

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

CORE COURSES

CONSTRUCTION MANAGEMENT

Objectives:

To impart knowledge of parameters of construction projects. To learn management tools & techniques for planning, scheduling, organizing, controlling and monitoring of construction projects.

Course content :

Construction as industry and its challenges, Role of construction management, Methods of construction managements.

Basic requirements of construction management

Overview of CPM / PERT, PERT cost networks : Modifications and extensions of network models, problems and prospects in application of CPM / PERT. Resource based networks, scheduling, monitoring and updating, resource planning and allocation, LOB techniques, network crashing, time cost trade off.

Computer applications and introduction to project management softwares.

Precedence networks, GERT, decision tree etc.

Work study, work breakdown structures, time estimates, application of networks and statistical concepts.

Progress management techniques, performance monitoring techniques, time and motion studies.

Case studies

Tutorials on

1. Work breakdown structure of various construction projects.
2. Practice problems on CPM, PERT.
3. Preparation, crashing and updating of precedence-network for a major construction work.
4. Performing & reporting on time and motion study work measurement of construction activity.
5. Exercises on Resource Levelling.
6. Exercises on Cash Flow analysis.
7. Exercises on LOB
8. Exercises on GERT & decision tree.
9. Practice on M.S. Project

References:

- (i) A Management Guide to PERT/CPM by J.D. Weist & F.K. Levy - Prentice Halls of India Pvt. Ltd.
- (ii) Techniques for Construction Network Scheduling by J.D. Stevens - Mc Graw Hills.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

- (iii) Fundamentals of Network Analysis by Don T. Phillips et al. - Prentice Hall.
- (iv) Project Management for Construction by Chris Handrickson & Tung Au. - Prentice Hall.
- (v) Construction Engineering & Management by Dr. S. Seetharaman - Umesh Publications.
- (vi) Construction Project Management Planning Scheduling and Controlling By K.K.Chitkara Tata Macgrow Hill

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

CONSTRUCTION TECHNIQUES

Objectives :

To expose students for various construction techniques adopted on construction projects to manage such projects efficiently & effectively.

Course content:

Introduction to construction operations, erection work, automation processes and special equipments.

Introduction to modular coordination :

Principles, comparison and advantages of modular coordination.

Prefabrication in construction industry :

Principles, components, joints, storage handling and delivery of components.

Erection technology :

Erection cycle, methods for various types of buildings, plant and heavy steel structures.

Enabling structures for the construction project (including special types of formwork)

Introduction to special types of concrete and concreting methods : Ready Mix Concrete, Self compacted concrete etc.

Recent trends in construction techniques.

Site visits for

- (1) Techniques of excavations
- (2) Dewatering techniques.
- (3) Trenchless technology
- (4) Tunnelling operations.
- (5) Special temporary structures (scaffolds, formworks)
- (6) RMC plants, concreting operations.
- (7) Batchining mixing plants.
- (8) Hot mix plants, paving operations.
- (9) Special concreting operations.
- (10) Erection technology
- (11) Minimum four site visits for above topics.

References :

- (i) Construction Technology by S.S. Ataev - Mir Publishers
- (ii) Prefabrication of Reinforced Concrete by P. Dyanchenko & S. Mirotvorsky
- Mir Publishers
- (iii) Industrial Building and Modular Design by Henrick Nissen - Cement
Concrete Association, London.
- (iv) Construction Technology (Vol. I to IV) by R. Chudlay - Longman

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

STATISTICAL AND NUMERICAL ANALYSIS

The main objective of this course is to make the students aware of basic principles and different techniques of statistics and numerical methods along with the use of software.

- ❖ Motivation, Data and Decisions, Measurement Uncertainties, Random Processes.
- ❖ Various Statistical Measures.
- ❖ Basic Probability, Sample Space, Events, Axioms of Probability, sample space with Equality likely outcomes, conditional probability, independent events.
- ❖ Random variables, continuous/Discrete random variables, expectation, variance, covariance, conditional distributions, moment generating functions.
- ❖ Multiple regressions.
- ❖ Distributions, Bernoulli, Binomial, Poisson, Uniform, Normal, Exponential, Chi-square T and F.
- ❖ Random number generation.
- ❖ Sample statistics, empirical distributions, and goodness of fit, sampling from normal populations.
- ❖ Parameter estimation, moment method, maximum likelihood, interval estimated.
- ❖ Hypothesis Testing, Significance Intervals.

NUMERICAL METHODS

Basic: Summary of basic concepts from Linear algebra and numerical analysis, Matrices. Operation counts, Matrix Norms, Type of Errors in Numerical computation.

NUMERICAL INTEGRATION

Gaussian Quadrature, Romberg Integration, Adaptive Quadrature.

MATRIX FACTORIZATION AND LINEAR SYSTEM :

Cholesky Factorization, QR factorization by House holder matrices Lufactorization and Gaussian elimination, partial pivoting, error Analysis (statement of result) solving triangular system by substitution, solving full systems by factorization.

Lu-factorization for banded and sparse matrices, storage schemes, Iterative Methods, Jacobi, Gauss – Seidal and SOR Iterations, Conjugate gradient method, preconditioning.

INTERPOLATION AND CURVE FITTING

PRACTICAL

INTRODUCTION TO: SPSS / SAS software / Matlab Statistical Tool Box.

USE OF MATHEMATICAL SOFTWARE

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

MATLAB: Essentials of MATLAB, Vectors, Matrices and the colon operators, M Files, Scripts and functions, Input and Output Graphics, Control Structures and Logical Tests. Symbolic Math Tool Box. Advanced MATLAB Features.

- ❖ Graphical representation of data bar diagram, Histogram, Pi charts, frequency polygon.
- ❖ Random number generation and generating a random sample using various sampling techniques.
- ❖ Compute correlation co-efficient between two sets of data points and plot regression lines.
- ❖ Fitting of curves.
- ❖ Multiple regression techniques to linear and non-linear problems.
- ❖ Testing of hypothesis – practical examples of Type I and II.
- ❖ Computation of Confidence intervals for mean, proportionate.
- ❖ Testing with Chi-Square, t-Distribution and F-ratio application.
- ❖ Study of numerical methods using software.
- ❖ Solution of linear system of equation
- ❖ Solution of numerical integration
- ❖ Interpolation

References

Probability and Statistics for Engineers –Miller, Freund-Hall, Prentice India Ltd. Applied Mathematics for Engineers and Physicists-pipes and Harvill. McGraw Hill International Edition.

1. Sampling techniques-Cochran, Wiley Series.
2. Statistics-Concepts and Controversies-David S. Moore-Freeman Company, New York.
3. Numerical methods, E. Balaguruswami, Mc Graw Hill publication.
4. Numerical Methods: Problems & Solutions, [Jain Mk](#) ,[Iyengar Srk](#),[Jain Rk](#), Wiley Eastern Ltd.
5. Advanced Engineering Mathematics with Mathematics and Matlab by Reza Malek – Madani, Addison-Wesley Pub.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT
ADVANCED CIVIL ENGINEERING MATERIALS

Objectives :

To give knowledge to students to select proper materials for desired performance, durability, minimum maintenance & repair for construction projects.

Course content:

Classification, specification, properties, tests as per IS for various civil engineering materials

Walling units, binding materials and additives, aggregates, gypsum products, wood base products, ferrous and non-ferrous metal products, concrete and its various varieties, fly-ash bricks.

Durability, mechanical, deformational behaviour and thermo physical properties for thermal insulation, sound insulation and damp prevention application materials, Adhesives and sealants.

Recent developments and market awareness regarding applications, varieties, sizes and specification for various materials.

References :

- (i) Materials of Construction by D.N. Ghose - Tata Mc Graw Hill
- (ii) Civil Engineering Materials by Jackson N. Ed. – ELBS, London.
- (iii) Material of Construction by S.Z. Haider - Oxford University Press
- (iv) Building Materials by BRE Digest - The Construction Press, London.
- (v) Building Materials and Components by CBRI - Tata Mc Graw Hill

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

RESOURCES MANAGEMENT

Objectives :

To impart knowledge of *material management* and *equipment management* for efficient & effective construction management of projects.

Course content:

Material Management:

Materials & their peculiarities, material planning, accounting and material reconciliation. Systems of material classification.

Role of purchasing function, restraints & factors, purchasing decisions, procedures, forms, records and reports, vendor analysis.

Inventory models and control techniques, deterministic and probabilistic models and applications, ABC analysis, replenishment and replacement policies, VED analysis, lead time demand, purchase planning, EOQ model.

Wastage audit at site, Site waste material management plan.

Computer applications based upon available softwares.

Equipment management :

Classification and operational characteristics and production rates of various equipment. New trends and construction equipment of future.

Planning and selection of equipments, for earthmoving, hauling, hoisting, conveying, pneumatic, pumping, aggregate production, concrete production, pile driving, tunneling and road construction applications.

Equipment procurement, purchase, import of equipment, procedural formalities for import.

Preventive Maintenance :

Availability of spares, equipment servicing and servicing facilities, cost of preventive maintenance, lubricants and centralized lubrication, storage, handling and record keeping for spares. Safety aspects on construction equipments.

Systems approaches to planning and maintenance of equipment, replacement policies.

Depreciation problems in machines

Tutorials on RESOURCE MANAGEMENT.

- (1) ABC analysis, VED analysis, FSN analysis etc.
- (2) Classical EOQ models.
- (3) EOQ for production run.
- (4) EOQ with planned shortages.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

- (5) Vendor rating.
- (6) Planning & selection of construction equipments.
- (7) Production of construction equipments.
- (8) Owning & operating cost study.
- (9) Study of depreciation of equipments.
- (10) Minimum two site visits.

References :

- (i) Construction Planning and Management through Systems Techniques by Mahesh Varma - Metropolitan Books Co. Pvt. Ltd.
- (ii) Fundamentals of Construction Management and Organization by Kwaku A. Tenah & Jose M. Guevara - Reston Publishing Co. Inc.
- (iii) Construction Engineering & Management by Dr. S. Seetharaman - Umesh Publications
- (iv) Construction Planning, Equipments & Methods by R.L. Peurity & W.B. Ledbetter - Mc Graw Hill
- (v) Fundamentals of Construction Management & Organization by K.A. Tenah & J.M. Guevara - Reston Publishing Co.
- (vi) Construction Equipments and its Planning & Applications by Dr. Mahesh Verma Metropolitan Publishing Co.
- (vii) Construction Equipment & Management by S.C. Khanna - Khanna Publishers.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

MAJOR ELECTIVES-I
CONSTRUCTION FINANCE & ACCOUNTING

Objectives :

To help students to understand various aspects of construction finance and management accounting for financial decision making.

Course content:

Basic financial concepts

Capital and Revenue, financial accounting, cost accounting, management accounting, financial management.

Accounting Process

GAPP, double entry system, ten point book keeping system, journal, ledger, cash book, trial balance, final account, provision and reserves, depreciation accounting, preparation of profit and loss account and balance sheet as per companies act, 1956, interpretation of financial statements.

Project Accounts

Methods of recording and reporting site accounts to project office and from project office to head office.

Financial Management

Financial statement analysis, ratio analysis, fund flow, cash flow analysis, source of finance. Estimating working capital needs and factors affecting it, financing working capital needs, sources, procedures and practice in construction industry, break even analysis.

Corporate taxing and tax planning, joint ventures, financial packaging of project.

Tutorials on construction finance

- (1) Terms related to finance & accounts.
- (2) Generally accepted accounting procedures.
- (3) Preparation of journal.
- (4) Preparation of final account / balance sheet.
- (5) Interpretation of financial statements.
- (6) Estimation of working capital
- (7) Break even analysis.
- (8) Tax planning.
- (9) Minimum two visits to construction account & finance department of construction firms.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

References :

- (i) Accounting for Management by Bhattacharya S.K. and John Dearden - Vani Educational Books, Bombay.
- (ii) Accounting and Finance Management for Construction Vol. I by Mott C.H. - John Wiley, New York
- (iii) Cost Accounting for Construction Firms by EPPS B.G. and Whiteman D.E. - John Wiley, New York.
- (iv) Construction Management : Planning & Finance by Corniman D. - Construction Press, London.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

TQM IN CONSTRUCTION

Objectives:

To give knowledge of various aspects of quality management to students so that they are able to prepare quality manuals, checklists, inspection reports, quality assurance system for different construction projects.

Course content:

Quality : Necessity for improving Quality in the context of Global Challenges.

Concept of Quality Control, Quality Assurance, Quality Management and Total Quality Management (TQM) Study of various Quality Standards in Construction : Related to building materials and other inputs for construction processes, methods and techniques for construction outputs, products and services, such as BIS, BS, Indian standard, British, American, German & Japanese standards, Managing Quality in various projects stages from concept to completion by building quality into design of structures, Inspection of incoming material and machinery In process quality inspections and tests.

Designing of quality manuals, checklists and inspection reports, installing the quality assurance system, monitoring and control.

Quality Assurance Department and quality control responsibilities of the line organization.

Quality in foundations and piling work, structural work. Concreting, electrical system building facilities, waste recycling and maintenance.

Developing quality culture in the organization : Training of people, Bench – marking quality.

Quality circles.

Study of ISO 9000, ISO 14000 and QS 9000 standards and certification procedures.

1. Terms related TQM

2. Study of quality standards related to construction materials and other construction inputs.

3. Study on Construction processes methods and technique for construction outputs.

4. Study of BIS and other standards

5. Inspections of incoming materials and machineries.

6. Preparations of quality manuals check lists and inspection reports

7. Study on quality assurance system.

8. Case studies on quality in foundations, piling work, structural waste recycling and facilities like electrical systems.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

References:

1. James, J.O Brian, " Construction Inspection Handbook - Quality Assurance and Quality Control ", Van Nostrand, New York, 1989.
2. Kwaku A., Tenah and Jose M.Guevera, " Fundamental of Construction Management and Organization ", Prentice Hall of India, 1995.
3. Juran Frank, J.M. and Gryna, F.M. " Quality planning and Analysis ", Tata McGraw Hill, 1982.
4. Hutchins. G., " ISO 9000 ", Viva Books, NewDelhi, 1993.
5. Clarkson H. Oglesby, " Productivity Improvement in Construction ", McGraw Hill 1989.
6. John L.Ashford, " The Management of Quality in Construction ", E & F.N Spon, New York, 1989.
7. Steven McCabe, " Quality Improvement Techniques in Construction ", Addisson esley Longman Ltd., England, 1998.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

MAJOR ELECTIVES-II

CONSTRUCTION CONTRACTS MANAGEMENT

Objectives:

To make students aware of legal aspects of construction projects, of construction contract, of issues related to contract administration. To expose students of various disputes resolution techniques including arbitration.

Course content:

Introduction to law, Indian legal system.

Laws governing structure & Working of Construction Organisation Firms.

Laws of Tort.

Evaluation of contract documents, need for documents, present stage of national and international contract documents, types of construction contracts, roles and functions of parties to the contract.

Stages in contracting: Preparation of tender documents estimating, pre-qualification, bid evaluation, award of contract, project financing and contract payments, contracts close out and completion.

Contract conditions: interpretation by parties to contract, obligations and responsibilities of the parties, protection and indemnification, bonds and insurance, laws and liens, subsurface conditions, inspection of work, change of work, rejected work and deficiencies.

Office Engineering: Proper record keeping in contract administering, establishment of standard procedures, coordination between various agencies involved, providing data for interpretation of contract clauses.

Special aspects of contract management.

ARBITRATION

Comparison of Actions and Laws-Agreements, subject matter-Violations-Appointment of Arbitrators-Conditions of Arbitrations-Powers and duties of Arbitrator-Rules of Evidence-Enforcement of Award-costs. Causes and resolution of disputes, settlement of claims and extra items, arbitration.

Indian Contract Act, Arbitration Act.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

Tutorials on

- (1) Study of one building contract.
- (2) Study of tender filling procedure by taking one sample tender- part1
- (3) Study of tender filling procedure by taking one sample tender- part2
- (4) Study of tender opening procedure and study of contract clauses.
- (5) Study of legal & technical interpretation of contract clauses.
- (6) Record keeping on construction projects _ case study by visit of any construction project site office & study of live documents maintained.
- (7) Study of types of disputes on construction projects.
- (8) Study of minimum two disputes resolution by arbitration.

References

- (i) Explanation of Indian Contract Act: Mulla and Sanjeeva Rao, B.D. Virmani, B.T.Gajaria.
- (ii) Handbook of Contracts: Hudson.
- (iii) Construction Contracting, Clough Richarch , John Wiley & Sons, New York, 1986.
- (iv) Construction Contract Management , Prakash V.A., NICMAR, BOMBAY

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

PROJECT RISK ANALYSIS AND MITIGATION TECHNIQUES

Objectives:

To give knowledge of various aspects of risk management to students so that they are able to identify risk events, to use of risk prompts, use of risk assessment tables and utility of grading of construction entities.

Course Contents :

- 1.) Net present Work
- 2.) Perfectly co related, moderately co-relations & uncorrelated cash flows.
- 3.) Scenerio analysis
- 4.) Sensitivity analysis
- 5.) Risk Profile methods
- 6.) Certainty Equivalent Method
- 7.) Risk adjusted discount rate method
- 8.) Certainty index method
- 9.) 3 point estimated method
- 10.) Use of risk assessment tables.

General – Importance of Risk, types of risks, quantifiable and unquantified risks.

Risk analysis and Management for projects (RAMP) – Identifying risk events. Probability distribution. Stages in Investment life-cycle; determination of NPV and its standard deviation for perfectly co-related, moderately co-related and un-correlated cash flows. Sensitivity analysis, scenario analysis simulation, decision tree analysis, risk profile method, certainly equivalent method; risk adjusted discount rate method, certainty index method, 3 point estimated method; use of risk prompts, use of Risk Assessment tables, details of RAMP process, utility of Grading of construction entities for reliable risk assessment.

Risk Mitigation – by elimination, reducing, transferring, avoiding, absorbing or pooling. Residual risk, mitigation of unquantified risk. Coverage of risk through CIDC's MOU with the Actuarial Society of India through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI).

Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy.

References

1. Industrial Engineering and Management of manufacturing systems. Dr.Surendra Kumar Satya Prakashan
2. RAMP Handbook by institution of Civil Engineers and the faculty and Institute of Actuaries- Thomas Telford publishing, London.
3. Construction Engineering and Management – Seetharaman.
4. Projects Planning analysis selection implementation and Review – Prasanna Chandra.

MAJOR ELECTIVES-III

VALUE ENGINEERING

Objectives:

To impart knowledge to know, to target & to remove unnecessary cost associated with every design & project.

To establish importance of *rupee saved over rupee generated*.

Course content:

Fundamental of Value Engineering

Basic terms and definitions.

Overview of the systematic approach, general phase, information phase, function phase, creative phase, valuation phase, investigation and recommendation phase.

Value Engineering Job Plan

Project selection, phases.

Function – cost – worth, FAST diagramming, VE versus quality, performance and other parameters.

Cost control theory, life cycle cost theory.

Environmental impact assessment with value engineering approach.

Case studies, applications of value engineering, for a building project and waste-water treatment plant.

Tutorials on

1. Systems approach & utility of computers.
2. Information phase projects under executive by Government/company.
3. Functional analysis of items/services.
4. Function analysis of projects covered under future no:2
5. Preparation of VE job plan & FAST diagnosis for projects.
6. Cost function value analysis with shifts.
7. EIA with VE approach for the projects under study.
8. VE application to the project under their by student as case study.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

References :

- (i) Value Engineering : A Practical Approach for Owners, Designers & Contractors by Larry W. Zimmerman & Others - CBS Publication
- (ii) Value Engineering : A Systematic Approach by Arthur E. Mudge - Mc Graw Hill
- (iii) Value Engineering : Theory by Donald E. Parker - Soundaram Publishers
- (iv) Value Analysis in Design and Construction by O' Brien, J.J. - Mc Graw Hill

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT
IT SOLUTION IN CONSTRUCTION MANAGEMENT

Objectives:

To manage complex & mega cost construction projects efficiently & effectively with the help of softwares(IT solutions) .

Course content:

Management softwares: Microsoft project, Primavera, QE-Pro and other project management softwares.

Tools to manage project, Multiple project scheduling, monitoring & resource management by softwares in details.

Tutorials:

- (1) Study of required hardwares & output options.
- (2) Operationalization of Primavera
- (3) Operationalization of Microsoft project.
- (4) Operationalization of other softwares.
- (5) Tutorials on project management using softwares
- (6) Preperation of detailed construction project with the help of software & all tools.
- (7) Seminar on prepared project.

References.

- (i) Project Management: Clifford F. Gray & Erik W. Larson.
- (ii) Project Management: Dennis Lock.
- (iii) A management guide to PERT/CPM: Jerome D. Wiest & Levy.
- (iv) Project planning , analysis & selection: Prasanna Chandra.
- (v) Using Microsoft Project: Tim Pyron.
- (vi) Construction scheduling with Primavera: David A. Marchman.

MAJOR ELECTIVES-IV

OPERATIONS RESEARCH IN CONSTRUCTION

Objectives :

To give knowledge of various scientific methods to help students in taking right decisions for various aspects of construction projects.

Course content:

Introduction to OR history, nature, scope and phases of OR classification of OR models.

Decision Theory

Decision strategies – decision under certainty – decision under risk – decision under uncertainty – formulation – decision criterion and decision under competitive situation.

Game Theory

Classification of games.

Two – person, zero – sum games – formulation of pay off matrix – saddle points – games with pure strategies and mixed strategies – value of the game.

Solution to 2×2 matrix, $2 \times n$ matrix, $m \times 2$ matrix and $m \times n$ pay-off matrix. Graphical method, algebraic method, linear programming methods. Guidelines to modeling an OR project.

Linear Programming

General and standard forms of LPP

Formulation and solution methods – graphical solution – simplex method – dual simplex method, dynamic L.P.

Transport and assignment models.

Post – optimality analysis.

Complications in LP problems and resolution.

Queuing theory and waiting time – application to industries.

Introduction to dynamic programming and network analysis.

Monte – Carlo system simulations.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

Case Studies

Developing mathematical models related to construction projects.
Solution to problems using QSB computer package.

Tutorials on OR IN CONSRUCTION MANAGEMENT.

- (1) Decision theory
- (2) Game theory
- (3) Formulation of LPP
- (4) Solution of LPP by graphical method, simplex method, big M method, II phase method.
- (5) Sensitivity analysis.
- (6) Transportation problems.
- (7) Assignment problems.
- (8) Non linear & dynamic programming problems.
- (9) Waiting line theory
- (10) use of QSB computer package.

References :

- (i) Theory & Problem of Operations Research by Richard Bronson, Schaum's Outline Series - Mc Graw Hill Book Co., 1983
- (ii) Operations Research : An Introduction by Hamdy A. Taha - Maxwell Macmillan International Edition – IV Edition – 1989
- (iii) Operations Research for Management by G.V. Shenoy, U.K. Srivastav, S.C. Sharma - Wiley Eastern Limited – 1988
- (iv) Operations Research for Management by M.P. Gupta, J.K. Sharma - National Publishing House – 2nd Edition – 1987
- (v) Operations Management by John O. McClain and Joseph Thomas - Prentice Hall of India Private Limited, New Delhi – 1987
- (vi) Quantitative Methods and Operations Research by R.C. Gupta - CBS Management Series – 1986
- (vii) Quantitative Techniques in Management by Vohra - Tata McGraw Hill Book Co.
- (viii) Rea's Problem Solver – Operation Research - Research & Education Association Publication

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

REPAIR, RETROFITTING AND REHABILITATION

Objectives :

To impart knowledge of causes of failures & damages of structures to properly diagnose for the problem. To decide right repair materials, right repair technique.

To make damaged structures habitable in minimum possible time & cost.

Course content:

Durability of Structure

Effect of dampness, heat, frost, precipitation, chemical agents, biological agents on building materials in relation of life, serviceability and strength.

Maintenance, Repair and Rehabilitation of Structures

Principles of construction, detection of defects and line of action.

Life serviceability and strength of building materials used for the purpose of maintenance and repairs.

Structure Failure

Definition, of failure – types of failure, structural, functional and architectural failure of buildings. Investigation – diagnostic testing and line of action.

Damages due to Natural Calamities

Damage assessment methods

Structure Repair, Retrofitting and Rehabilitation

Technology of repairs for concrete, steel, timber, masonry works, grouting, stitching, jacketing, guniting.

Corrective Maintenance of Structures

Problems of cracking, leakage, corrosion, and other forms of deterioration, methods of corrective maintenance.

Preventive Maintenance of Structures

Importance of regular maintenance – choice and priorities in preventive maintenance. Structure survey : Structure survey for assessment of damaged of aged structure, fire damaged structures, flood affected structures, structure affected by explosion and earthquake.

Dangerous Structures

Liability for injuries to third-parties, liability of owner and occupier to persons coming to building and to adjoining owner.

Preparation of specifications and bills of quantity for alteration, maintenance and repairs of residential and public buildings.

Machines, tools, instruments for investigation, NDT and repairs.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

References :

- (i) Deterioration Maintenance and Repair of Buildings by S.M. Jhonson, Mc Graw Hill.
- (ii) Failure and Repair of Buildings by S. Champion, Johy Willey.
- (iii) Technology of Building Repairs by R.N. Raikar, Structural Designers and Consultant Pvt. Ltd., New Bombay.
- (iv) Diagnosis and Treatment of Structures in Distress by R.N. Raikar, Structural Designers and Consultant Pvt. Ltd., New Bombay.
- (v) Durable Structures through Planning for Preventive Maintenance by R.N. Raikar, Structural Designers and Consultant Pvt. Ltd., New Bombay.
- (vi) Learning from Failures by R.N. Raikar, Structwel Designers and Consultant Pvt. Ltd., New Bombay.
- (vii) Structural Failures in Residential Buildings by Schild Oswal, Crosby Lockwood Staples, Granda Pub.
- (viii) Causes, Prevention and Remedies of Cracks in Building, SP 25, Bureau of Indian Standards

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

MAJOR ELECTIVES-V
MANAGEMENT INFORMATION SYSTEMS

Objectives:

To give knowledge of basic principles of MIS so as to make them able to develop MIS of various organizations.

Course content:

Introduction to concepts in management information systems, role of information in decision making, effect of quality, reliability and availability of information on quality of decision.

Decision making without proper information (under uncertainty)

Design of MIS, information needs for various kinds of management, number, level of detail and frequencies of information, choice of source for information, management information organization and routing, selective information management.

Structure, organization and components of integrated construction management information systems.

Types of systems.

Data base management systems.

Nolan Stage Model – stages of information system growth.

References :

1. Management Information Systems by Kanter J. - Prentice Hall of India
2. Analysis & Design of Information Systems by V. Rajaraman - Prentice Hall of India
3. Computers & Information Management by S.C. Bhatnagar and K.V. Ramani
Prentice Hall of India
4. Information Systems for Modern Management by Mardick R.G. & Others -
Prentice Hall of India

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

PERSONNEL MANAGEMENT

Objectives :

To emphasis role of personnel function in construction firms, to give basis of personnel management , man power planning , labour laws and industrial relations.

Course content:

Introduction

Basic of personnel management, manpower planning, labour laws and industrial relations. The role of personnel management in construction enterprises.

Personnel Management

Concepts, definitions, growth, role and functions, new developments in HRD and HRM, manpower estimation for company and project, methods and procedures of estimation at various stages.

Related Aspects

Methods of recruitment, selection, training, placement, financial compensation, discipline, separation etc. in employing and retaining engineers and managers.

Personnel Office at Head Office and Project Site

Role, functions, status and relationship with other departments, personnel office records and procedures.

Legal Aspects

Labour legislation, related labour acts, grievance handling, enquiry procedure, labour administration and judiciary in regards to construction industry.

References :

1. Personnel Management by Monappa A. and M.S. Saiyadaiu - Tata Mc Graw Hill
2. Labour Laws for the Construction Industry in India by Vaid K.N. NICMAR, Bombay.
3. Personnel and Industrial Relations – A Management Approach by Miuer J.B. and Miuer M.G. - Mc Millan, New York
4. Human Resource Development in Construction Industry by Shah Vinita - NICMAR, Bombay.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT
CONSTRUCTION SAFETY MANAGEMENT

Objectives:

To learn occupational & safety hazard assessment. To give knowledge to prepare safety and health programs. To develop safety culture in construction firms.

Course content:

CONSTRUCTION ACCIDENTS

Accidents and their causes-Human factors in construction safety-cost of construction injuries Occupational and Safety hazard assessment-Legal implications

SAFETY PROGRAMMES

Problem areas in construction safety-Elements of an Effective an safety progrmme-Job site Safety assessmentsafety eetings-safety incentives

CONTRACTUAL OBLIGATIONS

Safety in construction contracts-Substance Abuse-Safety record keeping

DESIGNING FOR SAFETY

Safety culture-Safe workers-Safety and first line supervisors-Safety and Middle Managers-Top Management Practices,Company Activities and Safety-Safety Personnel-Subcontractual obligation-Project Cordination and Safety Procedures-Workers Compensation

OWNERS AND DESIGNERS OUTLOOK

References:

1. Jimmy W.Hinze, “ Construction Safety “, Prentice Hall Inc., 1997.
2. Richard J. Coble , Jimmie Hinze and Theo C. Haupt, “ Construction Safety and Health Management “,Prentice Hall Inc., 2001.
3. Factory Act.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

INTERDISCIPLINARY ELECTIVES-I
DISASTER MANAGEMENT

Objectives:

To impart knowledge to prepare damage assessment of natural and manmade disasters.
To work out financing relief expenditures and distribution program. To prepare emergency management program.

Course content:

Disasters – Natures and extent of disasters, natural calamities such as earthquake, floods, drought volcanoes, forest, coasts hazards, landslides etc. Manmade disasters such as chemical and industrial hazards, nuclear hazards, fire hazards etc.

Damage Assessment Methods

Disaster Management – Financing relief expenditure, legal aspects, rescue operations.
Casually management, risk management.

Emergency Management programme – Administrative setup and organization. Hazard analysis, training of personnel, information management, emergency facilities and equipment necessary public awareness creation, preparation and execution of the emergency management programme.

Reference Books

1. Construction Engineering and Management – Seetharaman
2. CE&CR's Journals
3. NICMAR Publications
4. Different sites on internet on disaster management
5. Project Management – K Nagarajan – New Age International Ltd.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

ENERGY MANAGEMENT

Objectives:

To introduce concepts, phenomena, in the energy science to impart importance of energy planning to expose students for analysis, design and operations of energy systems and uses of energy.

To give an overview methods and tools to diagnose, analyze and solutions of various problems of potential energy applications.

Course content :

Definitions and basic concepts

Energy science & energy Scenario in Global Backdrop and Energy scenario in India.

Non renewable Energy Sources & renewable energy sources.

Current and Emerging Technologies: Coal Based Emerging Technologies
Hydrogen Fuels and Fuel-Cell Technologies. Fusion fuel for future.
Solar Ponds. Solar Photovoltaic systems. Geothermal energy.

Demand & supply assessment. Energy impact Assessment – predication
and analysis. Regulation in energy management

Energy in urban as well as rural planning.

References:

1. Energy management handbook. Wayne C. Turner., Stevadofy
2. A text book of energy technology. Vedams ebooks Pvt. Ltd. New Delhi.
3. Non conventional Energy sources. G.D. Rai. Khanna publisher. New Delhi.
4. Handbook of energy Audit & environment. Y.P.Abbbi, Shashank Jain.
TERI book store.
5. Solar energy by S. P. Sukhatme. Tata McGraw Hill. New Delhi.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

INTERDISIPLINARY ELECTIVES-II

STRATEGIC MANAGEMENT

Objectives:

To identify the relevant government environment: laws, policies, regulations etc. with respect to a given industry/firm. To analyze the relevant government environment for corporate planning and policy decisions. To Recognize the impact and changes in the regulatory and other profiles of the government environment over different stages of corporate growth.

Course Content:

Nature of policies, pyramid of policies, central role of policies in organization.

Analysis of managerial job: strategic, tactical & operational decisions.

Organization & its environment. The basis of corporate laws & government policies.

Corporate decision making based on monetary & fiscal policies.

Joint sector & government policies.

Strategic management processes: strategic elements, role of strategies.

Study of strength & weaknesses of corporate. Alternative strategic options.

Competitive study of other companies.

Subjective & objective evaluation of strategy.

References:

1. Business policy & strategy. William F Glueck & L. R. Jauch. McGraw Hill.
2. Management policy & strategy. Steiner G. & J. Miner. Macmillan New York.
3. Government and Business in INDIA. Dasgupta A. & Sen Guha. Allied publishers. Calcutta.
4. Organization Strategy structure & processes. Miles R. & C Snow. McGraw Hill
5. Strategic planning systems. Hofer C. & D. Vencil. Englewood cliffs.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

RESEARCH METHODOLOGY

Objectives

To create interest for research. to impart knowledge for sources of data analysis of data and presentation of data.

To give knowledge to the researcher for effective research report preparation.

Course Content:

Introduction to research methodology

Importance of research in decision Making

Defining research problem and formulation of research problem

Research designs: Exploratory, Descriptive, Experimental

Data collection and measurement :-

Methods and techniques of data collection : Primary data through communication, Designing Questionnaire, Qualitative Research, sampling and sampling designs Attitude measurement and scales.

Data presentation and analysis

Data processing, Univariate and Bivariate analysis, Corelational analysis ANOVA, Analysis of Associations, Multivariate analysis and data, Model bulding and decision making

Report Writing and presentation

Content of reports, formatting of content, and presentation of reports.

References :

- 1 C.R. Kothari. "***Research Methodology – Methods and Techniques***",
2nd Edition, New Delhi : New Age International (P) Limited, 2003.
2. Eileen M. Trauth. "***Qualitative Research in IS: Issues & Trends***",
USA/London: IDEA Group Publishing, 2001. (ISBN: 1-930708-06-08)

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT
SEMINAR (ON ANY CONTEMPORARY TOPIC)

Course Objectives

In this course, the construction engineering and management, concepts on specific contemporary topic will be studied and tools for preparing reports will be used by students to prepare report. Reporting, writing and presentation skill development in engineering and technology is the main objective.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

PRESENTATION OF LITERATURE REVIEW

Course Objectives and Contents

In this course, the student will read and review the technical papers/articles from international and journals/conferences in the chosen topics from the area of traffic engineering, pavement engineering or transportation systems. Tools for preparing reports and presentation will be used by students to prepare report and to make presentation. Reporting and presentation skill development in engineering and technology is the main objective.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

DISERTATION PHASE I

Course Objectives

The study of various topics from existing literature and application of the same for specific problem. Experiment Design and structure of report generation is main objective.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

PAPER PRESENTATION

Course Objectives

The student will write a research papers from the research work carried out in the format desired by publishing agency and make presentation. This will improve research and writing capabilities.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

DISERTATION PHHASE II

Course Objectives

Based on topic selected in **DISERTATION HHASE I** the actual cases will be studied with concepts data collection analysis simulation or relevant advanced methods and final thesis report will be prepared and presented.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT

SEMINAR

Course Objectives

In this course, the concepts on specific topic will be studied from the area of construction engineering & management and tools for preparing reports will be used by students to prepare report. Reporting and presentation skill development in engineering and technology is the main objective.

PAPER PRESENTATION

Course Objectives

In this course, the student will write technical paper in standards prescribed for international journals/conferences in the chosen one topic from the area of construction engineering & management. Tools for preparing reports will be used by students to prepare report. Reporting and presentation skill development in engineering and technology is the main objective.

PROJECT 1 (DISSERTATION)

Course Objectives

The study of various topics from existing literature and application of the same for specific problem in Construction Engineering and Management. Experiment Design and structure of report generation is main objective.

PROJECT 1(DISSERTATION)

Course Objectives

Based on topic selected in Construction Engineering and Management the actual cases will be studied with concepts data collection analysis simulation or relevant advanced methods and final thesis report will be prepared and presented.

GUJARAT TECHNOLOGICAL UNIVERSITY
M E (Civil) CONSTRUCTION ENGINEERING AND MANAGEMENT