

## Detailed Contents of Courses for the Master of Engineering Management Programme

### Construction Management

#### **CE-544 Quantitative Tools for Engineering Management**

Descriptive measures and review of probability concepts. Demand estimation and Time series Forecasting and Index number. Linear Programming for decision making, Optimisation techniques and management tools, Decision making under risk, Multivariate and constrained Optimisation, Economics Order Quantity (EOQ) model for inventory, Networks, Hypothesis testing for decisions, Analysis of Variance (ANOVA) techniques, Multiple Regression and correlation analysis. (Course to be supplemented by Case Studies)

#### **CE-545 Construction Claim Management**

Construction claims administration and avoidance. Covers the importance of construction contract errors, unforeseen and changed conditions, disruptions, acceleration, termination, and proving of claims; Dispute Resolution in Pakistan - Case study and analysis of reported appellate decisions on common construction law issues; licensing; bid disputes; contract issues; construction lien law; surety problems; unresolved claims. Construction related documentation requirements for avoidance of litigation before, during, and after completion of construction projects; dispute resolution processes for construction operations.

#### **CE-546 Vulnerability Analysis and Hazard Mitigation**

Assessment of risk and potential for damage to a community or facility from the impact of natural or anthropogenic hazards. Physical and construction related issues. Reducing potential damage to the built environment from natural hazards, including hurricanes, floods, earthquakes, explosions. Benefit-cost analysis. Regulatory problems.

#### **CE-547 Housing for Developing Countries**

Problems faced by developing countries in housing their population. Political, economic, social, and technical considerations in decision process. Recognition and definition of those factors which affect the planning, financing, and construction of housing projects. The operations and responsibilities of a multidisciplinary team dealing with decision process; housing delivery system including how the housing industry operates, various technologies prevalent in housing construction, and constraints to housing; Future assessment and examination of problems and forces that will shape opportunities.

#### **CE-548 Occupational Health and Safety in Construction Project Management**

Introduce the graduate student in Construction Management to the important elements essential in managing the health and safety function of a construction company. Principles of safety engineering applied to construction industry, job safety analysis, reduction of accident rates, protective equipment,

safety rules and regulations; Health and Environmental Management Issues in construction; Health hazards; Environmental hazards; OSHA and Construction Health and Safety; Discussion of the common hazardous materials and waste regulations found in construction activities

### **CE-549 Value Engineering in Construction**

The Value Concept; Developments in Value Thinking; Relationship of costs to time and life cycle of construction projects, and methods to improve the economic value of construction projects; Function Analysis; Teams, Team Dynamics and Facilitation; Current Study Styles and the Value Process; Value Framework; Value Engineering Job Plan; Project Value Chain; Client Value Systems; Application of Value Engineering Job Plan to Construction Projects; Professionalism and Ethics within Value Engineering; Value Engineering Organisation in the Construction Industry; Future of Value Engineering.

### **CE-550 Construction Productivity Management**

Construction Productivity: Definition and Importance; Failing Productivity Diagnosis; Method Improvement in Construction Operations; Productivity Improvement by Work Measurement; Productivity Analysis using Tested Scientific Models and Methods; Production Planning and Control; Construction Workforce Motivation; Computer Applications in Improving Productivity; Managing Construction Projects for Improved Productivity.

### **CE-587 Human Resource Management in Construction Industry**

The challenges of managing people in construction industry; Modern organizational and management theories; Strategic concepts and operational implications of human resource management in construction industry; Strategic approaches to managing human resource in the construction industry; The mechanics of human resource in construction: resourcing, development and rewards; Approaches to managing employee relations; Employee participation, involvement and empowerment in construction industry; Workforce diversity, equal opportunities and work-life balance in construction industry; Employee health, safety and welfare in construction industry; Strategic human resource development in construction industry; Issues and trends of human resource management in 21st century; Strategic human resource management as a route to improved business performance in construction industry.

### **CE-588 Leadership in Construction Management**

What is leadership?; Leadership styles in modern management; Leadership challenges in changing world; Taking up the role of leadership – the transition process; Innovation culture for sustainable development; Motivating people; Organizing people and resources; Transforming people; Leading people with authority; Leading people without authority; Leading geeks; Developing a sustainable virtual work environment to gain organizational objectives; Implementing and managing virtual teams; Leading international business.

### **CE-589 Supply Chain Management in Construction Industry**

Introduction to SCM; SCM in construction business; Strategic SCM; Customer focus in SCM; Management of supply sources; Assuring the quality of procurement system for construction contractors; Management of inventory in the supply chain; Re-engineering of supply chain; DSS for SCM; Performance measurement system for managing supply chain; Best Practices and Benchmarking for Supply Chain; Green supply chain; World class supply chain; Aligning supply chain with business strategy; High performance supply chain organization.

### **CE-590 Advanced Topics in Project Management**

Enterprise project management; Project Management Office; PM maturity models; PM integrated advanced techniques; PM Monitoring, Evaluation, Reporting and Control Framework; Application of software for project monitoring, evaluation and control (MS Project/ P3); Project Audit and Closure; Design integration management in construction; Communication and Conflict Management in Construction; Professional Responsibility and Ethics; Learning Curves; Leadership; Managing Project Teams; Partnering; Negotiating; Managing Customer Relations; International Construction Project Management: Introduction to procurement, financing and management of international construction projects with emphasis on international economics, contracts, trade agreements and specifications; Maintenance Management of construction projects; Construction/ Project Management Proposal Presentation.

### **CE-591 Cost Engineering and Control**

Introduction to Cost Engineering; Cost Estimating: Estimate Accuracy; Estimate Approaches/ Classes; Estimating Methods; Computerised Estimating; Labor Productivity Analysis; Equipment Unit Cost Estimation; Indirect Costs; Data Collection and Management; Activity Unit Price Estimation based on Field Data; Estimate Coding and Documentations; Predicting Future Escalation; Contingency; Application of computer software to rigorous exercises in construction estimating. Cost Control: Introduction to Cost Control; Role of Cost Control Engineer; Cost Control during Various Project Phases; Project Changes; Subcontract Development, Administration and Control; Cost Control during Construction; Monthly Cost Report and Cost Control Meetings; Computer Applications; The Cost of Cost Control; Control of Bulk Materials; Case Studies.

### **CE-592 Decision Making and Risk Management in Construction**

Sources of hazards; Definition of risk; System analysis; Functional modeling and analysis techniques; Techniques of analysis of engineering systems for risk management decisions involving trade-offs (technical, human, environmental aspects); Risk assessment, communication and management; Elements of decision analysis; Probabilistic risk analysis (fault trees, event trees); Analytical Hierarchy Process; EMV and EUV Criteria; Inventory Modeling; Monte Carlo Simulation; Risk acceptance; Consequence assessment; Risk benefit assessment; Economic analysis of failure consequences (issues of human safety and long-term economic discounting); Uncertainty sources and types; Uncertainty modeling; Human factors engineering; Quantitative and qualitative risk analyses and management

strategies employed in proactive, reactive, and interactive modes; Emphasis on risk management issues in public and private sector.

### **CE-593 Construction Operations and Development of Technologies**

Construction methods and practice; Design and construction technologies; Construction operations management: Integrated approach to planning, scheduling, modeling, analysis and design of construction processes and operations; Use of simulation models and other analytical tools; Constructability; Subcontractor and supplier management; Equipment selection; Material selection, procurement and control; Construction facilities and site development; Lean construction mechanisms for identifying and eliminating wastage and unnecessary cost by examining the construction process with a TQM framework. Artificial Intelligence Applications in Construction Management. A study of the concepts, techniques, and applications of AI technology in the construction management domain; Study of advanced field techniques and emerging uses worldwide. Information flow and creativity are highlighted as crucial elements which stimulate new developments. This course prepares the students to understand and deal with concepts of change.

### **CE-594 Bidding Strategy and the Legal Construction Environment**

Contract types and their implications on estimation and bidding procedures; general office operations, and bidding procedures; Bid Package Preparation; Tender Negotiations; Development of Working Methodologies. Legal and business aspects of engineering contracts and specifications in the construction industry. Legal principles as framework of interaction of project stakeholders; Contracts for civil engineering services; Contract risk allocation and reciprocal liabilities; Issues of contract formation, breach, and remedy; Analysis, study of precedents, and application of contract clauses, including changes, changed conditions, termination, disputes, payments, risk and insurance, inspection, liquidated damages, and technical requirements.

### **CE-595 Technical Entrepreneurship & the Management & Marketing of Construction Services**

Managerial, financial, legal, ethical and organisational aspects of starting and growing a construction organisation; Setting up a virtual company and carrying it through the entrepreneurship process; Marketing aspects of entrepreneurship including market research (Guest lectures from practicing entrepreneurs, financiers and professionals associated with the entrepreneurship process should play a key role in the course). Management of a construction company: company organisation, incorporation structures, policies and procedures, finance, accounting, information modeling, bidding strategies, and operation; Human effectiveness in marketing construction services in the public and private sectors.

### **CE-596 Public Infrastructure Management**

Complexities, expanding pressures and demands on infrastructure management; Issues, identification of indigenous needs and managing provisions of required infrastructure facilities; Maintaining public infrastructure inventories; Assets management models. Methods and integrative approaches for balanced infrastructure management policies and practices; Roles of civic agencies/ essential services

organisations; Disaster mitigation and management scenarios. Strategies for interaction between government and informal sectors; Infrastructure sustainability under economic constraints; Procuring funding for public infrastructure projects through non-conventional alternatives; Contemporary tools and instruments such as GIS/ LIS in public infrastructure management; Global trends and case studies.

### **CE-597 Real Estate Management**

Real Estate fundamentals; Real Estate Finance; Urban economic development and Real Estate market analysis; Real Estate development; Housing Economics and Finance; Real Estate investment decisions; Legal issues in Real Estate.

### **CE-598 Construction Failure Analysis**

Develop an understanding of the integration process of technical, human, capital, social and institutional aspects that drive the life cycle of a construction project. Study of failures to provide a vehicle to find ways for the improvement of planning, design and construction of facilities; Investigation of failure including technical analysis and also a comprehensive analysis of the organisational, contractual and regulatory aspects of the process that lead to the failure. (This course should use case studies to illustrate different types of failure in the planning, design, construction and operation of constructed facilities).