

Master of Engineering

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 MEng (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.

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 MEng 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 MEng
- C** = graduate credit as construction elective
- M** = graduate credit as secondary elective for MEng; many courses not listed are also acceptable if approved by the student's academic advisor.
- S** = one credit seminar course

All courses are not offered every semester or every academic year. Please consult your academic advisor at the beginning of each semester to create and follow your plan of study.

The MEng program in Construction Engineering and Management (CE&M) is designed for students who want to pursue a broad set of coursework, and are generally planning to pursue a professional career in the construction industry upon completion of their Master's program. With proper planning, the MEng program can be completed in two semesters (Fall and Winter terms). The interested MEng student is welcome to do research and get graduate credit that counts toward the degree. It is possible to continue on to the Ph.D. program after completing the MEng if the student demonstrates research competency during their Master's study. MEng students are required to take the course CEE 530 titled Construction Professional Practice.

MEng students must take a minimum of 26 credits (CR) as follows:

- 12 CR Core CE&M Courses: CEE435, CEE531, CEE532, CEE536
- 3 CR CE&M Elective: any course designated below as "C"
- 3 CR CE&M Professional Practice: CEE 530
- 6 CR Secondary Electives: two courses in same area (e.g., business, architecture, geotechnical, structures, transportation, systems, etc.) but not exclusively "C"
- 1 CR CE&M Graduate Seminar: CEE 830
- 1 CR Elective Graduate Seminar: seminar course in another CEE concentration area (e.g., structural engineering, geotechnical engineering) or a technical/management area outside the CEE department (e.g., architecture, real estate, business).

Note: Students who have already taken some of the above classes or their equivalent before enrolling in the MEng 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 MEng (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)

R

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 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 812 – Structural Engineering Graduate Seminar S
Presentation and discussion of selected topics relating to structural engineering practice and research by invited lecturers.

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.
Offered Fall Term Only (Kamat, Lee, Menassa)

CEE 840 – Geotechnical Engineering Seminar S
Presentation and discussion of selected topics relating to geotechnical engineering practice and research by invited lecturers.

Secondary Electives

The following table provides examples of acceptable secondary elective areas and representative courses. Students must select two courses (6 credits) in the same general area such as business, architecture, geotechnical, structures, transportation, and systems. The two courses selected as secondary electives need not be offered by the same program or department as long as they represent a common technical or management area. Construction graduate courses marked exclusively as “C” in this document cannot be used as secondary electives. Many areas and courses not listed below are also acceptable as secondary electives, only if approved by the student’s academic advisor.

Secondary Area	Representative Courses (M)
Business Administration	ACC 471 Accounting Principles FIN 503 Financial Management MO 501 Human Behavior and Organization MO 503 Leading People and Organizations
Architecture	Arch 583 Professional Practice
Real Estate	FIN 565 Real Estate Development: Fundamentals BL 482 Real Estate Law FIN 517 Real Estate Essentials
Sustainable Development	BA 605 Green Development NRE 557 Industrial Ecology ARCH 515 Sustainable Systems ARCH 555 Building Systems and Energy Conservation URP 552 Healthy Cities: Planning and Design
Civil Infrastructure Systems	CEE 573 Data Analysis in Civil and Environmental Engineering CEE 575 Sensing for Civil Infrastructure Systems
Geotechnical Engineering	CEE 545 Foundation Engineering CEE 547 Soils Engineering and Pavement Systems
Industrial and Operations Engineering	IOE 510 Linear Programming IOE 511 Continuous Optimization Methods
Mathematics	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 501 Probability & Random Processes

Secondary elective courses must be three credit hours each (multiple 1.5 hr courses do not count as secondary 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 secondary elective course selections is thus necessary.

Courses not eligible for graduate degree credit

Certain courses are not eligible as secondary electives and will not receive graduate credit towards the 26 credit hours required for the MEng in CE&M degree. It is very important that students discuss their secondary elective courses with their academic advisor and obtain written approval prior to finalizing their choices and plan of study.

General Program Requirements and Policies ---

Credit hours and normal progress: Twelve regular course credits plus a one credit seminar is the typical full-time course load per semester. It is recommended that students plan to complete all of the courses required for the MEng degree in two regular semesters (8 months).

Grades: The grade point average for the 26 hours of courses used to fulfill the requirements for the MEng degree program must be equivalent to at least a B average (3.00). Course grades below C (2.00) are not acceptable for graduate credit, but are considered in computation of a student's grade point average.

Time limit: A student must complete all degree requirements within a period of three consecutive years after their initial enrollment into the MEng degree program.

Graduate transfer credit: A maximum of six hours of graduate course credits may be transferred from another institution. These must be from graduate level courses taken either in residence or on-line with a grade of B or better from an accredited institution approved by the Rackham School of Graduate Studies. Students may request the transfer of such credits through the CEE Department after completion of one semester in the MEng program.

Undergraduate transfer credit: A maximum of six hours of graduate course credit, earned as an undergraduate student at the University of Michigan, with a grade of B or better may be included in the student's graduate study program subject to the following restrictions: (1) credit was not used to meet the bachelor's degree requirement, either as required courses or required credit hours; (2) credit was earned no more than two years before formal admission to the MEng degree program; (3) credit was earned in courses approved for graduate credit by the Rackham Graduate School; and 4) credit was earned in courses approved for the MEng courses listed in this document. Students may request the transfer of such credits through the CEE Department any time after admission to the MEng program.

Course Enrollment Worksheet

M. Eng. in Construction Engineering and Management													
Student:													
Adviser:	Term:												
CEE 435 Building Info Modeling	Hours 3												
CEE 531 Constr Cost Engineering	3												
CEE 532 Constr Project Engineering	3												
CEE 536 Critical Path Methods	3												
Construction Elective	3												
CEE 530 Constr Prof Practice	3												
Secondary Elective	3												
Secondary Elective	3												
CEE 830 Const Grad Seminar	1												
Elective Grad Seminar	1												
Hours Toward M Eng	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Term</td> <td style="padding: 2px;">Total</td> </tr> <tr> <td style="padding: 2px;">26</td> <td style="padding: 2px;"></td> </tr> </table>	Term	Total	26		/	/	/	/	/	/	/	/
Term	Total												
26													
Additional Courses:													
Comments:													
Meeting Date													
Adviser's Initials													

12 hr Core CE&M + 3 hr CE&M Elective + 3 hr CEE 530 + 6 hr Secondary + 2 hr Graduate Seminars = 26 hr
 26 credit hours required, with 18 hours > 400 level
 Program (and all courses) must be approved by student's Faculty Adviser.
 All Construction courses taken must be graded.
 Required GPA > 3.0/4.0 (B average)
 18 hr MEng(CE&M) tuition-fees required.

Last edited by vkamat 12/21/2020