

**FACULTY OF PHYSICAL PLANNING & ARCHITECTURE**

**SYLLABUS**

**FOR**

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT  
(Credit Based Evaluation and Grading System)**

**(Semester-I-II)**

**Examinations: 2019-20**



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**GURU NANAK DEV UNIVERSITY,  
AMRITSAR.**

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**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT**  
**(Credit Based Evaluation and Grading System)**

**SEMESTER-I**

Sr. No.	Course Code	Course Title	Course Type	Credits	L	T	U	Duration of Exams
1	CTM 101	Construction Management	DC	03	02	01	0	03 hrs
2	CTM 102	Advanced Construction Techniques	DC	03	02	01	0	03 hrs
3	CTM 103	Building Services	DC	03	02	01	0	03 hrs
4	CTM 104	Construction Equipment	DC	03	02	01	0	03 hrs
5	CTM 105	Computer Lab-II	DC	05	02	03	0	Viva-Voce
<b>Elective Subjects (Any One of the Following)</b>								
6	CTM 106	Advanced Construction techniques	DE	03	02	01	0	03 hrs
7	CTM 107	Construction Personnel Management	DE	03	02	01	0	03 hrs
8	CTM 108	Quantitative techniques in Construction Management	DE	03	02	01	0	03 hrs
<b>Total</b>				<b>20</b>	<b>12</b>	<b>8</b>	<b>0</b>	

**SEMESTER-II**

Sr. No.	Course Code	Course Title	Course Type	Credits	L	T	U	Duration of Exam
1.	CTM 151	Construction Costing & Finance management	DC	03	02	01	0	3 hrs
2.	CTM 152	Maintenance and Rehabilitation of Structures	DC	03	02	01	0	3 hrs
3.	CTM 153	Materials Management	DC	03	02	01	0	3 hrs
4.	CTM 154	Energy Conservation Techniques In Building Construction	DC	03	02	01	0	3 hrs
5.	CTM 155	Project Formulation and Appraisal	DC	05	02	01	0	Presentation & Report Submission
<b>Total</b>				<b>17</b>	<b>10</b>	<b>05</b>	<b>0</b>	
6.	-	Inter Disciplinary Course	ID	-	-	-	-	-

Note: Every student would be required to undergo industrial training of four weeks duration after

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMSEER-I)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 101**

**Duration of Exam: 3hrs**

**Course Title: CONSTRUCTION MANAGEMENT**

**Credits:03 (L=2, T=1,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To study the elements of construction project management consisting of owners' perspective, organization, design and construction procedures, resource utilization and cost estimation

**OBJECTIVES**

1. To study how the owner view a project in consideration with project life cycle, construction agencies legal requirements etc.
2. To study the various types of organization and their impact on and suitability to construction projects
3. To study the design and construction procedures along with labour material and equipment utilization
4. To study the elements of cost of a project

**Section-A**

**INTRODUCTION TO PROJECT**

Concept of a Project – Characteristic features – Project Life cycle – Phases –Project Management – tools and techniques for project management – role of project managers.

**Section-B**

**ROLE OF PROJECT MANAGEMENT**

Development of project plan and objectives – programming – scheduling – project organization – organization and project team – role of communication in project management – controlling systems.

**Section-C**

**WORKING SYSTEMS**

Working systems – Characteristics – class of systems – design of systems – work break down system (WBS) – project execution plan – project procedure manual –sub systems of project management- monitoring of projects- networks – monitoring contracts.

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Section-D

PROJECT DIRECTION

Project direction – direction during production stage – value engineering review –stages – directives – project coordination – procedure – interface management –project control –scope for progress control – overall project progress control – stages– methods. Basic concept – Labour requirements – Labour productivity – site productivity –Equipment Management – Material management- procurement organization –procurement planning – functions of material management – inventory control

REFERENCES

1. Prasanna Chandra, “Project Planning, Analysis, Selection, Implementation and review”, Tata Mcgraw Hill ,2009.
2. Chitkara, K.K “Construction Project Management: Planning Scheduling and control”, Tata McGraw-Hill Publishing Company, New Delhi- 2008.
3. Frederick E. Gould, “Construction Project Management”, Went worth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
4. Choudhury, S “Project Management”, Tata McGraw-Hill Publishing company New Delhi 2008.
6. Sengutha .B, Guha .H, “Construction Management and Planning”, Tata Mc Graw Hill, 2001.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-SEER-I)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 102**

**Course Title: Advanced Construction Techniques**

**Duration of Exam: 3hrs**

**Credits:03 (L=2, T=1,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To bring about a complete understanding of advanced construction techniques in sub structure super structure and repair construction

**OBJECTIVES**

To study the substructure construction techniques.

1. To create awareness on tall structure construction elements
2. To know about the techniques used for large span structures.
3. To know about the recent and advancement in construction techniques.
4. To study the elements of repair construction.

**Section-A**

**SUB STRUCTURE CONSTRUCTION**

Box Jacking: Need – elements – concept – precautions – advantages. Pipe jacking: Technique – factors – applications – advantages. Diaphragm walls – methods – sheet piles – applications – advantages. Piling techniques: Classifications – factors. Well and caisson: Types – sinking method –precautions. Cofferdam: Purpose – types –techniques. Cable anchoring – screw anchor – necessity- applications. Grouting: Need – materials – techniques – applications – guniting and shotcreting. Well points -dewatering – techniques.

**Section-B**

**TALL STRUCTURES CONSTRUCTION**

Concrete in tall buildings – types of concrete pumps – factors – blockage – causes -clearing – safety. Slip form techniques: Vertical - chimney – horizontal – concrete paving methods. Suspended form work: Purpose – methods – advantages – erection techniques. Prestressing techniques – insitu prestressing in high rise structures.

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Section-C

LARGE SPAN STRUCTURES CONSTRUCTION

Tunneling: Purpose – aspects – shafts – mucking – construction techniques – advantages – trenchless technology. Bow string bridges: Systems – arrangements – advantages. Suspension and cable stayed bridges: Parallel – radial patterns – concept. Domes: Types – structural framing – erection methods. Aerial transportations – components – advantages – applications.

Section-D

SPECIAL STRUCTURE CONSTRUCTION

Lattice tower: Definition – techniques. Rigging of transmission line structures: Definition – precaution – stages involved. Advanced construction techniques in offshore construction practice: Various operations – under water concrete – vacuum dewatering of concrete flooring. Articulated structure – definition – mechanism.

REFERENCES

- 1 Roy Chudley, Roger Geeno ,”Advanced Construction Technology” Latest Edition.
- 2 Ponnuswamy .S,”Bridge Engineering “Second Edition.
- 3 Sankar, S.K. And Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008.
- 4 Gahlot .P.S & Sanjay Sharma ,”Building repair and maintenance management “CBS Publications.2006.
- 5 Robertwade Brown, "Practical Foundation Engineering Hand Book", Mcgraw Hill Publications, 2005.
- 6 Patrick Powers .J, "Construction Dewatering: New Methods And Applications" John Wiley & Sons, 2002.
- 7 Micheal T.Kubal ,”Construction Waterproofing Handbook”.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMESTER-I)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 103**  
**Course Title: Building Services**

**Duration of Exam: 3hrs**  
**Credits:03 (L=2, T=1,U=0)**

**Minor Test: 20%**  
**Assignment/Seminar/Case Study/Minor Project:20%**  
**Quiz/Group Discussion: 10%**  
**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To study the elements of building services like water supply sanitation, electrical installations air

**OBJECTIVES**

1. To study the components of water supply and sanitation arrangements in a building
2. To study the rudiments of electrical installations in a building
3. To bring about an exposure to air conditioning and fire safety arrangement
4. To introduce the concepts of intelligent building

**Section-A**

**WATER SUPPLY SYSTEMS**

Water quality, Purification and treatment- water supply systems-distribution systems in small towns –types of pipes used- laying jointing, testing-testing for water tightness plumbing system for building-internal supply in buildings- municipal bye laws and regulations - Rain Water Harvesting - Sanitation in buildings-arrangement of sewerage systems in housing -pipe systems- storm water drainage from buildings -septic and sewage treatment plant – collection, conveyance and disposal of town refuse systems –.

**Section-B**

**VENTILATION AND ITS IMPORTANCE**

Ventilation and its importance-natural and artificial systems-Window type and packaged air-conditioners-chilled water plant –fan coil systems-water piping –cooling load –air conditioning systems for different types of buildings –protection against fire to be caused by A.C. Systems.

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Section-C

SAFETY REGULATIONS

Causes of fire in buildings-safety regulations-NBC-planning considerations in buildings like Non-combustible materials, construction, staircases and A.C. systems, special features required

for physically handicapped and elderly in building types-heat and smoke detectors-dry and wet risers-Automatic sprinklers

Section-D

INTELLIGENT BUILDINGS

Intelligent buildings-Building automation-Smart buildings- Building services in high rise buildings-Green buildings-Energy efficient buildings for various zones-Case studies of residence, office buildings and other buildings in each zones.

REFERENCES

- 1 Fair G.M., Geyer J.C. and Okun .D, "Water and waste Engineering", Vol. II, John Wiley & sons, Inc., New York. 2008.
- 2 Hopkinson .R.G and Kay .J .D, "The Lighting of buildings", Faber and Faber, London, 2009.
- 3 "Hand book for Building Engineers in Metric systems", NBC, New Delhi, 2008.
- 4 "Philips Lighting in Architecture Designs", McGraw Hill, New York, 2004.
- 5 "Time saver Standards for Architecture Design Data", Callendar JH, McGraw Hill, 2004.
- 6 William H.Severns and Julian R.Fellows, "Air conditioning and refrigeration", John Wily and sons, London, 2008.



**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-SEER-I)**  
**(Credit Based Evaluation and Grading System)**

**Course Code: CTM 104**

**Course Title: Construction Equipment**

**Duration of Exam: 3hrs**

**Credits:03 (L=2, T=1,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

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**PURPOSE**

To introduce various construction equipment and study the efficient utilization of the same using scientific principles

**OBJECTIVES**

1. To introduce various construction equipment for earthwork, material handling and other miscellaneous purposes.
2. To study the working of the equipment mentioned above and apply scientific principles for effectively utilizing them.

Section-A

**EQUIPMENT MANAGEMENT**

Identification –Planning - Equipment Management in Projects – Maintenance Management – Replacement - Cost Control of Equipment – Depreciation Analysis, Methods of calculation of depreciation- Safety Management.

Section-B

**EARTHWORK EQUIPMENT**

Fundamentals of Earth Work Operations - Earth Moving operations-Types of Earthwork Equipment - Tractors, Motor Graders, Scrapers, Front end Loaders, Earth Movers – capacity calculations.

Section-C

**PUMPS USED IN CONSTRUCTION**

Equipment for Dredging, Trenching, Tunneling, Drilling and Blasting. Equipment for compaction - Types of pumps used in Construction - Equipment for Grouting – Pile Driving Equipment- Equipment of Erection and demolition.

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**(Credit Based Evaluation and Grading System)**

Section-D

**FORKLIFTS EQUIPMENTS, DEMOLITION**

Forklifts and related equipment - Portable Material Bins - Conveyors – equipment used in demolition – Chain Pulley Blocks. Crushers – Feeders - Screening Equipment - Batching and Mixing Equipment –Hauling equipment - Pouring and Pumping Equipment – Ready mixed concrete carriers. Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

**REFERENCES**

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder.C, “Construction Planning Equipment and Methods”, McGraw Hill. Singapore 2005.
2. Sharma S.C. “Construction Equipment and Management”, Khanna Publishers, Delhi, 2008.
3. Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers Delhi, 2008.
4. Mahesh Varma .Dr., “Construction Equipment and its planning and application”, Metropolitan Book Company, New Delhi,2003.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMSEER-I)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 105**

**Duration of Exam: Viva Voce**

**Credits:05 (L=2, T=3,U=0)**

**Course Title: COMPUTER APPLICATION IN CONSTRUCTION MANAGEMENT  
(Theory and Practice)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**PURPOSE**

To bring about an understanding of use of computers for solving scheduling and other related problems by applying critical path methods

**OBJECTIVES**

1. To review the basics of computer hardware
2. To study the preparation of the detailed estimation.
3. To apply the concepts studied under 1 and 2 above to scheduling and other related problems.

**Section-A**

**INTRODUCTION TO COMPUTERS**

Basic components of System Hardware - Languages – Procedural Language – Data Base Management – developing application with files and database software-Spread Sheets - Applications.

**Section-B**

**CONSTRUCTION DRAWINGS AND SPECIFICATIONS**

Basic skills and techniques required producing construction drawings and specifications conforming to current building codes and standards- Laboratory assignments develop visualization skills in order to examine the integration of construction systems-organization of working drawings and specifications.

**Section-C**

**QUANTITY TAKEOFF**

Estimating – Types of estimates- Terms Involved in Estimation – Quantity takeoff men, material, machinery and duration-A complete Estimate of a project- A Case study

**Section-D**

**PROJECT PLANNING AND SCHEDULING**

Project planning and scheduling- Critical path method (CPM) – Project Evaluation Review Techniques (PERT) – Advanced planning and scheduling concepts –computer application- Case study. Resource Allocation - Over Allocation- Resource Leveling and Smoothing- Preparation of Detailed Reports.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMESTER-I)  
(Credit Based Evaluation and Grading System)**

**REFERENCES**

1. Billy E. Gillet Introduction to Operation Research - Computer Oriented Algorithmic Approach, Tata McGraw Hill, 2000.
2. Paulson. B.R., Computer Applications in Construction, McGraw Hill, 1995.
3. Feigenbaum .L, Construction Scheduling with Primavera Project Planner, Prentice Hall Inc., 2009.
4. Prasanna Chandra, “Project Planning, Analysis, Selection, Implementation and review”, Tata McGraw Hill ,2009.
5. Chitkara, K.K “Construction Project Management: Planning Scheduling and control”, Tata McGraw-Hill Publishing Company, New Delhi- 2008.

**PRACTICE**

**EXPERIMENT I-MS EXCEL**

Quantity takeoff by using MS EXCEL - Estimation of Quantities stage wise –Carryout the rate analysis and costing for different stages of work - Preparation and delivery of the bid or proposal of an engineering construction project.

**EXPERIMENT II**

Preparation of Planning and Scheduling by using MS PROJECT - scheduling for a small construction project - Allocation of resource- Tracking of a Project-Cost analysis- Reports preparation.

**EXPERIMENT III**

Preparation of Planning and Scheduling by using PRIMAVERA - scheduling for a small construction project - Allocation of resource- Tracking of a Project-Cost analysis- Reports preparation.

**LIST OF EQUIPMENTS / SOFTWARES / TOOLS REQUIREMENTS**

1. MS OFFICE
2. MS PROJECT
3. PRIMAVERA

**REFERENCES**

1. Krishnamoorthy .C.S and Rajeev .S, Computer Aided Design, Narosa publishing house, New Delhi, 2001.
2. Harrison .H .B, Structural Analysis and Design, vol. I & II, Pergamon press, 2001.
3. Billy E. Gillet Introduction to Operation Research - Computer Oriented Algorithmic Approach, Tata McGraw Hill, 2000.
4. Paulson. B.R., Computer Applications in Construction, McGraw Hill, 2005.
6. Feigenbaum .L, Construction Scheduling with Primavera Project Planner, Prentice Hall Inc., 2009.
7. Lab Manual, Department of Civil Engineering.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMESTER-I)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 106**

**Duration of Exam: 3hrs**

**Course Title: ADVANCED CONSTRUCTION  
TECHNIQUES**

**Credits: 03 (L=2, T=3,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

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**OBJECTIVE:** To study and understand the latest construction techniques applied to engineering construction for sub structure, super structure, special structures, rehabilitation and strengthening techniques and demolition techniques.

**Section-A**

**SUB STRUCTURE CONSTRUCTION**

Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam - cable anchoring and grouting - Driving diaphragm walls, Sheet piles - Laying operations for built up offshore system - Shoring for deep cutting - Large reservoir construction - well points - Dewatering for underground open excavation.

**Section-B**

**SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS**

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab- aerial transporting – Handling and erecting lightweight components on tall structures.

**Section-C**

**CONSTRUCTION OF SPECIAL STRUCTURES**

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries – Erection of articulated structures and space decks.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMESTER-I)  
(Credit Based Evaluation and Grading System)**

Section-D

REHABILITATION AND STRENGTHENING TECHNIQUES

Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques.

Reference Books:

1. Jerry Irvine, Advanced Construction Techniques, CA Rocketr, 1984
2. Patrick Powers. J., "Construction Dewatering: New Methods and Applications", John Wiley & Sons, 1992.
3. Peter.H.Emmons, "Concrete repair and maintenance illustrated", Galgotia Publications Pvt. Ltd., 2001.Press, 2008.
4. Robertwade Brown, "Practical foundation engineering hand book", McGraw Hill Publications, 1995.
5. Sankar, S.K. and Saraswati, S., "Construction Technology", Oxford University.
6. Construction Technology: Analysis, and Choice, 2ed,Bryan, Wiley India
7. Construction Planning, Equipment and methods – Peurifoy-Tata McGraw Hill Publication
8. Construction Equipment Planning and Applications – Dr. Mahesh Varma
9. Brochures Published by various agencies associated with construction. 5. Journals such as CE & CR. Construction world, International Construction.
10. Document Reports of actual major works executed.
11. Construction Technology by Roy Chudley and Roger Greeno, Prentice Hall, 2005.
12. Dr. Kumar Niraj Jha, — Formwork for Concrete Structures|| , Mc Graw Hill Publication

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMESTER-I)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 107**

**Duration of Exam: 3hrs**

**Course Title: CONSTRUCTION PERSONNEL  
MANAGEMENT**

**Credits: 03 (L=2, T=3,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

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**PURPOSE**

To Introduce the elements of human behaviour and their impact on construction personnel management.

**OBJECTIVES**

1. To bring about awareness on fundamentals of human behaviour under varying stress conditions.
2. To apply the studied behaviour pattern to manpower planning in organizational setups
3. To study the means of management of construction personnel and utility of training as a tool for improvement.

**Section-A**

**MANPOWER PLANNING**

Manpower Planning, Organizing, Staffing, directing, and controlling – Personnel Principles. Organization -Span of Control -Organization Charts -Staffing Plan - Development and Operation of human resources -Managerial Staffing -Recruitment -Selection –Placement.

**Section-B**

**PERFORMANCE MANAGEMENT**

Introduction to the field of people management -basic Individual psychology motivation-job design and performance management -Managing groups at work – self managing work teams- Intergroup behaviour and conflict in organizations –Leadership- Behavioral aspects of decision-making; and communication for people management

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMESTER-I)  
(Credit Based Evaluation and Grading System)**

Section-C

PERFORMANCE APPRAISAL

Compensation- Wages and Salary, Employee Benefits, employee appraisal and assessment- Employee services -Safety and Health -Discipline and discharge -Special Human resource problems, Performance appraisal-Employee hand book and personnel manual -Job descriptions and organization structure and human relation. Productivity of Human resources.

Section-D

HUMAN RESOURCES TRAINING

Identification of training needs- training calendar- outsourcing for training- in-house training- training to overcome deficiencies- evaluation of training.

REFERENCES

1. Carleton Counter II and Jill Justice Coutler, "The Complete Standard Handbook of Construction Personnel Management", Prentice Hall, Inc., New Jersey, 2009.
2. Memoria .C.B "Personnel Management", Himalaya Publishing Co., 2002.
3. Josy .J, Familiaro, "Handbook of Human Resources Administration", McGraw-Hill International Edition, 2007.
4. Pringle Charles, "Management Longenecker", Emerricle Publishing Company, 2001
5. Dwivedi .R .S, "Human Relations and Organizational Behaviour", Macmillan Indian Ltd, 2005.



**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMSEER-I)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 108**

**Duration of Exam: 3hrs**

**Course Title: QUANTITATIVE TECHNIQUES IN  
CONSTRUCTION MANAGEMENT**

**Credits: 03 (L=2, T=3,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To bring about an exposure to quantitative techniques applied to construction industry

**OBJECTIVES**

1. To review the basics of Optimization principles
2. To study the optimization techniques and simulation of models
3. To apply the concepts studied under 1 and 2 above to inventory, scheduling and other related problems

Section-A

**INTRODUCTION TO OPERATIONS RESEARCH**

Introduction to Operations research-Linear programming-Graphical and Simplex Methods-Duality and Post-Optimality Analysis- Dynamic programming- Capital Budgeting problem, Reliability improvement problem, Shortest path method.

Section-B

**OPTIMIZATION TECHNIQUES**

Integer Programming- Branch and bound techniques-Transportation Problems –Least cost method, North west corner cell method, vogel’s approximation method, U-V method- Work Assignment Problems.

Section-C

**INVENTORY MANAGEMENT**

Application to Production Scheduling-Single machine scheduling, Flow Shop Scheduling, Job shop Scheduling -Inventory control, Economic order quantity (EOQ), Quantity Discounts, Safety Stock.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMSEER-I)  
(Credit Based Evaluation and Grading System)**

Section-D

TIMIZATION THEORY

Replacement Theory - Decision Theory-Decision Rules-Decision making under conditions of certainty, risk and uncertainty - Decision trees-Utility Theory- Bayes theory. Cost concepts- Break-even -Analysis-Pricing techniques- Theory applications

REFERENCES

1. Vohra, N.D. "Quantitative Techniques in Management ", Tata McGraw Hill Co., Ltd, New Delhi, 2000.
2. Seehroeder, R.G., "Operations Management ", McGraw Hill, USA, 2002.
3. Levin, R.I, Rubin, D.S., and Stinsonm J., " Quantitative Approaches to Management" McGraw Hill Book Co., 2008.
4. Frank Harrison, E., "The Managerial Decision Making Process ", Houghton Mifflin Co.Boston, 2005.
5. Varshney, R.L. and Maheswari, K.L., "Managerial Economics ", Sultan Chand, 2005.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-III)**  
**(Credit Based Evaluation and Grading System)**

**Course Code: CTM 151**

**Duration of Exam: 3hrs**

**Course Title: Construction Costing & Finance Management**

**Credits:03 (L=2, T=1,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

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**PURPOSE**

To bring about an exposure to construction economics, financing and accounting methods and their usefulness in controlling construction projects.

**OBJECTIVES**

1. To study the elements of construction economics
2. To study the need for financial management and means of achieving the same
3. To study a few accounting methods
4. To study the elements of lending to the contractors

**Section-A**

**ADVANCES IN CONSTRUCTION MANAGEMENT**

Role of Construction Management in industrial development - Advances in Construction Management and engineering economics - Support matters of economy as related to engineering Market demand and supply- choice of technology and quality control and quality production - Audit in economic, Law of returns governing production.

**Section-B**

**MATERIAL SELECTION**

Construction development in housing, transport and other infrastructures –Economics of ecology, environment, energy resources, local material selection, form and functional designs – Construction workers - Urban problems - Poverty - Migration - Unemployment - Pollution.

**Section-C**

**NEED FOR FINANCIAL MANAGEMENT**

The need for financial management - Types of financing - Short term borrowing -Long term borrowing –Leasing - Equity financing - Internal generation of funds -External commercial borrowings - Assistance from government budgeting support and international finance corporations - analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement - Ratio analysis – Investment and financing decision –Financial control Job control and centralized management.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMESTER-I)  
(Credit Based Evaluation and Grading System)**

Section-D

OVERVIEW OF CASH BASIS ACCOUNTING

General overview - Cash basis of accounting - Accrual basis of accounting -Percentage - Completion method - Completed contract method - Accounting for tax reporting purposes and financial reporting purposes.

REFERENCES

1. Warner Z, Hirsch, "Urban Economics", Macmillan, New York, 2003.
2. Prasanna Chandra, " Project Management ", TMH,2007.
3. Kwaku A, Tenah and jose M.Guevara, " Fundamental of Construction Management and organisation ", Prentice - Hall of India, 2005.
4. Chitkara .K.K, "Construction Project Management", Tata McGraw Hill.2008.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-III)**  
**(Credit Based Evaluation and Grading System)**

**Course Code: CTM 152**

**Duration of Exam: 3hrs**

**Course Title: Maintenance and Rehabilitation of Structures**

**Credits:03 (L=2, T=1,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To study the damages, repair and rehabilitation of structures

**OBJECTIVES**

1. To study about Durability of Different Types of Buildings
2. To know about the Phases of Maintenance
3. To study about the Techniques for Repair and Strengthening Measures

**Section-A**

**DURABILITY**

Durability: Life Expectancy of Different Types of Buildings –Influence of Environmental Elements Such as Heat, Moisture, Precipitation and Frost on Buildings- Design and Construction Errors, Corrosion Mechanism- Effect of Biological Agents like fungus, moss, plants, trees, algae, - Termite Control and Prevention - Chemical Attack on Building Materials and Components- Aspects of Fire and Fire Prevention on Buildings- Impact of Pollution on Buildings.

**Section-B**

**PHASES OF MAINTENANCE**

Maintenance- Definitions, objectives , Phases of Maintenance, Repair and Rehabilitation- Common Defects In Buildings And Measures To Prevent And Control The Same- Building Failures – Causes And Effects- Cracks In Buildings –Preventive Measures Various Aspects- Inspection, Assessment Procedure For Evaluating Damaged Structure -Causes of Deterioration - Testing Techniques- Non Destructive Testing Methods.

**Section-C**

**MATERIALS FOR REPAIR**

Materials-Materials For Repair - Special Mortar And Concretes, Concrete Chemicals, Special Cements And High Grade Concrete – Expansive Cement, Polymer Concrete, Sulphur Infiltrated Concrete, Ferro Cement, Fiber Reinforced Concrete-Admixtures Of Latest Origin.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-III)**  
**(Credit Based Evaluation and Grading System)**

Section-D

TECHNIQUES FOR REPAIR, STRENGTHENING MEASURES

Techniques for Repair- Surface Repair – Material Selection – Surface Preparation - Rust Eliminators And Polymers Coating For Rebars During Repair – Repair Of Cracks In Concrete And Masonry-Methods Of Repair - Epoxy Injection, Mortar Repair For Cracks -Guniting And Shotcreting -Waterproofing Of Concrete Roofs.

Strengthening Measures- Flexural Strengthening, Beam Shear Capacity Strengthening, Column Strengthening, Shoring, Under Pinning And Jacketing Demolition Of Buildings– Introduction – Planning, Precautions And Protective Measures In Demolition Work-Sequence Of Operations- Demolition Of Structural Elements.

REFERENCES

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 2001.
2. Allen .R.T and S. C .Edwards, “Repair of Concrete Structures”, Blakie and Sons, UK, 2007.
3. Santhakumar .A.R, “Concrete Technology”, 2012 Oxford University Press, 2006.
4. Edward D. Mills, “Building Maintenance and Preservation: A Guide for Design and Management”, Butterworth-Heinemann, 2006
5. Raikar, R.N., “Learning from failures - Deficiencies in Design, Construction and Service - R & D Centre (SDCPL)”, Raikar Bhavan, Bombay, 2007.
6. CPWD “Handbook on Repairs and Rehabilitation of RCC Buildings”, 2002
7. Xilin Lu, “Retrofitting Design of Building Structures”, Science Press,2010

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-SEER-II)**  
**(Credit Based Evaluation and Grading System)**

**Course Code: CTM 153**

**Course Title: Materials Management**

**Duration of Exam: 3hrs**

**Credits:03 (L=2, T=1,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To define and describe the effective purchase, utilization and storage of materials

**OBJECTIVES**

1. To Study about the material organizing and purchasing
2. To Study about the material supply and demand
3. To Study about the material storage and causes of wastage of materials

Section-A

**MATERIAL CLASSIFICATION**

Material Classification- Organizing for materials management – basis for forming organizations – conventional and modern approaches to organizing materials management. Materials identification – classifying of materials – codification of materials – standardization – simplification and variety reduction of materials

Section-B

**MATERIAL PURCHASING**

Material Purchasing– Planning Purchasing Materials – Norms Of Vendor Rating – Cei Methodology – Material Selection And Development – Purchasing Procedures And Methods – Legal Aspects – Insurance Of Materials. Supply Management – Sources Of Supply – Out Sourcing Material Management- Procurement Organization - Procurement Planning - Functions Of Material Management - Inventory Control.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-SEER-II)**  
**(Credit Based Evaluation and Grading System)**

Section-C

STORE MANAGEMENT

Storing of Materials-Management of stores – location – different types of stores –methods of storing – safety and security of materials – stores equipment – materials handling equipment – factors affecting materials handling

Section-D

WASTE MANAGEMENT

Scrap & Obsolete Materials-Management of surplus obsolete and scrap materials –reasons for accumulation of surplus obsolete and scrap materials – methods of disposal – regulations and procedures

REFERENCES

1. Datta .A.K, “Materials Management: Procedures, Text and Cases”, PHI Learning Pvt. Ltd., 2004.
2. Arnold, “Introduction To Materials Management”, Pearson Education India,2009
3. Richard J. Tersine, “Principles Of Inventory And Materials ,Management”, Prentice Hall,2004
4. Richard J. Tersine, “Modern Materials Management”, John Hardin Campbell -2007
5. Gopalakrishnan .P, “Handbook of Materials Management”, PHI Learning Pvt. Ltd. 2004



**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-SEER-II)  
(Credit Based Evaluation and Grading System)**

**Course Code: CTM 154**

**Duration of Exam: 3hrs**

**Course Title: Energy conservation Techniques In  
Building Construction**

**Credits:03 (L=2,T=1,U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project:20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To bring an about exposure to different sources and production systems of energy and their effective management adopting appropriate design methodology in construction.

**OBJECTIVES**

1. To study the sources of energy and energy production in relation to heating, ventilating and air conditioning.
2. To study the elements related to quality of energy utilization
3. To study the concepts underlying energy management by adopting appropriate design methodology in providing energy related services.

Section-A

**FUNDAMENTALS OF ENERGY**

Fundamentals of energy-Energy Production Systems -Heating, Ventilating and Air conditioning -Solar Energy and Conservation -Energy Economic Analysis –Energy conservation and audits - Domestic energy consumption –savings- challenges – primary energy use In buildings - Residential, Commercial -Institutional and public Buildings. Natural building design consideration. Energy efficient design strategies –Contextual factor -Longevity and process Assessment -Renewable Energy Sources and design -advanced building Technologies. Smart buildings –Economics and cost analysis

Section-B

**ENERGY AND RESOURCE CONSERVATION**

Energy and resource conservation. Design of green buildings -Evaluation tools for building energy -Embodied and operating energy .Peak demand-Comfort and indoor air quality -Visual and acoustical quality -Land, water and materials –Airborne emissions and waste management.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMSEER-II)**  
**(Credit Based Evaluation and Grading System)**

Section-C

ENERGY IN BUILDING DESIGN

Energy in building design- Energy efficient and environment friendly building –Thermal phenomena.-thermal comfort- Indoor Air quality -Climate, sun and Solar radiation.

Psychometrics -passive heating and cooling systems- Energy Analysis. Active HVAC systems -Preliminary Investigation -Goals and policies -Energy audit -Types of Energy audit -Analysis of results –Energy flow diagram -Energy consumption /Unit Production- identification of wastage - Priority of conservative measures –Maintenance of energy management programme

Section-D

ENERGY MANAGEMENT

Energy management of electrical equipment- Improvement of power factor -Management of maximum demand -Energy savings in pumps -Fans.-compressed air systems -Energy savings In Lighting systems- Air conditioning systems- Applications- .Facility operation and maintenance- Facility modifications- Energy recovery dehumidifier- Waste heat recovery. Steam plants and distribution systems-Improvement of boiler efficiencies-Frequency of blow down -Steam leakage-steam Flash and condensation

REFERENCE BOOKS

1. Moore F., “Environmental Control system”, Mc Graw Hill, Inc. 2004
2. Brown, GZ Sun, “Wind and Light: Architectural design strategies”, John Wiley2005.
3. Cook. J Award –“Winning passive Solar Design”, Mc-Graw Hill- 2004.
4. Waters J.R, “Energy Conversation in Building: A Guide to part of the building regulations”, Black well publishing, 2003.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-SEER-II)**  
**(Credit Based Evaluation and Grading System)**

**Course Code: CTM 155**

**Course Title: Project Formulation and Appraisal**

**Duration of Exam: 3hrs**

**Credits: 03 (L=2, T=1, U=0)**

**Minor Test: 20%**

**Assignment/Seminar/Case Study/Minor Project: 20%**

**Quiz/Group Discussion: 10%**

**End Semester Examination: 50%**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**PURPOSE**

To introduce and study formulation, costing, appraisal and finance of construction projects

**OBJECTIVES**

1. To study elements of project formulation and appraisal
2. To study the costing and financial aspects of projects
3. To study the implications of private sector participation in construction projects

Section-A

**PROJECT INITIATION**

Project Initiation: Capital investments- Capital budgeting – feasibility study – preliminary analysis – market, technical, financial, economic and ecological – Market and Demand analysis- Detailed technical analysis

Section-B

**TIME VALUE OF MONEY**

Time Value of Money –time lines and notations, Future value of single amount, Present value of single amount, Future value of an annuity, Present value of an annuity-Simple interest-Compound interest - project cash Flows-principles of cash flow estimation.

Section-C

**COSTING**

Costing: Investment Criteria- Discounting criteria-Net present value (NPV), Benefit cost ratio(BCR), internal rate of return(IRR)- Non-Discounting criteria - Pay Back Period, Accounting rate of return(ARR), Urgency - Investment analysis in practice.

Financial aspects: Financing of projects – means of finance – Equity and Debt -financial institutions – cost of Capital- Risk Analysis, Sources and Measures of risk Methods of risk analysis-Analysis of standalone risk, Analysis of contextual risk -special schemes

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEM-SEER-II)**  
**(Credit Based Evaluation and Grading System)**

Section-D

DIFFERENT INFRASTRUCTURE PROJECTS

Private sector participation in Infrastructure Development Projects –Build operate own transfer(BOOT), Build operate transfer(BOT) , Build operate lease transfer (BOLT), Design Build operate transfer (DBOT) - Technology Transfer and Foreign Collaboration-Case Study.

REFERENCES

1. Prasanna Chandra, “Projects -Planning Analysis Selection Implementation &Review”, Fourth Edition,. Tata McGraw Hill Publishing Company Ltd., New Delhi.2005.
2. Joy P.K. “Total Project Management - The Indian Context (Chapters 3 7)”, New Delhi, Macmillan India Ltd., 2002.
3. “United Nations Industrial Development Organization (UNIDO) Manual for the preparation of Industrial Feasibility Studies”, (IDSI Reproduction) Bombay, 2007.
4. Barcus. S.W and Wilkinson.J.V. “Hand Book of Management Consulting Services”, McGraw Hill, New York, 2006.

**M.TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT (SEMSEER-II)**  
**(Credit Based Evaluation and Grading System)**

**INDUSTRIAL TRAINING (4 week practical training in Industry)**  
**(Training to be undergone after II semester)**

Prerequisite

**PURPOSE**

To provide practical exposure in Civil Engineering related organizations.

**OBJECTIVES**

1. Students have to undergo four – week practical training in Construction Technology and Management related organizations so that they become aware of the practical applications of theoretical concepts studied in the class rooms.

Students have to undergo four-week practical training in Civil Engineering related organizations of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

**ASSESSMENT PROCESS**

This course is mandatory and a student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.