



**ARAB ACADEMY FOR SCIENCE, TECHNOLOGY
AND MARITIME TRANSPORT**

**COLLEGE OF ENGINEERING
AND TECHNOLOGY**

(GRADUATE STUDIES)

Master of Science Programs

STATUS REPORT

ALEXANDRIA

2012

CONSTRUCTION AND BUILDING ENGINEERING

M.Sc. PROGRAMS

M.Sc. in Construction and Building Engineering

OVERVIEW

Construction is one of the largest nation's industries, encompassing an incredibly wide range of activities, from high-rise buildings construction to homes, from highways to power plants. Indeed modern construction projects have become so large, complex, expensive and time-consuming that special educational programs now are being offered to prepare students for entry into this important and challenging industry.

The mission of the Construction and Building Engineering Department at the AASTMT is to provide the educational, research, and training programs that serve both the needs of our students and those of the construction industry. The curriculum objective is to prepare individuals for a professional career in construction engineering and management and for continued learning through post-graduate education or self study.

The department offers a B.Sc., a diploma, and a Master's degree in Construction Engineering. As a student in construction engineering, you will learn to identify the best methods and techniques of construction, to determine construction costs and set schedules, to apply methods of quality control and to supervise construction projects.

The program is designed to prepare our students to become outstanding construction engineers, whose job is to devise and design construction facilities, coordinate and direct the efforts of labor and equipment, and control the time and cost demands of field operations.

As they gain experience, construction engineers become construction managers who combine engineering, management, and field construction skills in the administration and management of field construction.

Graduates of the Construction and Building Engineering degree program design and manage construction processes that create living and working environments such as office buildings, industrial buildings, airports, housing, roads, bridges, utilities, and dams. Graduates fill positions in construction companies, engineering consulting firms, government agencies, and large construction corporations. The positions usually involve either the planning, design, and management of the construction process for a general, specialty, or mechanical contractor, or the coordination, inspection, and management of design, contracts, or facilities for a business, industry or government owner.

When you ask top managers in construction and engineering firms why they selected this career, you can hear the excitement of the construction industry in their responses. Some say they like to conceive an idea and then engineer and manage it through to reality. Others say that they like the combination of computerized planning, process design, cost engineering, and scheduling with the gratification of seeing a job well done.

Graduates of this degree program enjoy a wide range of opportunities to apply their technical knowledge with tremendous variety in the day-to-day work. Some choose design, planning, or financial management positions working in an office environment, while others prefer to direct field operations or some combination of the above.

Program Detailed Structure

M.Sc. PROGRAM

(A) CONSTRUCTION ENGINEERING AND MANAGEMENT

M.Sc. in Construction and Building Engineering

Program Structure

(A) Construction Engineering and Management

M.Sc. in Construction and Building Engineering

(A) Construction Engineering and Management

ELECTIVE COURSES:

Course Code	Course Title	Credit Hours
CB 710	Advanced Construction Engineering	3
CB 711	Value Engineering in the Construction Industry	3
CB 712	Advanced Construction Management	3
CB 713	Construction Equipment Management	3
CB 714	Advanced Systems Analysis for Construction Engineers	3
CB 715	Special Topics in Concrete Construction	3
CB 716	Estimating, Tendering and Contracting in Construction	3
CB 717	Advanced Project Planning and Control	3
CB 718	Financial Management in Construction	3
CB 719	Construction Economics and Feasibility Studies	3
CB 710-M	Construction Productivity	3
CB 711-M	Artificial Intelligence in Construction	3
CB 712-M	Research Methods in Construction Engineering and Management	3
CB 713-M	Quality Management in Construction	3
CB 714-M	Strategic Management in Construction	3
CB 715-M	Risk Management in Construction	3
CB 716-M	Human Resources Management in Construction	3
CB 717-M	Information Technology Applications in Construction	3
CB 718-M	Disaster Risk Management	3
Subtotal	8 Courses * 3 Credit Hours	24

RESEARCH THESIS:

Course Code	Course Title	Credit Hours
CB 701	Master's Research Thesis (Part 1)	6
CB 702	Master's Research Thesis (Part 2)	6
Subtotal	2 Parts * 6 Credit Hours	12

Total	36
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Courses

DETAILED STRUCTURE

Course Code : CB 710

Course Title : Advanced Construction Engineering

Credit Hours : 3

Course Description

Advanced topics in the area of construction engineering including underground construction: dewatering systems; shoring systems; and underpinning. Formwork systems in building construction: horizontal formwork; and vertical formwork systems. Cranes works. Belt-conveyor systems. Tunnel construction: driving tunnels in rock, drilling rock, drill jumbos, drilling patterns, and driving tunnels with tunnel-boring machines. Bridge construction: traditional construction; cantilever carriage method; and flying shuttering. Dam construction.

Course Objectives

The aim of the course is to provide the students with an understanding of advanced topics in the field of constructing engineering, building construction, bridge construction and tunneling.

Course Topics

- Loads on formwork:
- Properties of materials used in formwork, Strength and rigidity of forming systems
- Advanced horizontal formwork systems.
- Advanced vertical formwork systems.
- Advanced special formwork systems.
- Shoring systems.
- Underpinning systems
- Dewatering systems
- Tunnel construction
- Bridge construction.
- Health and safety in construction.

References

- Peurifoy, R. L. and Schexnayder, G. J., "*Construction Planning, Equipment, and Methods*," McGraw Hill Co., New York, 2002.
- Peurifoy, R. L. and Oberlender, G. D., "*Formwork for Concrete Structures*", McGraw Hill Co., New York, 1996.
- Allen, E. and Iano, J., "*Fundamentals of Building Construction: Materials and Methods*", Wiley, New York, 2003.
- Nunnally, S. W., "*Construction Methods and Management*", Prentice Hall, 2003.
- Girmscheid, G. and Reilly, J., "*Fundamentals of Tunnel Construction*", Wiley, 2005.
- Institution of Civil Engineers, "*Current and Future Trends in Bridge Design, Construction and Maintenance: Safety, Economy, Sustainability and Aesthetics*", Thomas Telford, 2001.

Course Code : CB 711

Course Title : Value Engineering in the Construction Industry

Credit Hours : 3

Course Description

Development of value engineering concept: its history, definitions, incentive provisions and applications. Value engineering methodology and tools: functional analysis; level of abstraction and alternative evaluation techniques. The process and procedures of a value study. Whole life cycle costing and its effect of value engineering. Case studies and applications.

Course Objectives

The course aims at providing students with the understanding of the concepts of value engineering and its applications in the construction industry.

Course Topics

- Value engineering concepts and definitions
- Value engineering study process and procedures
- Function analysis
- Level of abstraction and selection of alternatives
- Evaluation techniques
- Presenting value studies
- Whole life cycle costing
- Construction case studies and applications

References

- Dell'Isola, A. "*Value Engineering: Practical Applications for Design, Construction, Maintenance and Operations*", MRS. Means Company Ltd, 1997.
- Kelly, J., Male, S. and Graham, D. "*Value Management of Construction Projects*" Blackwell Sciences, 2004.
- Parker, D. E., "*Management Application of Value Engineering: For Business and Government*", The Value Foundation, Washington D.C., 1994.
- Kumar, S., "*Value Engineering: A Fast Track to Profit Improvement and Business Excellence*", Narosa Publishing House, 2004.
- Barrie, D. S. and Paulson, B. C., "*Professional Construction Management*", McGraw-Hill, 1992.
- Venkataraman, R.R and Pinto, J.K. "Cost and Value management in Projects", Wiley, Latest Edition.
- Younker, D.L. "Value Engineering: Analysis and Methodology (Cost Engineering)", CRC Press, Latest Edition.

Course Code : CB 712

Course Title : Advanced Construction Management

Credit Hours : 3

Course Description

General characteristics of the construction industry and the general aspects and nature of construction management. Further management and business topics include: strategic management; risk management; human resources management; health and safety in construction; organizational behavior; business performance management; quality management, environmental management and process management.

Course Objectives

To develop an understanding of advanced project management, organizational management and business administration issues related to construction.

Course Topics

- Characteristics of the construction industry
- Aspects and nature of construction management
- Advanced project management
- Strategic management
- Quality management
- Risk management
- Human resources management
- Health and safety management
- Sustainable construction
- Knowledge management
- Business performance management

References

- Ellis, R. and Fryer, B. G., "*The Practice of Construction Management*", Blackwell Publishing, 2004.
- Ritz, G. J., "*Total Construction Project Management*", McGraw Hill Co., New York, 1994.
- Harris, F. and McCaffer, R. "*Modern Construction Management*", Blackwell Sciences, Oxford, 2001.
- Coble, R. J., Haupt, T, C. and Hinze, J. "*The Management of Construction Safety and Health*", Balkema, Rotterdam, 2000.
- Cooper, R. et al., "*Process Management in Design and Construction*", Blackwell Publishing, Oxford, 2004.

Course Code : CB 713

Course Title : Construction Equipment Management

Credit Hours : 3

Course Description

Factors affecting the selection of construction equipment. Fundamentals of construction equipment. Construction equipment costs, sizing operation and maintenance. Construction equipment productivity. Evaluation and selection of appropriate construction technology.

Course Objectives

To provide the students with the fundamentals of equipment in the construction industry, and to acquaint students with the productivity and cost of the major equipment in construction.

Course Topics

- Earth moving basics
- Shovels
- Hoes
- Draglines
- Clamshells
- Machine equipment power requirements
- Dozers
- Trucks and hauling equipment
- Scrapers
- Aggregate production
- Piles and pile-driving equipment.
- Health and safety

References

- Peurifoy, R. L. and Schexnayder, G. J., "*Construction Planning, Equipment, and Methods*," McGraw Hill Co., New York, 2002.
- Edwards, D. G., Harris, F. C. and McCaffer, R., "*Management of Off-Highway Plant and Equipment*", Spon Press, 2003.
- Harris, F., "*Modern Construction and Ground Engineering Equipment and Methods*", Prentice Hall, 1994.
- Nunnally, S. W., "*Managing Construction Equipment*", 1999.

Course Code : CB 714

Course Title : Advanced Systems Analysis for Construction Engineers

Credit Hours : 3

Course Description

Modeling and analysis of systems for decision making in construction. Optimization using mathematical programming and sensitivity analysis. Decision-making under uncertainty and multi-criteria decision-making. NP-Hard Problems and applications in resource allocations. Heuristics and near-optimal solutions. Queuing theory and simulation. Transportation and assignment problems.

Course Objectives

To provide students with an understanding of optimizing quantitative models and decision-making.

Course Topics

- Modeling and analysis of systems for decision making in construction
- Mathematical programming and sensitivity analysis
- Decision making under uncertainty
- Multi-criteria decision-making
- NP-Hard problems and applications in resource allocations
- Heuristics and near-optimal solutions
- Queuing theory and simulation
- Transportation and assignment problems

References

- Tang, S. L., Ahmad, I. U., Ahmed, S. M., and Lu, M., “*Quantitative Techniques for Decision Making in Construction*”, Hong Kong University Press, Hong Kong, 2004.
- Oseenbruggen, P. J., “*Systems Analysis for Civil Engineers*”, Wiley, New York 1984.
- Anderson, D. R., Sweeney, D. J. and Williams, T. A., “*An Introduction to Management Science – Quantitative Approaches to Decision Making*”, Thomson - South-Western College Publishing, Kentucky, 2002.
- Pilcher, R., “*Principles of Construction Management*”, McGraw-Hill, 1992.

Course Code : CB 715

Course Title : Special Topics in Concrete Construction

Credit Hours : 3

Course Description

Design of form work for concrete structures: horizontal formwork and vertical formwork; Causes of failure; Analysis of loads, deflections and stresses of formwork systems. Assessment of removal times. Shoring and unshoring systems. Health and safety in concrete construction. Concreting under water; Concrete in marine environment. Special concretes: Hot weather concrete, Mass concrete, ready mix concrete, self compacting concrete, high performance concrete.

Course Objectives

To provide knowledge of the construction and design of different formwork systems, and to be acquainted with the construction systems in building construction.

Course Topics

- Design of form work for concrete structures
- horizontal formwork
- vertical formwork
- Analysis of loads, deflections and stresses of formwork systems
- Health and safety in concrete construction.
- Concrete in marine environment
- Hot weather concrete
- Mass concrete
- Ready mix concrete
- Self compacting concrete

References

- Peurifoy, R. L. and Oberlender, G. D., "*Formwork for Concrete Structures*", McGraw Hill Co., New York, 1996.
- Dobrowolski, J. A., "*Concrete Construction Handbook*", McGraw Hill Co., New York, 1998.
- Hurd, M. and Hurd, M. K., "*Formwork for Concrete*", American Concrete Institute, Detroit, 1995.
- Nawy, E. G., "*Concrete Construction Engineering Handbook*", CRC Press, 1997.

Course Code : CB 716

Course Title : Estimating, Tendering and Contracting in Construction

Credit Hours : 3

Course Description

Construction quantity and cost estimation by various contractual parties. Procurement paths and apportionment of risks. The tendering process and documentation. Contractor selection and pre-qualification. Contract law and construction forms of contracts. Sub-contractors and nominated suppliers. Managing variations in construction contracts - change orders and claims. Dispute resolution and arbitration.

Course Objectives

To provide students with the knowledge concerned with estimating quantities and costs, the construction tendering process and contractual issues in construction.

Course Topics

- Construction project objectives and stakeholders
- Quantity surveying
- Cost estimating
- Principles of contracting
- Construction contract types in terms of payment method
- Project delivery systems
- Tendering methods
- Construction tendering process
- Contract and tender documents
- Construction laws
- International forms of contracts
- Managing variations in projects
- Dispute resolution and arbitration

References

- Brook, M., *“Estimating and Tendering for Construction Contracts”*, Butterworth and Heinemann, Oxford, 2001.
- Clough, R. H. and Sears, A., *“Construction Contracting”*, John Wiley and Sons, New York, 1994.
- Halpin, D. W. and Woodhead, R. W., *“Construction Management”*, Wiley, New York, 1997.
- Broome, J. *“Procurement Routes for Partnering: A Practical Guide”*, Thomas Telford, London, 2002.
- Murdoch, J. and Hughes, W., *“Construction Contracts: Law and Management”*, Spon Press, London, 2000.
- Hinze, J., *“Construction Contracts”*, McGraw-Hill Science, USA, Latest Edition.
- Phillips, C. S., *“Construction Contract Administration”*, SME, Latest Edition.
- *“Fidic Conditions of Contract for Construction”*, Red Book, FIDIC, Latest Edition.

Course Code : CB 717

Course Title : Advanced Project Planning and Control

Credit Hours : 3

Course Description

Advanced planning and scheduling methods in construction. Scheduling with resource constraints and under uncertainty, and line-of-balance. Cost planning in projects and design of costing systems. Acceleration of construction projects. Control of time and costs in construction projects. Forecasting and controlling cash flows of projects. Earned-value systems in controlling construction projects.

Course Objectives

To provide students with the advanced knowledge and skills concerned with planning and controlling of construction projects.

Course Topics

- Project planning and controlling processes
- Project scope management and work breakdown structures
- Schedule development and types of schedules
- Network diagrams and bar charts
- Probabilistic scheduling and time risk management
- Resource leveling
- Resource constrained scheduling
- Computerized scheduling
- Line-of-balance and repetitive scheduling
- Time-Cost relationship and acceleration of construction projects
- Tracking project progress – time and costs
- Earned-value systems in controlling construction projects
- Schedule delay / forensic analysis

References

- Oberlender, G. D., “*Project Management for Engineering and Construction*”, McGraw-Hill, New York, 2000.
- Hinze, J., “*Construction Planning and Scheduling*”, Prentice Hall, New York, 2003.
- Cooke, B. and Williams, P. “*Construction Planning, Programming and Control*”, Blackwell Publishing, Oxford, 2004.
- Halpin, D. W., Woodhead, R. W. “*Construction Management*”, Wiley, New York, 1997.
- Barrie, D. S. and Paulson, B. C., “*Professional Construction Management*”, McGraw-Hill, 1992.

Course Code : CB 718

Course Title : Financial Management in Construction

Credit Hours : 3

Course Description

Basics of accounting: accounting terms; accounting systems and transactions; and compilation of financial statements. Reading and understanding financial statements. Basics of financial analysis for profitability, liquidity, leverage and efficiency. Company financial failure and bankruptcy analysis. Cash flow analysis of construction companies. Investor analysis of construction companies.

Course Objectives

To introduce students to the basics of financial management in construction.

Course Topics

- Basics of accounting: accounting terms; accounting systems and transactions; and compilation of financial statements.
- Reading and understanding financial statements.
- Financial analysis - basic financial ratios for profitability, liquidity, leverage and efficiency.
- Failure / bankruptcy analysis for construction firms.
- Cash flow analysis of construction companies.
- Investor analysis of construction companies.

References

- Peterson, S. J. "*Construction Accounting and Financial Management*", Prentice Hall, New York, 2004.
- Palmer, W., Palmer, W. J., Coombs, W. E. and Smith, K. A., "*Construction Accounting and Financial Management*", McGraw Hill, New York, 1999.
- Pilcher, R., "*Principles of Construction Management*", McGraw-Hill, 1992.
- Gibson, C. H., "*Financial Statement Analysis*" International Thomson Publishing, 1998.
- Brigham, E. F., Gapenski, L. C. and Erhardt, M. C., "*Financial Management: Theory and Practice*", The Dryden Press, 1999.

Course Code : CB 719

Course Title : Construction Economics and Feasibility Studies

Credit Hours : 3

Course Description

Introduction to economics of the construction industry: role of industry in the economy; and demand and supply in construction. Introduction to microeconomics of construction firms. Introduction to engineering economics and discounting principles. Economic comparisons and influences on economic analysis. Feasibility studies and construction projects appraisal: cost and benefits analyses; economic evaluation techniques and sensitivity analysis.

Course Objectives

To provide an understanding of construction economics and feasibility studies.

Course Topics

- Introduction to economics of the construction industry – role of construction in the economy and demand and supply in construction.
- Introduction to the theory of the firm and microeconomics of construction firms.
- Introduction to engineering economics and discounting principles.
- Economic comparisons and influences on economic analysis.
- Feasibility studies and construction projects appraisal – analyses of costs and benefits, economic evaluation techniques and sensitivity analysis.

References

- Gruneberg, S. “*Construction Economics: An Introduction*”, Palgrave McMillan, 1997.
- Rogers, M. “*Engineering Project Appraisal – The Evaluation of Alternative Development Schemes*”, Blackwell Publishing, London, 2001.
- Flanagan, R. and Jewell, C. “*Whole Life Appraisal for Construction*”, Blackwell Science, 2004.
- Gruneberg, S. L. and Weight, D. H. “*Feasibility Studies in Construction*”, Mitchell, London, 1990.
- Pilcher, R., “*Principles of Construction Management*”, McGraw-Hill, 1992.

Course Code : CB 710-M

Course Title : Construction Productivity

Credit Hours : 3

Course Description

Factors affecting productivity. Productivity engineering and management. Productivity measurement. Work study. Method study. The total productivity model. Optimum allocation of resources. Productivity improvement techniques, technology based, material based, employee based, product based, and task based.

Course Objectives

To provide a knowledge of the productivity concepts and in the construction industry.

Course Topics

- Productivity engineering and management
- Factors of productivity
- Productivity measurement methods
- Total productivity model
- Optimum allocation of resources
- Productivity improvement techniques

References

- Adrian, J., "*Construction Productivity: Measurement and Improvement*", Stipes Pub., 2004.
- Olomolaiye, P., Jayawardane, A., and Harris, F. C., "*Construction Productivity Management*", Longman and Chartered Institute of Building, 1998.
- Oglesby, P. and Howell, G. "*Productivity Improvement in Construction*", McGraw Hill, 1994.
- Pilcher, R., "*Principles of Construction Management*", McGraw-Hill, 1992.

Course Code : CB 711-M

Course Title : Artificial Intelligence in Construction

Credit Hours : 3

Course Description

Introduction to Artificial Intelligence. Fuzzy set theory and mathematics. Fuzzy rule-based systems and applications. Evolutionary algorithms (EA) and basic EA operations. Expert Systems. Neural Networks. Application in Civil Engineering.

Course Objectives

To provide an introduction to the basic principles, techniques, and applications of Artificial Intelligence (AI) in the field of construction engineering and management. Upon successful completion of the course, students will have an understanding of the basic areas of AI and their applications in design and implementation of AI for a variety of tasks in analysis, design, and problem solving.

Course Topics

- Overview – Introduction to AI
- Fuzzy set theory and mathematics
- Fuzzy rule-based systems
- Applications
- Evolutionary Algorithms (EA): an Introduction
- Basic EA operations, Overview of different Algorithms
- Applications
- Expert Systems: an introduction
- Applications
- Neural Networks: an introduction
- Back-propagation
- Applications

References

- Lin, C.T., and Lee, C.S.G., “*Neural Fuzzy Systems: A Neuro-Fuzzy Synergism to Intelligent Systems*,” Prentice Hall, Upper Saddle River, NJ, 1995.
- Haupt, R.L. and Haupt, S.E., “*Practical Genetic Algorithms*,” Wiley, 2004.
- Mitchell, M., “*An Introduction to Genetic Algorithms*,” MIT Press, London, 1999.
- Beale, R. and Jackson, T., “*Neural Computing: An Introduction*,” IOP Publishing, NY, 1990.
- Ross, T.J., “*Fuzzy Logic with Engineering Applications*,” McGraw-Hill, NY, 1995.

Course Code : CB 712-M

Course Title : Research Methods in Construction Engineering and Management

Credit Hours : 3

Course Description

The nature of research methods in construction engineering and management are discussed. Formulation of the research problem. Reviewing literature and technical writing. Design of research methodology and overview of basic research methods. Qualitative and quantitative research methods of data collection and analysis. Overview of statistical methods, modeling techniques, optimization, simulation and IT applications. Methods of research validation and presenting / communicating the research methodology and outcomes.

Course Objectives

To provide an understanding of the main research methods used in construction engineering and management, and develop the necessary knowledge and skills for pursuing research projects, theses or dissertations.

Course Topics

- Nature of construction engineering and management research
- Formulation of research problem
- Literature review and technical writing
- Research methods and research design
- Qualitative research methods
- Quantitative research methods
- Statistical analysis: parametric and non-parametric techniques, regression and factor analysis.
- Advanced statistical topics
- Modeling techniques, optimization, simulation, and IT applications in research
- Research validation
- Communicating research methodology and outcomes to a professional audience

References

- Fellows, R. and Liu, A. “*Research Methods for Construction*”, Blackwell Publishing, 2003.
- Coles, D. H. and Naoum, S. “*Dissertation Writing and Research for Construction Students*” Architectural Press, 1997.
- Tan, W. “*Practical Research Methods*” Pearson Prentice Hall, New York, 2004.
- Cramer, D. “*Advanced Quantitative Data Analysis*” Open University Press, McGraw-Hill Education, 2003.
- Bryman, A. and Cramer, D. “*Quantitative Data Analysis with SPSS Release 12.0*”, Routledge, London, 2004.

Course Code : CB 713-M

Course Title : Quality Management in Construction

Credit Hours : 3

Course Description

The history, role and definition of quality in construction leading to the differentiation of the basic quality concepts / approaches. The management of inspection and testing, in addition to process improvement techniques of statistical process control and six sigma. Quality assurance systems with application to ISO 9000:2000 in construction. The implementation of total quality management and the introduction of excellence models. The importance of continuous improvement through effective benchmarking and performance measurement.

Course Objectives

To provide an understanding of the role of quality in construction projects and organizations and the main techniques associated with improving customer satisfaction and quality in construction.

Course Topics

- The history, role and definition of quality in construction
- Differentiating inspection, quality control, quality assurance and total quality management
- Managing inspection and testing in construction
- Process improvement techniques in construction - Statistical process control and six sigma
- Quality assurance systems – ISO 9000:2000
- Total quality management in construction
- Excellence models in construction – EFQM and Baldrige
- Continuous improvement, benchmarking and performance measurement

References

- Thorpe, B. and Sumner, P. “*Quality Management in Construction*” Gower Publishing Limited, 2005.
- ASCE, “*Quality in the Constructed Project: A Guide for Owners, Designers, and Constructors*”, American Society of Civil Engineers, 2004.
- McCabe, S. L. “*Benchmarking in Construction*”, Blackwell Science, 2001.
- McCabe, S. L. “*Quality Improvement Techniques in Construction: Principles and Methods*”, Harlow: Longman, co-published with The Chartered Institute of Building through Englemere Ltd., 1998.
- British Quality Foundation “*How to Use the Model. The EFQM Excellence Model*”, British Quality Foundation, 2002.

Course Code : CB 714-M

Course Title : Strategic Management in Construction

Credit Hours : 3

Course Description

Introduction to strategic management concepts and process. Types of strategies in organizations. Strategic planning concepts and tools of strategic analysis. Strategic management in the construction context. Strategic performance measurement. Cascading of strategies and development of functional strategies in construction (e.g. human resources and marketing strategies).

Course Objectives

To provide students with knowledge pertaining to strategic management in construction.

Course Topics

- Strategic management concepts and process
- Types of strategies in organizations
- Strategic planning and formulation
- Strategic evaluation and analysis tools and techniques
- Strategic management in a construction context
- Strategic performance measurement
- Functional strategic management in construction

References

- Langford, D. A. and Male, S., "*Strategic Management in Construction*", Blackwell Science, 2001.
- Wheelen, T. L. and Hunger, J. D., "*Strategic Management and Business Policy*", Prentice Hall, 2003.
- Saloner, G., Shepard, A., Podolny, J., "*Strategic Management*", Wiley, 2000.
- Hill, C., "*Strategic Management Theory: An Integrated Approach*", 2003.
- Porter, M. E., "*Competitive Strategy: Techniques for Analyzing Industries and Competitors*", Free Press, 1998.

Course Code : CB 715-M

Course Title : Risk Management in Construction

Credit Hours : 3

Course Description

Principles of risk management and types of organizational and project risks in construction. Risk identification and risk analysis. Risk mitigation and insurance. Control and improvement of the risk management process. Differentiating risk in construction parties: clients, contractors and consultants. Practical aspects implementing risk management.

Course Objectives

To provide students with the fundamentals of risk management in construction.

Course Topics

- Principles of risk management: risk management theory; definitions and terms; and the risk management process
- Types of organizational and project risks in construction
- Risk identification, assessment, quantification and prioritization of risks
- Risk reduction and insurance
- Managing the risk management process
- Risks in different parties of the construction project: client; contractors; and consultants
- Practical aspects of implementing risk management (e.g. risk registers)

References

- Smith, N. J. *“Managing Risk in Construction Projects”*, Blackwell Publishing, 2003.
- Chapman, C. and Ward, S., *“Project Risk Management – Processes, Techniques and Insights”*, John, Wiley and Sons, 2003.
- Edwards, L., *“Practical Risk Management in Construction”*, Thomas Telford, 1995.
- Barrie, D. S. and Paulson, B. C., *“Professional Construction Management”*, McGraw-Hill, 1992.

Course Code : CB 716-M

Course Title : Human Resources Management in Construction

Credit Hours : 3

Course Description

Human resources management theory and concepts. Strategic and operational human resources management. Work design and selection practices. Training and development. Performance appraisal. Workforce diversity. Work/life balance and employee welfare. Employee relations and empowerment. Health and safety issues in human resources. Employment laws.

Course Objectives

To provide students to the basics of managing human resources in construction.

Course Topics

- Human resources management theory and concepts
- Strategic and operational human resources management in construction
- Construction work design and selection practices
- Training and development
- Performance evaluation
- Workforce diversity
- Work/life balance and employee welfare
- Employee relations and employee empowerment
- Health and safety issues in human resources
- Employment laws.

References

- Loosemore, M., Dainty, A. and Lingard, H. "*Human Resource Management in Construction Projects: Strategic and Operational Approaches*", Spon Press, 2003.
- Gratton, L., "*Strategic Human Resource Management: Corporate Rhetoric and Human Reality*", Oxford University Press, 1999.
- Pilcher, R., "*Principles of Construction Management*", McGraw-Hill, 1992.
- Dessler, G., "*Human Resources Management*", Prentice Hall, 2004.
- Fisher, C. D., Schoenfeldt, L. F. and Shaw, J. B., "*Human Resources Management*", Houghton Mifflin, 2002.

Course Code : CB 717-M

Course Title : Information Technology Applications in Construction

Credit Hours : 3

Course Description

Construction and office management applications. Database management and information systems in construction. Internet based applications including E-Commerce in construction. Knowledge management in construction. Artificial intelligence and expert systems. Neural networks. Optimization packages including genetic algorithms. Introduction to software development including: programming principles, process, and testing; and principles of algorithm design and data structures.

Course Objectives

To introduce students to the modern methods of information technology (IT) and its applications in construction.

Course Topics

- Construction and office management applications
- Database management and information systems in construction
- Internet based applications in construction – use of web publishing, intranets and E-Commerce in construction
- Knowledge management in construction
- Artificial intelligence and expert systems
- Neural networks
- Optimization packages and genetic algorithms
- Software development – programming principles, programming phases and steps, verification and validation of software / programs, principles of algorithm design and data structures

References

- Sun, M. and Howard, R., “*Understanding IT in Construction*”, F.N. Spon, 2001.
- Hegazy, T., “*Computer-based Construction Management*”, Prentice Hall, 2001.
- Anumba, C. J., Egbu, C. and Carrillo, P., “*Knowledge Management in Construction*”, Blackwell Publishing, London, 2004.
- Pressman, R. S. and Pressman, R., “*Software Engineering: A practitioners Approach*”, McGraw-Hill Science, 2004.
- Waterman, D. A., “*A Guide to Expert Systems*”, Addison Wesley, 1986.
- Russell, S. J., and Norvig, P., “*Artificial Intelligence: A Modern Approach*”, Prentice Hall, 2002.
- Finch, E. “*Net Gain in Construction, Using the Internet in Construction Management*”, Butterworth-Heinemann, 2000.

Course Code : CB 718-M

Course Title : Disaster Risk Management

Credit Hours : 3

Course Description

Identification natural phenomena; earthquake, flood, drought, storm, cyclone and tsunami. Type of weathers and classification of regions; plains, mountains and arid zones. Hazards frequency; amplitude and probability of occurrence. Climate models and climate change impact on natural hazards. Exposed zones and vulnerability of population and constructions. Cost estimate of damages and losses. Diverse methods of transferring disaster risk. Methods to improve society and buildings resilience to disaster.

Course Objectives

The course aims at Learning the disaster risk management approach. Identifying regional disasters frequency. Understanding the relation between climate change and natural hazards. Enabling the student to evaluate the disaster damages and losses. Raising awareness about disaster impact and importance of preparedness to disaster before occurrence.

Course Topics

- Introduction to natural disaster risk management
- Types of natural hazards and exposed regions
- Probability of earthquakes, floods, drought and storms
- Numerical tools for hazards prediction
- Climate models
- Impact of climate change
- Vulnerability of population, buildings and infrastructures
- Cost estimate of disaster damages
- Estimation of losses and reconstruction needs
- Risk models
- Risk assessment - case study
- Adaptation to climate change
- Reduction of disaster risk and feasibility of mitigation plans
- Efficiency of awareness and preparedness for disasters

References

- Intergovernmental Panel on Climate Change (IPCC) (2007a) Working Group II Contribution to the Intergovernmental Panel on Climate Change, Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability. Cambridge University Press, Cambridge.
- Intergovernmental Panel on Climate Change (IPCC) (2007b) Climate change 2007: Impacts, adaptation and vulnerability. Summary for Policy makers, <http://www.ipcc.ch>

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(in alphabetical order)

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Environmental Engineering

General Rule for Graduation

For Graduation [M.Sc. in Construction & Building Engineering]

A student should complete (with satisfactory grades) a total of 8 courses (24 Credit Hours) and a thesis (12 Credit Hours) with a total of (36 Credit Hours).

A student can take into account a maximum of 7 courses (21 Credit Hours) from the same special division for the completion of the requirements of his graduation.

For Graduation [M.Sc. in Construction & Building Engineering (special division)]

A student should complete at least 5 courses (15 Credit Hours) at the special division and a thesis (12 Credit Hours) at the same special division.

Note:

- Each student must have a supervisor by the end of the first term.
- An advising committee, assigned by the department council, will be acting as the academic advisor for the student until he chooses a supervisor.
- The student after consulting with his supervisor chooses the courses.