CEM core courses List (30 credit hours):

1. CEM 510 Project Planning and Control
2. CEM 519 Sustainable Construction and Carbon Management
3. CEM 520 Construction Contracting and Leadership
4. CEM 521 Construction Engineering and Cost Estimation
5. CEM 513 Construction Productivity and Quality Management
6. CEM 547 BIM, Lean Construction, and Digital Transformation
7. EM 502 Data Analytics for Decision support systems
8. EM 573 Loss Prevention & Risk Management
9. CEM 619 Project

CEM elective courses (0 credit hours)

None.

Master (30 Credits)	**Credits**
CEM 510 Project Planning and Control	**3**
CEM 519 Sustainable Construction and Carbon Management	**3**
CEM 520 Construction Contracting and Leadership	**3**
CEM 521 Construction Engineering and Cost Estimation	**3**
CEM 513 Construction Productivity and Quality Management	**3**
CEM 547 BIM, Lean Construction, and Digital Transformation	**3**
EM 502 Data Analytics for Decision support systems	**3**
EM 573 Loss Prevention & Risk Management	**3**
CEM 619: Research Project	**6**
Total	**30**

EM/CEM Courses Descriptions

Course Number\code	Course Title	Course Bulletin Description
CEM 510	**Project Planning and Control**	Planning, scheduling, and control of construction projects using Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT); resource allocation and levelling; scheduling with limited resources; time-cost trade-offs; introduction to complex networks, short interval production scheduling; effective communication of schedule information and reporting; schedule analysis for construction delay and other claims; schedule updating and project control and earned value systems; schedule risk management and related computer applications.
CEM 513	**Construction Productivity and Quality Management**	Production economics in construction; nature of the construction industry; production theories of construction; concept and components of the construction productivity system; quantitative methods for measuring productivity and productivity loss; factors affecting construction productivity and strategies for productivity improvement; emerging digital technologies for automated productivity measurement and monitoring; quality theory; total quality management in construction; quality management systems; the tools of quality; strategic quality planning; quantitative methods and simulations in project planning and operations management.
CEM 519	**Sustainable Construction and Carbon Management**	Introduction to sustainability; sustainable construction legislation, regulation, and drivers; traditional construction materials and methods; techniques and methods of sustainable construction; integration of collaborative team effort from owners, architects, engineers, constructors, and consultants; influences on the cost and schedule due to a sustainable construction project; LEED assessment process; High performance buildings and green building materials; Economical analysis of green buildings; low carbon and carbon neutral building materials; carbon dioxide sequestration in cementitious construction materials; carbon negative building materials; construction and demolition waste management; and circular construction.
CEM 520	**Construction Contracting and Leadership**	Basic characteristics of the construction industry; business ownership and company organization; interrelationship of the design and construction processes; construction contract documents; contract law; bidding and awarding procedures; construction claims and disputes; national labor and procurement regulations; engineering and construction ethics; leadership in construction; organization vision,

		strategy, and structure; ethical leadership; stakeholder management; team building; and communication management.
CEM 521	**Construction Engineering and Cost Estimation**	Types of construction works; cost theory and type of cost estimates; cost index; construction resources and costs; types of construction equipment and production estimates; equipment economics and optimized selection of equipment; material quantity take-off; estimating indirect cost and contingencies; bidding strategies; accounting systems, revenue and accounting recognition methods; use of financial statements and financial ratios; Budget development, cashflow analysis, projection, and management, and cost control; cost information systems; evaluation of company financial status and forecasting impacts on profits; and construction financing.
CEM 547	**BIM, Lean Construction, and Digital Transformation**	Fundamental BIM knowledge and overview of BIM uses for construction management; project delivery methods and BIM, integrated digital delivery; BIM tools and new workflows of construction planning & management; basic modeling and project navigation; model-based cost estimating; project scheduling and 4D simulation; design coordination; BIM and facility management; construction progress monitoring technologies; construction safety planning using BIM; BIM, value engineering and constructability; BIM and construction administration; ISO 19650 standard and BIM process; BIM execution plan; construction 4.0 and BIM; digital twin; lean construction and BIM.
CEM 619	**Research Project**	A report on an independent study performed under the supervision of a CEM faculty advisor. This report should include an introduction to the topic, literature review, research methodology, analysis of data, conclusions and recommendations, appendixes and references. The report will be presented and orally examined by a faculty committee. The report should contain work that includes analysis and design of a construction processes and system in a construction engineering specialty field, or an applied construction management project, that demonstrates both mastery of the subject matter and a proficiency in oral and written communication skills.
EM 502	**Data Analytics for Decision support systems**	A wide range of data analytics techniques that serve as the foundation for a broad range of applications, including inferential, predictive, and prescriptive analytics, the elements of statistical modeling; model interpretation and assessment; and structured and unstructured data analysis, the critical phases of analytics including data preparation,

		model development, evaluation, validation, selection, and deployment.
EM 573	**Loss Prevention & Risk Management**	Health and safety planning, project resilience, theories of accident causation and health and safety management systems. Risk management planning, identification, assessing, prioritizing and mitigating risks. Principles related to the ISO 31000, assessment of potential effects on schedule, cost and other performance dimensions using sensitivity analysis, decision tree analysis and simulation techniques, tools and techniques to track, monitor and control projects risks.