

Gordon University

Engineering Management Certificate Program

The purpose of the Engineering Management Certificate Program is to prepare engineers and others for technical decision-making and for increased leadership responsibility in a multi-disciplinary, technical environment.

Rather than complete all the course requirements for a master's degree, students are often interested in taking only select courses from the Master of Engineering Management (MEM) degree program that are relevant to their specific needs. The certificate program is intended to allow these students to receive a certificate of achievement after completing four, three-hour graduate-level courses (12-credit hours) in specific areas of engineering management specialization. While it is expected that students strive for the highest level; minimum grades of B or better must be earned in every class.

While completing the certificate requirement may be the intended goal for many students, others may want to apply the certificate program courses to other graduate degree programs or the Master's Degree in Engineering Management. Therefore, all students participating in the Engineering Management Certificate Program must meet the following requirements:

1. Qualify for graduate-level coursework by being admitted to the Gordon University Graduate School, and
2. Successfully complete the four courses for the specified certificate. (It is important to understand that applying for admission to a Certificate Program does not automatically result in admission to the Master of Engineering Management Masters Degree Program. Also, while a student may earn more than one certificate, a maximum of 12 credit hours will transfer into the Masters Degree Program if the student should desire later to pursue the graduate degree in Engineering Management.)
3. Students in the Master Degree Program may take combinations of courses which qualify them for the certificates. If they wish to receive a certificate they have earned, they may also apply.

Six certificates are available in the Master of Engineering Management degree program. Each certificate requires four, 3-hour graduate-level courses and represents a significant achievement in an area of concentration. Certificates are awarded by the WSU College of Engineering and Architecture.

Engineering Management Certificate Program Options

- 12 semester hours each -

<u>Certificate in General Engineering Management</u>
<u>Certificate in Six Sigma Quality Management</u>
<u>Certificate in Project Management</u>
<u>Certificate in Manufacturing Leadership</u>
<u>Certificate in Constraints Management</u>
<u>Certificate in Supply Chain Management</u>
Certificate in Construction Project Management - new



Certificate in General Engineering Management

Any 4 of the following 6 core courses

- E M 501 Management of Organizations
- E M 505 Financial Management for Engineers
- E M 540 Operations Research for Managers
- E M 564 Project Management
- Stat 430 Statistical Methods in Engineering
- E M 591 Strategic Management of Technology and Innovations in Engineering

Syllabus for each course

E M 501 [Management of Organizations](#) 3 credits

This course explores issues dealing with individual behavior in work organizations. The major focus and goals of the course are to learn various approaches to motivation, leadership, and team-building and to illustrate how and when those approaches are appropriately used. A key focus is team management skills: how to organize groups for maximum effectiveness, how to motivate group members, and how to promote and reward team success.

E M 505 [Financial Management](#) 3 credits

In today's world, it is nearly impossible for an engineer to perform without considering the financial implications of the design, manufacture, construction, sales, and the company strategic plan. Traditional accounting and financial decision-making are not much help to the engineer who needs to cut through paperwork and get to the bottom line. As a result, engineering and cost accounting are usually at odds with each other. The engineer-manager who must constantly compromise between engineering issues and financial decisions is thwarted from doing the best things for the company. A smart approach to finance, its implications for technical processes, and financial management of the technical firm are needed.

E M 540 Operations Research for Managers 3 credits

Applying linear, integer, goal programming; network optimization; queuing analysis; dynamic programming; simulation; Markov analysis; and forecasting to engineering management decisions. Mathematical models have been part of the decision-making process virtually since man learned to represent physical entities and relationships with an abstract system of numbers. In the engineering professions, the majority of engineering design work is based on the application of mathematical models of physical systems. It is conceptually simple, then, to extend the modeling process to managerial and business systems. The models of operations research simply represent a collection of mathematically based models which help to rationalize and quantify the role of the manager. This course introduces students to a number of models which have proven to be effective in solving certain classes of managerial problems. Students receive the opportunity to apply these tools to various representative sample problems. The tools to be surveyed include linear programming, network models, scheduling models, integer and goal programming, dynamic programming, stochastic models, decision theory, queuing models, digital simulation, and inventory systems. The course also introduces the manner in which these models are integrated into decision support systems, heuristics, and expert systems.

E M 564 Project Management 3 credits

Prerequisite basic statistics. The use of projects and project management continues to grow in our complex society. Project management differs from more traditional organizational management because most projects are one-time, extremely focused efforts. Time, money, people, and other resources must be managed extremely well to achieve success, yet there is usually only one chance to do it right. This course examines technical tools, (CPM, PERT, Cost and Schedule Control Systems), behavioral issues, and considerations of organizational structure. The objective of the course is to enable students to understand the strengths and pitfalls of project management. The ultimate goal is to improve the effectiveness of students at all levels of project management: from project selection and chartering at the highest managerial levels, to day-to-day skills for the project manager, to

communicating the meaningful contributions made by participating project team members.

E M 591 [Strategic Planning of Technology & Innovations in Engineering](#) 3 credits

This course focuses on the concepts, techniques, and processes of management with direction and purpose. The perspective taught is that of the manager responsible for the long-term health of the enterprise. The use of technology for competitive advantage, and the interaction of technology with other strategic variables are central themes of the course. The course objective is to understand both the formulation of strategic decisions and the management of strategic processes; therefore students are taught to deal with analytical, behavioral, and creative aspects of management—frequently simultaneously.

Stat 430 [Statistical Methods in Engineering](#) 3 credits

Engineering and technical managers are often confronted with problems and issues involving CERTAINTY and UNCERTAINTY. Basic analysis and design theory fits the first type of problem when initial design concepts are considered. However, when implementation and use is considered, then the second type of problems emerge. This course examines this second type of problem and decision making. The course assumes no background in statistics. Students learn to read and interpret statistical literature and to apply basic statistical methods in evaluating data.

Certificate in Project Management

E M 501 Management of Organizations

E M 508 Legal Issues in Engineering Management

E M 564 Project Management

And one of the following:

E M 520 Construction Project Management (previously offered as E M 595 topics)

E M 565 Systems Engineering Management

Syllabus for each course

E M 501 [Management of Organizations](#) 3 credits

This course explores issues dealing with individual behavior in work organizations. The major focus and goals of the course are to learn various approaches to motivation, leadership, and team-building and to illustrate how and when those approaches are appropriately used. A key focus is team management skills: how to organize groups for maximum effectiveness, how to motivate group members, and how to promote and reward team success.

E M 564 Project [Management](#) 3 credits

Prerequisite basic statistics. The use of projects and project management continues to grow in our complex society. Project management differs from more traditional organizational management because most projects are one-time, extremely focused efforts. Time, money, people, and other resources must be managed extremely well to achieve success, yet there is usually only one chance to do it right. This course examines technical tools, (CPM, PERT, Cost and Schedule Control Systems), behavioral issues, and considerations of organizational structure. The objective of the course is to enable students to understand the strengths and pitfalls of project

management. The ultimate goal is to improve the effectiveness of students at all levels of project management: from project selection and chartering at the highest managerial levels, to day-to-day skills for the project manager, to communicating the meaningful contributions made by participating project team members.

E M 508 Contract Law 3 credits

This course is designed to provide the career engineering manager with a general understanding and knowledge of business law and the legal environment. The course covers generally the laws of the constitution, contracts, sales, business organizations, agency and employment, property, torts, crimes, government regulation, government contracting, and litigation. The course will explore the engineering manager's own role in the legal environment as well as the relationships between engineering managers and other engineering managers, employees, project owners, prime contractors, subcontractors, and the general public.

AND, EITHER

E M 565 Systems Engineering Management 3 credits

The design, manufacture, and operation of complex systems present a major challenge for today's managers. These systems, encumbered schedule and cost constraints while pushing the state of the art technology, demand new tools for project planning, organizing, controlling. This course is designed to assist students in knowledge essential for the management of new and modified complex system development.

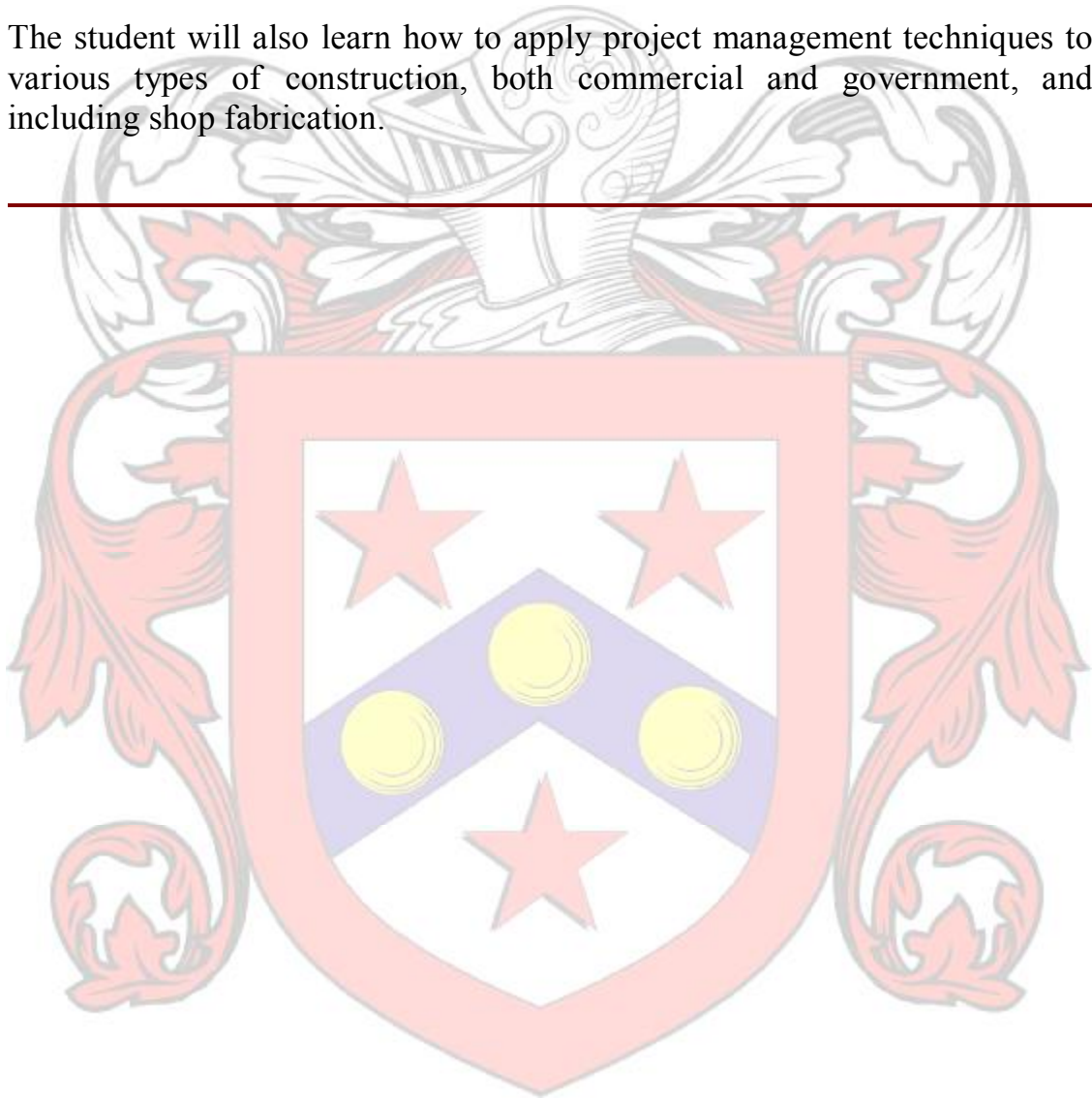
OR

E M 520 Topics in EM: Construction Project Management 3 credits

Successful construction management requires the judicious application of knowledge and skills in several areas, including:

- developing project proposals and plans
- estimating, budgeting, and scheduling
- team-building, managing resources, and communications
- monitoring progress and managing changes with project controls
- environmental, quality, safety and health issues applied to construction

The student will also learn how to apply project management techniques to various types of construction, both commercial and government, and including shop fabrication.



Certificate in Six Sigma Quality Management

Any 4 of the following 6 courses

- E M 560 Supply Chain Management
- E M 570 Six Sigma Quality Management
- E M 580 Quality Control and Reliability Design
- E M 585 Quality Engineering Using Experimental Design
- E M 590 Design for Manufacturability
- Stat 430 Statistical Methods in Engineering

Syllabus for each course

E M 560 Supply Chain Management 3 credits

Concepts and techniques for design; managing manufacturing and operations. Facilities for development of world-class organizations. Corporations operating on an international basis are found around the globe. The parent company provides equipment, sources of supply, procedures manuals, training, and other operating resources. Successes in such globe-spanning businesses force changes in competing firms. The effects are direct, often immediate, and far-reaching. The best concepts and techniques for design and managing manufacturing and operation facilities find their way into all world-class organizations.

E M 570 Six Sigma Quality Management 3 credits

Overview of the total field of quality, including strategic quality management programs, quality assurance, quality control, 6 Sigma, and product design reliability. This course provides the technical manager with an overview of the total field of quality. The subjects addressed throughout the course are: statistics of quality, quality cost, quality improvement, world-

class quality, design for quality, vendor relations, Japanese manufacturing concepts, process control and capability, measurement systems, customer relations, product safety and liability, quality assurance, product design reliability, and strategic quality management. This is an application-oriented course and interrelationships between the various topics of quality management will be reviewed in case studies, readings, and class discussion. Further investigation and a research project are required of each student.

E M 580 Quality Control and Reliability Design 3 credits

Quality improvement analysis for process and product quality; statistical process control, capability studies; acceptance sampling concepts; reliability models for prediction and testing. This course addresses statistical methods as used in quality analysis; modeling process and product quality. It covers statistical process control, control charts, and an introduction to process capability studies. Traditional acceptance sampling, process sampling, and sampling for quality audit; QC curves and sampling tables are included. The basic concepts of reliability; definitions; failure models, reliability prediction, estimation, and apportionment are covered; as well as failure data analysis and 6 Sigma. Product design, development, and production; design review, product testing. The final components are maintainability measures and prediction and preventive maintenance scheduling.

E M 585 Quality Engineering Using Experimental Design 3 credits

Design of quality into products and processes using design of experiments including robust/parameter design and tolerance design techniques. Design of experiments is a systematic and efficient method of design optimization for performance, quality, and cost in quality engineering. Statistical quality control improves the product and/or process quality for a given design. This course examines the design in order to acquire a better product/process quality. Other names for this include robust design, parameter design, or Taguchi Techniques. This course gives engineers a current understanding of the techniques and applications of design of experiments in quality engineering design. 6 Sigma will be included.

E M 590 [Design for Manufacturability](#) 3 credits

Various techniques to identify opportunities for improvement and development of a comprehensive product design are explored. Key issues and competitive product development and design optimization includes topics such as: quality function deployment; design for assembly and product variation; failure modes and effects analysis; reliability/serviceability, concurrent engineering; statistical process control, 6 Sigma process, and flexible process selection; tolerances design; rapid prototyping; design and development management issues; reducing part cost with DFM; DFM team building and training

Stat 430 [Statistical Methods in Engineering](#) 3 credits

Engineering and technical managers are often confronted with problems and issues involving CERTAINTY and UNCERTAINTY. Basic analysis and design theory fits the first type of problem when initial design concepts are considered. However, when implementation and use is considered, then the second type of problems emerge. This course examines this second type of problem and decision making. The course assumes no background in statistics. Students learn to read and interpret statistical literature and to apply basic statistical methods in evaluating data.

Certificate in Manufacturing Leadership

- E M 560 Supply Chain Management
- E M 575 Performance Management in Technical Organizations
- E M 590 Design for Manufacturability
- E M 526 Theory of Constraints

Syllabus for each course

E M 526 Constraints Management 3 credits

Introduction to the theory of constraints. Students learn the formal analysis techniques that find the limiting factor in any system. Identifying the goal and necessary conditions that must be met to achieve success in the system are addressed. Students learn to think logically and formulate cause and effect relationships that define the system. They learn to differentiate between the many annoying problems that exist within the system to find the core problem or root cause of the many negative effects. Ways to find breakthrough injections that lead to solutions eliminating the conflict that consistently prevents development of a solution to the core problem are presented. Students also learn how to break down the obstacles that prevent near impossible tasks and how to bring about change within the system.

E M 560 Manufacturing and Operations Design and Strategy 3 credits
Concepts and techniques for design; managing manufacturing and operations. Facilities for development of world-class organizations. Corporations operating on an international basis are found around the globe. The parent company provides equipment, sources of supply, procedures manuals, training, and other operating resources. Successes in such globe-spanning businesses force changes in competing firms. The effects are direct, often immediate, and far-reaching. The best concepts and techniques for design and managing manufacturing and operation facilities find their way into all world-class organizations.

E M 575 Performance Management in Technical Organizations 3 credits

Management of high technology organizations; planning, measurement, and human factors in improving high technology organizations; productivity, motivation, and performance systems. This course addresses the management of the high technology engineering process based on seven key dimensions: effectiveness, efficiency, quality, productivity, quality of work life, innovation, and profitability. The course is tailored to engineers. A critical element of the course is measurement including human performance management which is currently of interest in many engineering and high technology organizations. Development of closed-loop measurement and control systems designed to provide information at the source of variation within the system, from an engineering and engineering management perspective, is addressed. This course also provides students a current view of philosophies and methods for engineering organizational improvement of high technology processes. Strategic and tactical planning methods to refine engineering organizational objectives and to measure achievement of the objectives on seven key engineering dimensions are presented.

E M 590 Design for Manufacturability 3 credits

Various techniques to identify opportunities for improvement and development of a comprehensive product design are explored. Key issues and competitive product development and design optimization includes topics such as: quality function deployment; design for assembly and product variation; failure modes and effects analysis; reliability/serviceability, concurrent engineering; statistical process control, six sigma process, and flexible process selection; tolerances design; rapid prototyping; design and development management issues; reducing part cost with DFM; DFM team building and training.

Certificate in Constraints Management

- EM 501 Management of Organizations
- E M 526 Theory of Constraints
- E M 530 Applications in Constraints Management
- And one of the following:
- E M 590 Design for Manufacturability
- E M 565 Systems Engineering Management
- E M 534 Contemporary Topics in TOC
- E M 555 Enterprise Resource Planning

Syllabus for each course

E M 501 Management of Organizations 3 credits

This course explores issues dealing with individual behavior in work organizations. The major focus and goals of the course are to learn various approaches to motivation, leadership, and team-building and to illustrate how and when those approaches are appropriately used. A key focus is team management skills: how to organize groups for maximum effectiveness, how to motivate group members, and how to promote and reward team success.

E M 526 Constraints Management 3 credits

students will be provided an introduction to the theory of constraints. Students learn the formal analysis techniques that find the limiting factor in any system. Identifying the goal and necessary conditions that must be met to achieve success in the system are addressed. Students learn to think logically and formulate cause and effect relationships that define the system. They learn to differentiate between the many annoying problems that exist within the system to find the core problem or root cause of the many negative effects. Ways to find breakthrough injections that lead to solutions eliminating the conflict that consistently prevents development of a solution to the core problem are presented. Students also learn how to break down the

obstacles that prevent near impossible tasks and how to bring about change within the system.

E M 530 Applications of Constraints Management 3 credits

Every system can be characterized as a chain of interlocking activities or a network of interlinked events. The operation or productivity of such a linkage is limited by its weakest link. Constraint Management has a broad application for a variety of management problems. The Theory of Constraints provides powerful tools for finding the problem, creating breakthrough solutions, planning the implementation. This course focuses on proven solutions generated from applying the Theory of Constraints to a large number of real world problems. The proven solutions offer innovative, successful solutions superior to previous methods. While EM 526, Constraints Management teaches how to create your own breakthrough solution for your own environment, this course focuses on how to implement previously discovered solutions in your environment.

AND, EITHER

E M 590 Design for Manufacturing 3 credits

Various techniques to identify opportunities for improvement and development of a comprehensive product design are explored. This course will evaluate key issues and competitive product development and design optimization. It includes topics such as: quality function deployment; design for assembly and product variation; failure modes and effects analysis; reliability/serviceability, concurrent engineering; statistical process control, six sigma process, and flexible process selection; tolerances design; rapid prototyping; design and development management issues; reducing part cost with DFM; DFM team building and training.

OR

E M 565 Systems Engineering Management 3 credits

The design, manufacture, and operation of complex systems presents a major challenge for today's managers. These systems, encumbered schedule and cost constraints while pushing the state of the art technology, demand new tools for project planning, organizing, controlling. This course is designed to assist students in knowledge essential for the management of new and modified complex system development.

OR

E M 534 Contemporary Topics in Constraints Management 3 credits
Contemporary teaching tools, software packages, current techniques and thought in managing complex systems using the theory of constraints.

OR

E M 555 Decision Support and Enterprise Resource Planning (ERP) 3 semester credits

This course addresses the managerial and operational challenges of advanced service and manufacturing systems characterized by tight integration, short cycle times and variety and scope of product. Specifically, computerized advanced manufacturing systems, JIT, synchronous manufacturing and customer integrated service systems are discussed. The systems are reviewed as competitive strategies along with the accompanying organizational implications. The course culminates with an application of a computerized case study analysis for the Class Project.

Certificate in Supply Chain Management

- E M 560 Supply Chain Management
- E M 530 Applications in Constraints Management
- E M 555 Enterprise Resource Planning
- And one of the following:
- E M 590 Design for Manufacturability
- EM 570 Six Sigma Quality Management

EM 530 Applications of Constraints Management 3 credits

Every system can be characterized as a chain of interlocking activities or a network of interlinked events. The operation or productivity of such a linkage is limited by its weakest link. Constraint Management has a broad application for a variety of management problems. The Theory of Constraints provides powerful tools for finding the problem, creating breakthrough solutions, planning the implementation. This course focuses on proven solutions generated from applying the Theory of Constraints to a large number of real world problems. The proven solutions offer innovative, successful solutions superior to previous methods. While EM 526, Constraints Management teaches how to create your own breakthrough solution for your own environment, this course focuses on how to implement previously discovered solutions in your environment.

EM 560 Integrated Supply Chain Management (Formerly Manufacturing and Operations Design and Strategy) 3 semester credits

Every organization has internal supply chains, and links to external suppliers and customers. Interlinking organizations span the spectrum from raw materials to finished products and services in the hands of the consumer. The supply chain extends even to final disposition of the commodities we consume from concept to grave. The structured dependency of such chains, the uncertainty of forecasts and systemic delays are amplified as individual links in

the supply chain try to optimize their performance. Even minor changes in the market can cause wild swings in economic performance. Modern operation theories and information systems hold the promise of stabilizing some of the variability by providing visibility along the whole supply chain. Additional control and operational performance factors are needed to provide a complete solution. This course examines the strategy and tactics of supply chain management to include “how to” techniques to implement, measure and reward the individual links in the supply chain.

E M 555 Decision Support and Enterprise Resource Planning (ERP) 3 semester credits

This course addresses the managerial and operational challenges of advanced service and manufacturing systems characterized by tight integration, short cycle times and variety and scope of product. Specifically, computerized advanced manufacturing systems, JIT, synchronous manufacturing and customer integrated service systems are discussed. The systems are reviewed as competitive strategies along with the accompanying organizational implications. The course culminates with an application of a computerized case study analysis for the Class Project.

And either

EM 590 Design for Manufacturing 3 semester credits

Various techniques to identify opportunities for improvement and development of a comprehensive product design will be explored. Key issues and competitive product development and design optimization will include topics such as: quality function deployment; design for assembly and product variation; failure modes and effects analysis; reliability/serviceability, concurrent engineering; statistical process control, six sigma process and flexible process selection; tolerances design; rapid prototyping; design and development management issues; reducing part cost with DFM; DFM team building and training.

Or

EM 570 Six Sigma Quality Management 3 semester credits

Overview of the total field of quality, including strategic quality management programs, quality assurance, quality control, and product design reliability. The purpose of the Quality Management course is to provide the technical manager with an overview of the total field of quality. The subjects addressed throughout the course are: statistics of quality, quality cost, quality improvement, world class quality, design for quality, vendor relations, Japanese manufacturing concepts, process control and capability, measurement systems, customer relations, product safety and liability, quality assurance, product design reliability, and strategic quality management. This is an application-oriented course and interrelationship between the various topics of quality management will be reviewed in case studies, readings and class discussion. Further investigation and a research project will be required of each student.

Construction Project Management Certificate

The following four courses are required:

- E M 508 Legal Concepts for Engineers and Technical Managers
- E M 564 Project Management
- E M 520 Construction Project Management
- E M 5XX Supervision for the Engineers and Technical Managers

E M 508 Legal Concepts for the Engineering and Technical Manager 3 semester credits

This course is designed to provide the career engineering manager with a general understanding and knowledge of business law and the legal environment. The course covers generally the laws of the constitution, contracts, sales, business organizations, agency and employment, property, torts, crimes, government regulation,

EM 570 Six Sigma Quality Management 3 semester credits

Overview of the total field of quality, including strategic quality management programs, quality assurance, quality control, and product design reliability. The purpose of the Quality Management course is to provide the technical manager with an overview of the total field of quality. The subjects addressed throughout the course are: statistics of quality, quality cost, quality improvement, world class quality, design for quality, vendor relations, Japanese manufacturing concepts, process control and capability, measurement systems, customer relations, product safety and liability, quality assurance, product design reliability, and strategic quality management. This is an application-oriented course and interrelationship between the various topics of quality management will be reviewed in case studies, readings and class discussion. Further investigation and a research project will be required of each student.

Construction Project Management Certificate

The following four courses are required:

- E M 508 Legal Concepts for Engineers and Technical Managers
- E M 564 Project Management
- E M 520 Construction Project Management
- E M 5XX Supervision for the Engineers and Technical Managers

E M 508 Legal Concepts for the Engineering and Technical Manager 3 semester credits

This course is designed to provide the career engineering manager with a general understanding and knowledge of business law and the legal environment. The course covers generally the laws of the constitution, contracts, sales, business organizations, agency and employment, property, torts, crimes, government regulation, government contracting, and litigation. The course will explore the engineering manager's own role in the legal environment as well as the relationships between engineering managers and other

engineering managers, employees, project owners, prime contractors, subcontractors, and the general public.

E M 564 Project Management 3 semester credits;

Prerequisite basic statistics The use of projects and project management continues to grow in our complex society. Project management differs from more traditional organizational management because most projects are one-time, extremely focused efforts. Time, money, people, and other resources must be managed extremely well to achieve success, yet there is usually only one chance to do it right. This course will examine technical tools, (CPM, PERT, Cost and Schedule Control Systems), behavioral issues, and considerations of organizational structure. The objective of the course is to help students understand the strengths and pitfalls of project management. The ultimate goal is to improve the effectiveness of the students at all levels of project management: from project selection and chartering at the highest managerial levels, to day-to-day skills for the project manager, and meaningful contribution and participation for project team members.

E M 595 Topics in EM: Construction Project Management 3 semester credits

Successful construction management requires the judicious application of knowledge and skills in several areas, including developing project proposals and plans, estimating, budgeting, and scheduling, team-building, managing resources, and communications, monitoring progress and managing changes with project controls, and environmental, quality, safety and health issues applied to construction. The student will also learn how to apply project management techniques to various types of construction, both commercial and government, and including shop fabrication.

E M 5XX Topics in E M: Supervision for Engineering and Technological Managers 3 semester credits

new Supervision for engineering and technological managers is a study of the role of supervisor and effective supervision. Human relations, leadership, counseling, motivation, communication skills, problem solving, and decision making are all covered. The primary goal is to introduce the fundamentals of supervisory management and provide

practical advice on how to handle real-life, on-the-job situations. The course will cover terminology necessary for business and professional communication, planning and organizing, staffing, training, motivation theory and practice, appraisal and counseling of troubled employees and managing a diverse workforce.

