall Term Only (Lee)

CEE 533 - Engineering Process Modeling and Risk Analysis (3 CR) C

Engineering complex systems, models and simulation. Probabilistic aspects of simulations. Data collection and selection of input distributions. Design of experiments, input and output analysis and interpretation. Random number generators, variate and process generation. Monte Carlo simulation models. Activity cycle diagrams. Cyclone-EZStrobe-Stroboscope networks. In-depth examination of discrete-event simulation systems. Variance reduction techniques, antithetic sampling, common random numbers. Simulation and optimization. Parametric analysis. Single system output analysis and multiple system comparison. Hands-on model development using Stroboscope, EZStrobe, ProbSched, Risk-Solver-Platform, Simtools, and YASAI. Animations using Proof-Animation, Vita2D and Vitascope++. Applications from on-site construction, off-site manufacturing, tunneling, earthmoving, mining, land, air, and marine transportation systems. Prerequisites: senior or graduate standing.
Offered Winter Term Only (Ioannou)

CEE 534 - Construction Engineering, Equipment, and Methods (3 CR) C

Major construction equipment and concrete construction. Selection of scrapers, dozers, cranes, etc., based on applications, methods, and production requirements. Power generation, transmission, and output capacity of equipment engines. Calculation of transport cycle times. Concrete methods including mixing, delivery, and placement. Design of forms for concrete walls and supported slabs.
Offered Winter Term Only (Kamat)

CEE 536 - Critical Path Methods (3 CR) R

Construction project planning, scheduling, control using activity-on-arrow, activity-on-node, and overlapping network models. Start, finish, float, critical path calculations. Probabilistic activity durations, PERT concepts, merge event bias. Time-cost tradeoff, resource allocation and leveling algorithms, cost-schedule integration, computerized control systems. Case studies, term project.
Offered Fall Term Only (Ioannou)

CEE 538 – Computer-Aided Project Management (2 CR) C

Introduction to the application of modern computer systems, including Primavera Project Management Professional P6 and Microsoft Project, for construction project planning, scheduling and control. This course must be accompanied or preceded by CEE 536.
Offered Fall Term Only (Ioannou)

CEE 555 – Sustainability of Civil Infrastructure Systems (3 CR) C

Life Cycle Cost Analysis and Life Cycle Analysis - Methods and Applications in Buildings; Building Energy Modeling and Simulation; Energy Management in Buildings; Impact of Building Occupants and Behavioral Challenges; Renewable Energy and Efficiency in Buildings; Existing Buildings and Technical/Social Challenges of Energy Retrofits; and Building Certifications (e.g., LEED).
Offered Fall Term Only (Menassa)

CEE 630 - Directed Studies in Construction Engineering (3 CR maximum) R*

Selected reading in specific construction areas. Offered any term, by arrangement with instructor. With special permission, students may choose CEE 630 in consecutive terms. To be arranged with instructor: Ioannou (section 028); Kamat (section 020); Lee (section 047); Menassa (section 059).

CEE 631 - Construction Decisions Under Uncertainty (3 CR) C

Construction project and organization decisions for the uncertain future. Selection of construction method, equipment, contract, markup, and financing alternatives having the highest expected values. Uses decision theory, competitive bid analysis, probabilistic modeling and simulation, and multiple regression analysis in managing construction. Prerequisite: A course in probability or statistics such as Stat 310 or Stat 311 or SMS 301.
Offered Winter Term Only (Ioannou)

CEE 830 – Construction Engineering and Management Seminar S

Presentation and discussion of selected topics relating to construction engineering and management practice and research by invited lecturers.

MSE (CE&M) Cognates

Math Cognate

Examples of courses that will satisfy the MSE (CE&M) math cognate requirements are listed below. We particularly recommend CEE 573, EECS 501, EECS 551, Stat 412, and IOE 510.

CEE 573 - Data Analysis in CEE
IOE 510 - Linear Programming
Math 450 Advanced Mathematics for Engineers
Math 471 Introduction to Numerical Methods
Stat 412 Introduction to Probability and Statistics
Stat 425 or Math 425 Introduction to Probability Theory
EECS 442 Computer Vision
EECS 467 Autonomous Robotics
EECS 501 Probability & Random Processes
EECS 504 Foundations of Computer Vision
EECS 551 Mathematical Methods for Signal Processing
EECS 556 Image Processing
EECS 568 Mobile Robotics: Methods and Algorithms

Management Cognate

For the MSE (CE&M) management cognate, we particularly recommend one of the following courses.

ACC 471 Accounting Principles
FIN 503 Financial Management
MO 501 Human Behavior and Organization
MO 503 Leading People and Organizations
FIN 565 Real Estate Development: Fundamentals
BL 482 Real Estate Law
FIN 517 Real Estate Essentials

Cognate courses must be three credit hours each (multiple 1.5 hr courses do not count as minor electives). Courses in the Business School at the 500-level and up, as well as certain courses in other departments, require permission of the instructor to enroll. Obtaining such permission in a timely manner is the student's responsibility. Careful planning of cognate course selections is thus necessary.

Courses not eligible for graduate degree credit

Certain courses are not eligible as cognates and will not receive graduate credit towards the 30 credit hours required for the MSE in Construction Engineering and Management degree. It is very important that students discuss their cognate courses with their academic advisor and obtain written approval prior to finalizing their choices and plan of study.

Course Enrollment Worksheet

M.S.E. in Construction Engineering and Management

Student:

Adviser:	**Term:**								
CEE 531 Constr Cost Engineering	**Hours** 3								
CEE 532 Constr Project Engineering	3								
CEE 536 Critical Path Methods	3								
Construction Elective	3								
Construction Elective	3								
Construction Elective	3								
CEE 530 (or) CEE 630	3								
Math,Prob,Stat,Math Prog Cognate	3								
Management Cognate	3								
Program Elective	3								
Hours Toward MSE Term / Total	30								
Additional Courses, Misc									
Comments:									
Meeting Date									
Adviser's Initials									

18 hr Core CE&M + 3 hr CEE 630/CEE 530 + 3 hr Math Cognate + 3 hr Mgt Cognate + 3 hr Program Electives = 30 hr

To count as cognate, a course must be ≥ 2 hr outside CEE. Multiple 1.5 hr courses do not count for cognates.

30 credit hours required, with 18 hours > 400 level

Program (and all courses) must be approved by student's Faculty Adviser.

Required GPA ≥ 3.0/4.0 (B average)

Last edited by vkamat 12/21/2020