

***Faculty of Engineering & Technology***  
***P.K.University***  
***Shivpuri (MP)***



**Evaluation Scheme & Syllabus for**  
**Department of Civil Engineering**  
**M. Tech in CTM**  
***(CONSTRUCTION TECHNOLOGY & MANAGEMENT)***  
**(I to IV Semester)**  
(Effective from session 2019-20)

# EVALUATION SCHEME

## **M.TECH- CONSTRUCTION TECHNOLOGY & MANAGEMENT**

### **Semester-I**

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS. (30)	EXT. (70)	SESS. (25)	EXT. (25)	
MVCT-101	Advanced Mathematics	30	70	NA	NA	100
MVCT -102	Construction Material	30	70	NA	NA	100
MVCT -103	Ad. Geotechnical Engg.	30	70	NA	NA	100
MVCT -104	Construction Technology	30	70	NA	NA	100
MVCT -105	Low cost Build materials & cont. Technology	30	70	NA	NA	100
MVCT -106	Computer Workshop Lab-I	NA	NA	25	25	50
MVCT -107	Ad. Construction –I Lab-II	NA	NA	25	25	50

### **Semester-II**

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS. (30)	EXT. (70)	SESS. (25)	EXT. (25)	
MVCT -201	Construction Management	30	70	NA	NA	100
MVCT -202	Prefabrication design & its construction Technique	30	70	NA	NA	100
MVCT- 203	Construction Equipment and Material Management	30	70	NA	NA	100
MVCT- 204	Financial Management in Construction Industries	30	70	NA	NA	100
MVCT- 205	Appropriate Technology and Energy Conservation	30	70	NA	NA	100
MVCT- 206	Lab-III	NA	NA	25	25	50
MVCT- 207	Seminar-I	NA	NA	25	25	50

### **Semester-III**

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS. (30)	EXT. (70)	SESS. (25)	EXT. (25)	
MVCT -301	Dissertation phase-I	NA	NA	300	300	600
MVCT -302	Seminar-II	NA	NA	25	25	50

### **Semester-IV**

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT. (70)	SESS. (25)	EXT. (25)	
MVCT -401	Dissertation phase-II	NA	NA	300	300	600

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***I Year I Semester***  
**MVCT 101- ADVANCE MATHEMATICS**

**Theory:**

**Unit-1**

Introduction of operation-research, Mathematical Programming Techniques Linear programming (formulation, Graphical solution). Simplex method, BIG-M method. Duality theory in linear programming, Transportation & Assignment Problem.

**Unit-2**

Network Methods: CPM, PERT, Dynamic Programming, Bellman's Principle of optimality, Non linear Programming. Fibonacci method.

**Unit-3**

Game theory, Queuing system, Genetic algorithm, ANN methods, Evolutionary algorithms.

**Unit-4**

Probability concepts , Additive and Multiplicative laws of Probability , Boye's theorem, statistical frequency distribution, Binomial, Poisson, Normal Distribution, confidence intervals, Tests of Significance for small & large samples. Testing of Hypothesis, Linear and Non linear regression.

**Unit-5**

Reliability Engineering: Basic concepts of Reliability, Design for Reliability constraints and consideration Reliability and Mathematics, Components Reliability and Hazard models, System Reliability models.

**Books & References Recommended:**

1. Operation Research by Phillips & Ravindran
2. Operation Research by TAHA
3. Probability, Statistics & Decision in Civil Engineering by Benjamin & Cornell
4. optimization by S.S. Rao

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***I Year I Semester***  
**MVCT 102 - CONSTRUCTION MATERIALS**

**1. Material Science :**

Classification, Standardisation, Codification and Variety. Details of Micro Structure of Different construction Materials, Different effects on materials of construction.

**2. Properties of Materials :**

Environmental Influences : Thermal effects : Effect of Chemicals, Fire resistance, Corrosion and Oxidation, Radiation. Properties of fresh & hardened concrete. Shrinkage & creep of concrete.

**3. Concrete :**

Design and production of concrete ingredients, Additives and admixtures. Special concretes e.g. light weight, Heavy weight, Ready mix concrete, Fibre Reinforced concrete etc.

**4. New Construction Materials :**

Polymer materials, Thermo - Plastic, Polymer Concrete, Composite materials, Ferrocement, Ferroconcrete, Building materials from Agricultural & Industrial wastes.

**5. Quality control in construction :**

Various aspects, Principle of statistical quality control. Different techniques of materials and process Quality control, Destructive and non destructive Testing of Materials, I.S. and international procedures of testing.

**References Books :**

1. Ammer, D.A. Material Management Irwin Publishers Illionis, 1972.
2. White A.H. Engineering materials, MC Graw - Hill.
3. Deb. A., Engineerig materials, world press.
4. Billmeyer Jr. F.W. Text Book of Polymer Science, Interscience Publishers Inc.
5. Golding Brage Polymers and Resins Nortrand.
6. Schmidt A.X. & Marties CA "Principle of High Polymer Theory & Practice" MC Graw – Hill.
7. Stille, J.K. "Introduction to Polymer Chemistry" Johwiley.
8. Winding C.C. & Hiatt G.D. "Polymetric".

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***I Year I Semester***  
**MVCT 103 - ADVANCED GEOTECHNICAL ENGINEERING**

**1. Site Investigations & Stress Distribution in soils :**

Brief review of various methods of subsurface explorations, soil sampling, subsurface soundings, Geophysical explorations. Stress distribution beneath loaded areas by Boussinesq Westergaard's and Steinbrenner methods. Newmark's influence chart. Contact pressure distribution. Settlement analysis.

**2. Well Foundations & Cofferdams :**

Types of caissons, Wells, and their design criteria. IS and IRC codes and their provisions. Tilt and Shift in wells and their rectifications. Types, Design data for cellular dams, stability analysis. interlock Stresses, Methods of design of cellular coffer dams.

**3. Machine Foundations :**

Theory of Vibrations. Single and double degree of freedom system. Damped and undamped vibrations. Types of machine foundations, mass spring model of analysis. Apparent mass of soil. Design of block foundations for impact type of machinery. Indian standard on Design and Construction of Foundations for Reciprocating machines.

**4. Foundations on Expansive Soils :**

Characteristics and treatment of expansive soils. Construction techniques in expansive soils. Use of under-reamed piles and their design criteria, CNS Layer techniques. Construction on collapsible soil.

**5. Rock Mechanics :**

Problems in Rock mechanics, Classification of rocks, physical, geological and Mechanical properties of rocks, mechanics of rock, deformation and fracture under load. The range and scope of Rock mechanics in relation to civil engineering projects.

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***I Year I Semester***  
**MVCT 104 - CONSTRUCTION TECHNOLOGY**

**1. Advanced Pavement Construction Techniques :**

Pavement Construction using Bitumen, Hot mix plant, Concrete Road Construction, Fibre Reinforced Pavement Construction, Low Cost Road Construction Techniques.

**2. Form Work and Temporary Structures :**

Design and construction features of different types of Temporary Structures. Stationary and slip form work Techniques, Special features of insitu construction. Stripping and Removal of form works, Form works for special structures e.g. shells, bridges, towers etc.

**3. Steel Construction :**

Shop and insitu construction techniques, different connections. High strength bolts, Clearances and Tolerances, Erection of steel structures like Bridges, Trusses Chimneys, Power Houses.

**4. Prestressing :**

Plants, Equipment for Prestressed Construction, Different Techniques of Prestressing. Prestressing of Bridge girders, water tanks and special structures.

**5. Construction Techniques of Heavy and Special Structures :**

Dams, Bridges, large spanroofs, high rise Buildings, off shore Platforms, Pipelines, Tunnels and other underground structures, Safety measures in Construction.

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***I Year I Semester***

**MVCT 105 - LOW COST BUILDING MATERIALS AND CONSTRUCTION  
TECHNIQUES**

**1. Concepts of low cost materials**

Soil, Fly ash, ferrocement, Lime, Fibers, Stone Dust, Boulders and oversize metal, Bitumen etc.

**2. Low cost building material products:-**

(a) **Walls** - Stabilized and sun dried, soil blocks & bricks, Hollow concrete blocks, stone masonry blocks, Ferro-cement partitions.

(b) **Roofs** - Precast R.C. Plank & Joists roof, Precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof.

**3. Low cost construction Techniques and Equipment :-**

(a) **Techniques** :- Rat trap bond construction, Precast R.C. and Ferro cement technique, Mud Technology.

(b) **Equipments** :- Brick moulding machine, Stabilised soil block making machine and plants for the manufacturing of concrete blocks.

(c) **Low Cost Roads**

**4. Low cost sanitation :-**

(a) Waste water disposal system

(b) Low cost sanitation for rural and urban areas

(c) Ferrocement Drains

**5. Cost analysis and comparison:-**

(a) Low cost materials

(b) Low cost techniques

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***I Year II Semester  
MVCT 201 – Construction Management***

**1. Contract Management - I :**

Types of Construction contract, Lump sum, Unit rate, cost plus-fee, Cost Plus percentage-fee, Incentive Contracts, Nature of Contract, Contract Documents and Contracting procedures, contract revisions, Negotiated contracts, contract claims.

**2. Contract Management - II :**

Technical Specifications, Drawings, Tender Bond, Labour and Material Payment Bonds, Scrutiny of Tenders, acceptance, letter of indent. Important Contract clauses, Terms of Payment, retention acceptance and final payment, maintenance period, Time for Completion, Extension of time, Variation in work and conditions, claims and disputes, liquidated damages, Termination rights and responsibility of client, Architect, Engineer, Contractor, Professional liability. Disputes in contracts, Sub-contracts. Purchase orders as contracts. Insurance Contract and Claims. Arbitration, Accounts.

**3. Tender Management :**

Advance Techniques of Estimating. Principles of Analysis of rates and Specification, writing for different types of construction industries, capital structure, Theories.

**4. Legal Frame Work of Construction :**

Constitutional provisions relating to Business and industry, Master Plans, Indian Contract Act. Arbitration act.

**5. Labour Laws and Legislation :**

Contract labour (RRA) ACT 1970, laws relating to wages, bonus & industrial disputes.



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**MVCT 202 – Prefabrication design & its construction technique**

**1. Prefabricated Construction :**

Prefabricated construction, necessity, Advantages, disadvantages, Mass produced steel, reinforced concrete and masonry systems, Industrialized buildings.

**2. Modular Construction :**

Modular coordination, basic module, planning and design modules, Modular grid systems, National Building Code Specification, Standardization, Dimensioning of products, Preferred dimensions and sizes, tolerances and deviations layout and processes.

**3. Prefabricates :**

Classification, foundation, columns, beams, roof and floor panels, wall panels, clay units, box prefabricates, erection and assembly.

**4. Design of prefabricated Elements :**

Lift points, beams, slabs, columns, wall panels, footings, design of joints to transfer axial forces, moments and shear forces.

**5. Construction Techniques :**

Large panel construction, Lift slab system, Glover system, contains' jack-block system, Constrain V-Plate system, Bis on system, Silber-Kuhi System, control of construction processes. equipment's, horizontal and vertical transportation.

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**MVCT 203 – Construction Equipment and Material Management**

**1. Planning and Selection of Construction Equipment :**

Advantage of mechanization of Construction industry. Merits of Labour intensive construction. Planning for construction equipments. Analytical studies, equipment operation. Selection of construction machinery & equipments.

**2. Production Estimates, Sizing and Matching :**

Cycle time capacity ratings and output of Excavators, Power shovels, drag lines, scrapper, bulldozers, tractor shovels rippers, motor graders etc. Sizing and matching. Capacity ratings and output of compactors, aggregate processing plant concrete production plants etc.

**3. Economics of Construction Equipment :**

Equipment working rates, Investment cost, Depreciation cost, major repair cost. Cost of fuel and lubricants. Cost of labour, servicing and field repairs, overheads. Recommendations of statutory bodies.

**4. System Approach :**

Problems of equipment management. Application of CPM in equipment management. Application of the assignement model, transportation model and waiting line models in equipment management.

**5. Material Management :**

Materials planning and budgeting. Role and functions at different levels of management and budgeting variations. Stages of materials management. A.B.C. analysis. Advantages, mechanics purpose cautions, limitations and tabular analysis. Purchasing parameters and inter relationships. Time source quantity, price, quality, grading systems. Special purchasing systems. Obsolesence. Scrap disposal.

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**MVCT 204 – Financial Management in Construction Industries**

**1. Personnel Management :**

Principle of personnel management. Qualities of a personnel manager. Objective of personnel management. Personnel policies and procedures and programmes. Organizational structure of personnel department. Man power resources. Human resource planning. Job analysis. Performance standards, work rules. Recruitment and selection process. Tests and interview Induction orientation and indoctrination. Policies, promotion, demotion, transfers etc. Training of personnel. Need for training. Principles of training programmes. Types of training programmes on the job training policy and implementation. Task analysis identification and methodologies. Evaluation of training and post training follow up. Performance appraisal-rating scales, rankings etc. Management development programmes. Wage and salary management. Principles of wages and salary administration. Factors influencing wages. Types of wages and salary structure. Theory of wages. Minimum fair and living wages. Types of wages. Wage incentives. Types of incentive schemes. Profit sharing features-Fringe benefits general scope. Different types of fringe benefits and awards.

**2. Labour Management :**

Industrial relations in construction industry. Principles of industrial relationships. Functional requirements and programme, Industrial disputes, causes of disputes. Types Of disputes. Procedures of the settlement of industrial disputes. Implementation mechanism. Trade Unions - Principles of industrial trade unionism. Objectives and functions. Essentials of trade union. Objectives, forms levels and growth of worker's participation in management. Collective bargaining. Principles and main features of collective bargaining. Different industrial Regulations and labour laws and acts – Industrial Health and Safety. Occupational hazards. Provisions under factory act. Accident and safety at construction sites. nature and causes of accident. Safety Programmes and their principles. Factors effecting accidents etc.

**3. Waste Management :**

Introduction to waste and waste management, the concept of productivity and its inter relationship with productivity. Systems concept of waste. Complementarity of waste and resource management. Identification of construction waste material waste, man power waste, energy waste, space waste time waste, equipment waste, capital waste, utilities and services waste. Data and information waste. Design of waste reduction in construction. Reduction, Collection, recycling treatment and disposal of waste in construction systems. Modelling of resources and waste flow in construction systems waste management and cost reduction. Roles of legislation and government.

#### **4. Financial Management :**

*Managerial Economics & Financial Statement*, Nature and scope of managerial economics. Economic theories. Demand analysis and forecasting . Elasticities of demand. Cost and production analysis. Pricing decisions, Policies and practices. Break even analysis. Time value of money, Economics. Comparisons using time value of money basic of comparisons. Decision making amongst alternatives. Cash flow, discounted cash flow. Cash flow forecasting, Project appraisal through financial statements. Statement analysis. Financial ratio analysis, Trend analysis yield. Taxation and inflation, Sinking fund provisions. Risks and uncertainties. Project risk and firm risk. Replacement analysis. Finances & working capital. Capital budgeting & Performance budgeting. Benefit-cost ratio. Project selection, Control and evaluation, Pre-project and post project evaluation.

#### **5. Capital Generation & Financial Accounting**

Banking : Financial Institutes like IFCI, IBI, International financing etc. Book keeping process in construction. The accybtacy cycle. Journals, ledgers etc. for labour cost, materials and purchases miscellaneous ledgers and accounting procedures, types of financial statements in Govt.

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**MVCT 205 – APPROPRIATE TECHNOLOGY AND ENERGY CONSERVATION**

**1. Appropriate technology** - concept and its role in the present circumstances.

**2. Rural Housing & Rural Environmental Technologies** - Planning, use of locally available materials, construction techniques. Concept and scope in rural areas planning of water supply schemes in rural areas, development of preferred sources of water, springs, wells, infiltration wells infiltration galleries, collection of rain water, specific problems and method's in rural water supply and treatment. Treatment and disposal of waste water, community and sanitary latrines. Compact and simple waste water disposal systems, biogas plants.

**3. Rural roads** - Planning of rural roads, Socio-economic aspects, materials for rural roads, design aspects, drainage problems, and maintenance of rural roads.

**4. Energy Conservation :-** Energy production, distribution and utilization, a review of global situation. Energy Trends, renewable and non renewable sources, research reviews. Building designs and energy factors affecting energy budget in buildings and settlements, Design of buildings for minimizing energy.

**Solar, Wind and Tidal energies, a review and their adoptability.**

**5. Low energy materials, construction techniques and environmental control.**

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***I Year II Semester  
MVCT -206 Lab-III***

**LIST OF EXPERIMENTS**

1. Mix design of concrete of different grades & using admixtures.
2. Tensile and Flexural strength of concrete of different grades.
3. Tensile strength of different types of steel rebars, rolled steel sections.
4. Testing of simply supported RCC beams for flexural failure.
5. Testing of simply supported RCC beams for shear failure.
6. Testing of RCC column.
7. Non-destructive testing of concrete including rebound hammer and ultrasonic pulse method.
8. Permeability of concrete.
9. Vibration analysis of beams and plates.
10. Buckling load of struts.