

**PROPOSAL**

**FOR**

**M. TECH. CIVIL**

**in**

**CONSTRUCTION  
TECHNOLOGY AND  
MANAGEMENT**

## SCHEME FOR M.TECH. CIVIL (CONSTRUCTION TECHNOLOGY & MANAGEMENT)

### P G DEGREE COURSE

#### SEMESTER -I

Sr. No.	Course No.	Subject	Examination Schedule	Teaching Schedule	Time of Exams(Hrs.)						
					L	P/D	Total	Theory	Sessional	Practical	Total
1	MCM- 101	Project Planning & Control			3	-	4	60	40	-	100
2	MCM-102	Civil Engineering Materials			3	-	4	60	40	-	100
3	MCM-103	Quantitative Methods in Construction Management			3	-	4	60	40	-	100
4		<b>Departmental Elective-I</b>			3	-	4	60	40	-	100
5	MCM-104	Computational Laboratory for Construction Management <b>(Lab-I)</b>			-	4	4	-	40	60	100
		Total			12	4	20	240	200	60	500

#### SEMESTER- II

1	MCM- 201	Construction Methods & Equipment	3	1	-	60	40	-	100	3
2	MCM- 202	Management of Quality & Safety in Construction	3	1	-	60	40	-	100	3
3	MCM- 203	Building Services & Maintenance Management	3	1	-	60	40	-	100	3
4		<b>Departmental Elective-II</b>	3	1	-	60	40	-	100	3

5	MCM- 204	Quality Control in Construction <b>(Lab-II)</b>	-	-	4	-	40	60	100	3
		Total	12	4	4	240	200	60	500	

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### SEMESTER –III

Sr. No.		Course No.	Subject	Examination Schedule	Teaching Schedule	Time of Exams(Hrs.)							
						L	P/D	Total	Theory	Sessional	Practical	Total	
1	MCM- 301	Construction Economics & Finance				3	-	4	60	40	-	100	3
2		Departmental Elective-III				3	-	4	60	40	-	100	3
3	MCM- 302	Seminar				-	1	1		100	-	100	1
4		Dissertation / Major Project starts											

### SEMESTER -IV

1	Dissertation, Evaluation & Viva Voce
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### \* List of Electives for M. Tech. Civil (Construction Technology & Management)

1. MCM-401 Construction Engineering Practices
2. MCM-402 Construction & Contract Management

3. MCM-403 GIS in Construction Engineering and Management Reliability
4. MCM-404 Reliability Analysis in Construction Management
5. MCM-405 Systems Design and Value Analysis
6. MCM-406 Recent Advances in Construction Materials

\* The candidates will opt for one of these electives in each of I, II, III semesters in such a way so as not to opt the same elective more than once.

#### **DISSERATION GRADE**

A > 85%

B = 75% - 85%

C = 60% - 75%

D = 50% - 60%

**M.Tech Civil (Construction Technology and Management), First Semester**  
**MCM- 101 Project Planning & Control**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Work-study, work breakdown structure, Time estimates, Applications of CPM/PERT, statical concepts, Man-Material-Machinery-Money optimization, scheduling, monitoring, updating. Cost functions, time-cost trade off, resource planning-leveling and allocation. Resources - based networks, crashing, master networks, interface activities and dependencies, line of balancing techniques, application of digital computers. Material management-purchases management and inventory control, ABC analysis. Human Resource Management.

**Reference Books:**

- 1) Chitkara. K.K. Construction Project Management: Planning Scheduling and Control Tata McGraw Hill Publishing Company, New Delhi, 1998
- 2) Calin M. Popescu, Chotchal Charoenngam, Project Planning, Scheduling and Control in Construction : An Encyclopedia of terms and Applications, Wiley, New York, 1995
- 3) Chris Hendrickson and Tung Au, Project Management for Construction - Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall Pittsburgh, 2000
- 4) Moder, J., C. Phillips and E. Davis, Project Management with CPM, PERT and Precedence Diagramming, Van Nostrand Reinhold Company, Third Edition, 1983
- 5) Willis, E. M., Scheduling Construction Projects, John Wiley & Sons, 1986
- 6) Halpin, D. W. Financial and Cost Concepts for Construction Management, John Wiley & Sons. New York, 1985

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M.Tech Civil (Construction Technology and Management), First Semester**  
**MCM-102 Civil Engineering Materials**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Cement selection for civil works. Concrete making materials. Fresh concrete and its theology properties. Mechanical, deformational behavior and microstructure of hardened concrete. Creep and shrinkage. Laboratory testing of concrete. Durability of plain and reinforced concrete, Structural steels including alloyed and cold - worked steels.

**Reference Books:**

- 1) Metha P.K and Monteiro.P.J.M, " CONCRETE", Microstructure, Properties and Materials, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006
- 2) Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006
- 3) Neville. A.M. , " Properties of Concrete", 4th Edition Longman,1995
- 4) Mindass and Young, " Concrete", Prentice Hall.1998

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M.Tech Civil (Construction Technology and Management), First Semester**  
**MCM-103 Quantitative Methods in Construction Management**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Introduction and concepts of probability and statistics. Linear programming, Transportation and assignment problems. Dynamic programming, Queuing theory, Decision theory, Games theory simulations applied to construction, Modifications and improvement on CPM/PERT techniques.

**Reference Books:**

- 1) Gupta, S.C., and Kapoor, V.K., Fundamentals of mathematical statistics, Sultan Chand and sons, Reprint 2003
- 2) Gupta, S.C., and Kapoor, V.K., Fundamentals of Applied statistics, Sultan Chand and sons, 2003
- 3) Veerarajan.T., Probability Statistics and Random processes, TMH, First reprint, 2004
- 4) Vohra, N.D. " Quantitative Techniques in Management ", Tata McGraw Hill Co., Ltd, New Delhi, 1990
- 5) Seehroeder, R.G., " Operations Management ", McGraw Hill, USA, 1982
- 6) Levin, R.I, Rubin, D.S., and Stinsonm J., " Quantitative Approaches to Management" McGraw Hill Book Co., 1988
- 7) Frank Harrison, E., " The Managerial Decision Making Process ", Houghton Mifflin Co. Boston, 1975
- 8) Varshney, R.L. and Maheswari, K.L., " Managerial Economics ", Sultan Chand, 1975

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

### **MCM-104 Computational Laboratory for Construction Management (Lab-I)**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
-	-	4	4

<b>Max Marks</b>	<b>: 100</b>
<b>Practical</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

#### **List of Experiments:**

##### **PRIMAVERA**

1. Planning and Scheduling of Multi storied building
2. Planning and scheduling of Road Project
3. Prepare the resource sheet, assign and level the resource
4. Preparing different reports available in Primavera
5. Plot the variance graphs for the given Project



**M.Tech Civil (Construction Technology and Management), Second Semester**  
**MCM- 201 Construction Methods & Equipment**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Factors affecting selection of equipment - technical and economic, construction engineering fundamentals, Analysis of production outputs and costs, Characteristics and performances of equipment for Earth moving, Erection, Material transport, Pile driving, Dewatering, Concrete construction (including batching, mixing, transport, and placement) and Tunneling.

**Reference Books:**

1. Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995
2. Patrick Powers .J, Construction Dewatering: New Methods and Applications John Wiley & Sons, 1992
3. Jerry Irvine, Advanced Construction Techniques CA Rockers, 1984
4. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder.C, Construction Planning Equipment and Methods, McGraw Hill. Singapore 1995
5. Sharma S.C. Construction Equipment and Management, Khanna Publishers, Delhi, 1988
6. Deodhar, S.V. Construction Equipment and Job Planning Khanna Publishers Delhi, 1988
7. Dr. Mahesh Varma, Construction Equipment and its planning and application, Metropolitan Book Company, New Delhi 1983

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M.Tech Civil (Construction Technology and Management), Second Semester**  
**MCM-202 Management of Quality & Safety in Construction**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Introduction to quality. Planning and control of quality during design of structures. Quantitative techniques in quality control. Quality assurance during construction. Inspection of materials and machinery. In process inspection and test. Preparation of quality manuals, check-list and inspection report. Establishing quality assurance system. Quality standards/codes in design and construction. Concept and philosophy of total quality management (TQM). Training in quality and quality management systems (ISO-9000).

Concept of safety. Factors affecting safety: Physiological, Psychological and Technological. Planning for safety provisions. Structural safety. Safety consideration during construction, demolition and during use of equipment. Management of accidents/injuries and provision of first aid. Provisional aspect of safety. Site management with regard to safety recommendations. Training for safety awareness and implementation. Formulation of safety manuals. Safety legislation, standards/codes with regard to construction. Quality vs. Safety. Case Studies.

**Reference Books:**

1. Richard J. Coble, Theo C. Haupt, Jimmie Hinze, "The Management of Construction Safety and Health", Taylor & Francis, 2000, 905809328X, 9789058093288
2. Abdul Razzak Rumane, "Quality Management in Construction Projects", Taylor & Francis, 2010, ISBN 1439838712, 9781439838716
3. Tim Howarth, Paul Watson, "Construction Safety Management", John Wiley & Sons, 2008, ISBN 1405186607, 9781405186605
4. Phil Hughes, Ed Ferrett, "Introduction to Health and Safety in Construction: The Handbook for Construction Professionals and Students on Nebosh and Other Construction Courses", Edition 3, Publisher Routledge, 2008, ISBN 1856175219, 9781856175210

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M.Tech Civil (Construction Technology and Management), Second Semester**  
**MCM-203 Building Services & Maintenance Management**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Components of urban forms and their planning. Concepts of neighborhood unit. Street system and layout in a neighborhood. Functional planning of buildings, optimization of space: Spatial Synthesis graphical techniques, heuristic procedures, formulation of linear and non-linear optimization problem. Space requirements and relationships for typical buildings, like residential offices, hospitals, etc.

Standard fire, fire list, fire resistance, classification of buildings, means of escape, alarms, etc. Engineering services in a building as a systems. Lifts, escalators, cold and hot water systems, waste water systems, and electrical systems.

Building Maintenance: Scheduled and contingency maintenance planning. M.I.S. for building maintenance. Maintenance standards. Economic maintenance decisions.

**Reference Books:**

- 1) G. M. Fair, J. C. Geyer and D. Okun, Water and waste Engineering, Vol.II, John Wiley & sons, Inc., New York. 1968
- 2) R. G. Hopkinson and J. D. Kay , The Lighting of buildings ,Faber and Faber, London, 1969
- 3) Hand book for Building Engineers in Metric systems, NBC, New Delhi, 1968
- 4) Philips Lighting in Architecture Designs, McGraw Hill, New York, 1964
- 5) Time saver Standards for Architecture Design Data , Callendar JH ,McGraw Hill, 1974
- 6) William H. Severns and Julian R. Fellows, Air conditioning and refrigeration ,John Wily and sons,

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M.Tech Civil (Construction Technology and Management), Second Semester**  
**MCM-204 Quality Control in Construction (Lab-II)**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>	<b>Max Marks</b>	<b>: 100</b>
<b>-</b>	<b>-</b>	<b>4</b>	<b>4</b>	<b>Practical</b>	<b>: 60 Marks</b>
				<b>Sessional</b>	<b>: 40 Marks</b>
				<b>Duration</b>	<b>: 3 Hours</b>

**List of Experiments:**

1. Mix Design of Concrete
2. Tests on fresh concrete
3. Tests on hardened concrete
4. In-situ Strength determination by Rebound Hammer.
5. Measurement of Moisture content in aggregates, soil and hardened concrete surface using NDT techniques.
6. Pull-Out Tests on concrete
7. Effect of Chemical admixtures on fresh and harden properties of concrete
8. Effect of mineral admixtures on fresh and harden properties of concrete
9. Tests on Bitumen materials
10. Tests on Course aggregates for road construction

**Reference Books:**

- 1) Metha P.K and Monteiro. P. J. M. " CONCRETE", Microstructure, Properties and Materials, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006
- 2) Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi, 2006
- 3) Neville. A.M. , " Properties of Concrete", 4th Edition Longman, 1995
- 4) Mindass and Young, " Concrete", Prentice Hall. 1998

**M.Tech Civil (Construction Technology and Management), Third Semester**  
**MCM- 301 Construction Economics & Finance**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Construction accounting, Income statement. Depreciation and amortization. Engineering economics, Time value of money, discounted cash flow, NPV, ROR, PI, Bases of comparison, Incremental rate of return, Benefit-cost analysis, Replacement analysis, Break even analysis. Risks and uncertainties and management decision in capital budgeting. Taxation and inflation. Work pricing, cost elements of contract, bidding and award, revision due to unforeseen causes, escalation. Turnkey activities, Project appraisal and project yield. Working capital management, financial plan and multiple source of finance. International finance, Budgeting and budgetary control, Performance budgeting. appraisal through financial statements, Practical problems and case studies.

**Reference Books:**

- 1) Eugene F. Brigham, Michael C. Ehrhardt, "Financial Management Theory and Practice", Cengage Learning, 2010
- 2) Simon A. Burtonshaw-Gunn, "Risk and Financial Management in Construction", Gower Publishing, Ltd., 2009
- 3) Warner Z. Hirsch, Urban Economics, Macmillan, New York, 1993

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

### **Departmental Electives**

#### **M.Tech Civil (Construction Technology and Management) MCM-401 Construction Engineering Practices**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>	<b>Max Marks</b>	<b>: 100</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>Theory</b>	<b>: 60 Marks</b>
				<b>Sessional</b>	<b>: 40 Marks</b>
				<b>Duration</b>	<b>: 3 Hours</b>

Concrete Construction methods: form work design and scaffolding, slip form and other moving forms, pumping of concrete and grouting mass concreting (roller compacted concrete), ready mixed concrete, various methods of placing and handling concrete, Accelerated curing, Hot and cold weather concreting, Under water concreting, Pre-stressing.

#### **Reference Books:**

- 1) Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995
- 2) Patrick Powers .J, Construction Dewatering: New Methods and Applications John Wiley & Sons, 1992
- 3) Jerry Irvine, Advanced Construction Techniques CA Rockers, 1984
- 4) Peurifoy, R.L., Ledbetter, W.B. and Schexnayder. C, Construction Planning Equipment and Methods, McGraw Hill. Singapore 1995
- 5) Sharma S.C. Construction Equipment and Management, Khanna Publishers, Delhi, 1988
- 6) Deodhar, S.V. Construction Equipment and Job Planning Khanna Publishers Delhi, 1988
- 7) Dr. Mahesh Varma, Construction Equipment and its planning and application, Metropolitan Book Company, New Delhi 1983

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M.Tech Civil (Construction Technology and Management)**  
**MCM-402 Construction & Contract Management**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>	<b>Max Marks</b>	<b>: 100</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>Theory</b>	<b>: 60 Marks</b>
				<b>Sessional</b>	<b>: 40 Marks</b>
				<b>Duration</b>	<b>: 3 Hours</b>

Project cost estimation, rate analysis, overhead charges, bidding models and bidding strategies. Qualification of bidders. Tendering and contractual procedures, Indian Contract Act 1872, Definition of Contract and its applicability, Types of contracts, International contracts, Conditions and specifications of contract. Contract administration, Claims, compensation and disputes, Dispute resolution techniques, Arbitration and Conciliation Act 1996, Arbitration case studies, Professional ethics, Duties and responsibilities of parties. Management Information systems, Risk analysis, Value engineering.

**Reference Books:**

- 1) Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M. M. Tripathi Private Ltd., Bombay, 1982 Tamilnadu PWD Code, 1986
- 2) Jimmie Hinze, Construction Contracts, McGraw Hill, 2001
- 3) Joseph T. Bockrath, Contracts, the Legal Environment for Engineers and Architects, McGraw Hill, 2000
- 4) Oxley Rand Posicit, Management Techniques applied to the Construction Industry, Granda Publishing Ltd., 1980

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M.Tech Civil (Construction Technology and Management)**  
**MCM-403 GIS in Construction Engineering and Management Reliability**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>	<b>Max Marks</b>	<b>: 100</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>Theory</b>	<b>: 60 Marks</b>
				<b>Sessional</b>	<b>: 40 Marks</b>
				<b>Duration</b>	<b>: 3 Hours</b>

GIS Basic Concepts Definition - Components of GIS -Maps - Definition - Types of Maps - Characteristics of Maps - Map Projections -- Hardware, Software and Organizational Context - GIS software. Data Types - Spatial and Non-Spatial - Spatial Data - Points, Lines and areas- Non-spatial data - Nominal, Ordinal, Interval and Ratio - Digitizer - Scanner - Editing and Cleaning - Geo reference data. Raster and Vector Data Structure - Raster data storage - Run length, Chain and Block Coding - Vector Data Storage - Topology - Topological Models - Arc Node Structure - Surface Data - DEM - Grid DEM and TIN structure- Applications of DEM. Reclassification - Measurement - Buffering - Overlaying - SQL for Queries - Neighborhood and zonal operations - Data Quality - Components of data quality - Sources of errors in GIS - Meta data. Output - Maps, Graphs, Charts, Plots, Reports - Printers – Plotters. Fields of application - Natural Resource Management, construction management-Parcel based, AM/FM applications examples - Case study

**Reference Books:**

1. Burrough P.A., Principles of GIS for Land Resources Assessment, Oxford Publication, 1998
2. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996
3. Anji Reddy, Remote Sensing and Geographical Information Systems , BS Publications 2001
4. Srinivas M.G. (Edited by), Remote Sensing Applications, Narosa Publishing House, 2001
5. Rhind, D., Understanding of GIS, The ARC / INFO Method, ESRI Press. 1990

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.



**M.Tech Civil (Construction Technology and Management)**  
**MCM-404 Reliability Analysis in Construction Management**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>	<b>Max Marks</b>	<b>: 100</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>Theory</b>	<b>: 60 Marks</b>
				<b>Sessional</b>	<b>: 40 Marks</b>
				<b>Duration</b>	<b>: 3 Hours</b>

Probability Theory: Mutually exclusive events, set theory, sample points and sample space, laws of probability, total probability theorem, Baye's rule, random variables-discrete and continuous, jointly distributed discrete variables, marginal distribution, conditional distribution, jointly distribution continuous variables, functions of random variables, moments and expectations, common probability distribution normal. Lognormal, Gamma and Beta distribution, external distribution. Resistance Distribution and Parameters: Statistics of properties of concrete and steel, Statistics of strength of bricks and mortar, Characterization of variables, allowable stresses based on specified reliability. Monte Carlo Study of Reliability: Monte Carlo Method Inverse transformation technique. Application to columns beams and frames. Level 2 Reliability Methods: Basic variables and failure surface, first order second moment methods, Hasofer and Lind's method, Non-normal distributions; determination of reliability index B of structural elements. Reliability Based Design: Determination of partial safety checking formats. Development of reliability based criteria, optimal safety factors, and calibration of IS 456 and IS 800. Reliability of Structural Systems: System reliability, modeling of structural systems, bounds on system reliability, automatic generation of a mechanism, generation of dominant mechanism, reliability analysis of R.C.C. and steel frames.

**Reference Books:**

1. Ranganathan, R. (1990) 'Reliability Analysis and Design of Structures' Tata McGraw Hill Delhi.
2. Rao, S.S. 'Reliability based Design' Tata McGraw Hill Delhi.
3. Ghosh. D.I. (1989) 'A Primer of Reliability Theory', John Wiley, New York.
4. Lewis, E.E. (1987) 'Introduction to Reliability Engineering' John Wiley, New York.

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M. Tech Civil (Construction Technology and Management)**  
**MCM-405 Systems Design and Value Analysis**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>	<b>Max Marks</b>	<b>: 100</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>Theory</b>	<b>: 60 Marks</b>
				<b>Sessional</b>	<b>: 40 Marks</b>
				<b>Duration</b>	<b>: 3 Hours</b>

Analysis synthesis, Appraisal, System design procedure, objectives and constraints, application to buildings, value analysis. Introduction, function analysis. Job plan. Value savings during construction. Value management. Case studies in Value engineering.

**Reference Books:**

1. Keith F. Potts, "Construction Cost Management: Learning from Case Studies", Taylor & Francis, 2007.
2. HojjatAdeli, AsimKarim, AsimSalimulKarim, "Construction Scheduling, Cost Optimization and Management", Taylor & Francis, 2001.
3. K. K. Chitkara, "Construction Project Management: Planning, Scheduling and Controlling", Tata McGraw-Hill Education, 2002.
4. Panagiota E. Paraoulaki, "Value Engineering and Its Application to the Construction Industry", Massachusetts Institute of Technology, Department of Civil and Environmental Engineering, 2000.
5. Alphonse J. Dell'Isola, "Value engineering: practical applications --for design, construction, maintenance & operations", R. S. Means Company, 1997.

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.

**M. Tech Civil (Construction Technology and Management)**  
**MCM-406 Recent Advances in Construction Materials**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>Total</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Max Marks</b>	<b>: 100</b>
<b>Theory</b>	<b>: 60 Marks</b>
<b>Sessional</b>	<b>: 40 Marks</b>
<b>Duration</b>	<b>: 3 Hours</b>

Foams and light weight materials, fibre reinforced concrete. Types of fibres, workability, mechanical and physical properties of fibre reinforced concrete. Industrial waste materials in concrete, their influence on physical and mechanical properties and durability of concrete, Concrete at high temperature. High strength concrete. Changes in concrete with time, Corrosion of concrete in various environments. Corrosion of reinforcing steel. Electro-chemical process, measures of protection. Ferro-cement, material and properties. Polymers in Civil Engineering Polymers, fibres and composites, Fibre reinforced plastic in sandwich panels, modeling. Architectural use and aesthetics of composites. Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers, Polymer foams and polymers in Building Physics. Polymer concrete composites.

**Reference Books:**

1. Metha P.K and Monteiro. P.J.M, " CONCRETE", Microstructure, Properties and Materials, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006
2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006
3. Neville. A.M. , " Properties of Concrete", 4th Edition Longman,1995
4. Mindass and Young, " Concrete", Prentice Hall.1998

Note: Eight (08) questions are to be set covering all the syllabus. Students will be required to attempt any five (05) questions.