BHARTI UNIVERSITYDURG (C.G.)

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SCHEME OF EXAMINATION

& SYLLABUS

OF

M.TECH

IN

STRUCTURAL ENGINEERING

UNDER

FACULTY OF CIVIL ENGINEERING

Session 2021-22 (Approved by Board of Studies)

Effective from NOV. 2021

BHARTI UNIVERSITY, DURG

Scheme of Teaching & Examination M.TECH.(Civil)

with Specialization in Structural Engg.

I SEMESTER

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks
				L	T	P	ESE	CT	TA	
1	Civil Engg.	**MT04111**	Advanced Concrete Technologyand Admixtures	3	1	-	70	10	20	100
2	Civil Engg.	**MT04112**	Matrix Methods of Structural Analysis	3	1	-	70	10	20	100
3	Civil Engg.	**MT04113**	Instrumentation and Experimental Techniques	3	1	-	70	10	20	100
4	Civil Engg.	**MT04114**	Advanced Construction Management	3	1	-	70	10	20	100
5	Refer Table –I		Elective I	3	1	-	70	10	20	100
6	Civil Engg.	**MT04116**	Advanced Concrete Technologyand Admixtures Lab	-	-	10	70		30	100
7	Civil Engg.	**MT04117**	Matrix Methods of Structural Analysis Lab	-	-	10	70		30	100
Total				**15**	**5**	**20**	**490**	**50**	**160**	**700**

L- Lecture   T- Tutorial   P- Practical ,

ESE- End Semester Exam   CT- Class Test   TA- Teacher's Assessment

Table-I

S.No.	Board of Study	SubjectCode	Subject
1	Civil Engg.	**MT04115(1)**	Limit State Design of Steel Structures
2	Civil Engg.	**MT04115(2)**	Advanced Design of Steel Structures
3	Civil Engg.	**MT04115(3)**	Theory of Elastic Stability
4	Civil Engg.	**MT04115(4)**	Applied Fuzzy Logic and Fuzzy sets

Note (1) – $1/4^{th}$ of total strength of students subject to minimum of twenty students is requiredto offer an elective in thecollege in a Particular academic session .

Note (2) – Choice of elective course once made for an examination cannot be changed in futureexaminations.

Semester: MTECH- I **Branch: Civil Engineering**

Subject: Advanced Concrete Technology and Admixtures **Code: MT04111**

Total Theory Periods: 40 **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: MATERIALS AND PROPERTIES

IS specifications for materials and testing of concrete making materials, Properties, Grading, Methods of combining aggregates, Properties of fresh and hardened concrete, Variability of concrete strength, Elasticity, creep and shrinkage of concrete, Durability and factors affecting durability, behavior of concrete under aggressive environmental conditions including temperature.

UNIT II: ADMIXTURES

Different types of admixtures for improving properties of concrete such as strength, workability, durability etc. Suitability in different conditions.

UNIT III: CONCRETE MIX PROPORTIONING

Principles of concrete mix proportioning, Methods of concrete mix proportioning (with and without admixtures), Trial mixes, Testing of concrete mixes.

UNIT IV: SPECIAL CONCRETE

Light weight concrete, Fly ash concrete, Fibre reinforced concrete, Polymer Concrete, High performance concrete, Self compacting concrete, Concrete containing Silica Fumes, Concrete containing GGBS, Nofines concrete.

UNIT V: CONCRETING METHODS

Process of manufacturing of concrete, Methods of transportation, placing and curing - Extreme weather concreting, special concreting methods, Vacuum dewatering - underwater concrete, special from work.

Text Books:

1. Neville A.M., Properties of Concrete, Pearson Education.
2. Shetty M.S., Concrete Technology, S.Chand and Company Ltd., Delhi

Reference Books:

1. Ramachandran V.S., Concrete Admixtures Handbook, Standard Publishers Distributors, Delhi.

2. Proceedings of recent seminars / workshops / conferences and Papers from relevant NationalandInternational Journals.

Semester- MTECH- I   **Branch: Civil Engineering**

Subject: Matrix Methods of Structural Analysis   **Code: MT04112**

Total Theory Periods: 40   **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: INTRODUCTION

Review of force and displacement methods of structural analysis, Degree of Static Indeterminacy, Degree of Kinematic Indeterminacy, Basic Concepts of Matrix methods in structural analysis, Determinants and Matrices.

UNIT II: FLEXIBILITY METHOD FOR BEAMS

Flexibility coefficients, development of flexibility matrix, Analysis of continuous beams by flexibilitymethod.

UNIT III: FLEXIBILITY METHOD FOR FRAMES

Analysis of rigid jointed plane frame and pin jointed plane frame by flexibility method.

UNIT IV: STIFFNESS METHOD FOR BEAMS

Stiffness coefficient, development of stiffness matrix, relationship between flexibility matrix and stiffness matrix, Analysis of continuous beams by stiffness method.

UNIT V: STIFFNESS METHOD FOR FRAMES

Analysis of rigid jointed plane frame and pin jointed plane frame by stiffness method.

Text Books:

1. Pandit G.S. and Gupta S.P., Structural Analysis – A Matrix Approach, Tata McGraw-HillPublishingCompany Limited, New Delhi
2. Weaver W. and Gere J. M., Matrix Analysis of Framed Structures, CBS Publishers andDistributors,Delhi

Reference Books:

1. Krishanmurthy C.S., Finite Element Analysis – Theory and Programming, Tata McGraw- HillPublishingCompany Limited, New Delhi.
2. Proceedings of recent seminars / workshops / conferences and Papers from relevant NationalandInternational Journals.

Semester: MTECH- I   **Branch: Civil Engineering**

Subject: Instrumentation and Experimental Techniques Code: MT04113

Total Theory Periods: 40   **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: MEASUREMENT

Basic Concept in Measurements, Measurement of displacement, strain pressure, force, torque etc, Typesof strain gauges (Mechanical, Electrical resistance, Acoustical etc.)

UNIT II: STRAIN GAUGES

Strain gauge circuits, The potentiometer and Wheatstone bridge, use of lead wires switches etc. Use of strain gauges in structural applications.

UNIT III: DATA PROCESSING

Indicating and recording devices, Static and dynamic data recording, Data (Digital and Analogue) acquisition and processing systems. Strain analysis methods, Rosette analysis. Static and dynamic testing techniques. Equipment for loading-Moire's techniques.

UNIT IV: NON DESTRUCTIVE TECHNIQUES

Non destructive testing techniques. Photoelasticity, optics of photoelasticity, Polariscope, Isoclinics andIsochromatics, methods of stress separation.

UNIT V: MODEL ANALYSIS

Laws of similitude, model materials, model testing, testing large scale structures, holographic techniques

Text Books :

1. Dally J W and Riley W.F, Experimental stress Analysis, McGraw-Hill Inc. New York, 1991.
2. Srinath L S et al, Experimental Stress Analysis, Tata McGraw-Hill Publishing Co., Ltd., NewDelhi, 1984.

Reference Books :

1. Rangan C S et al., Instrumentation – Devices and Systems, Tata McGraw-Hill Publishing Co.,Ltd., New Delhi, 1983.
2. Sadhu Singh, Experimental Stress Analysis, Khanna Publishers, New Delhi, 1996.

Semester: MTECH- I   **Branch: Civil Engineering**

Subject: Advanced Construction Management   **Code: MT04114**

Total Theory Periods: 40   **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: ORGANIZING FOR PROJECT MANAGEMENT

Project Management, Trends in Modern Management, Strategic Planning and Project Programming, Effectsof Project Risks on Organization, Organization of Project Participants, Traditional Designer, Constructor Sequence, Professional Construction Management, Owner-Builder Operation, Turnkey Operation, Leadership and Motivation for the Project Team, Interpersonal Behavior in Project Organizations, Perceptions of Owners and Contractors.

UNIT II: DESIGN AND CONSTRUCTION PROCESS

Design and Construction as an Integrated System, Innovation and Technological Feasibility, Innovation and Economic Feasibility, Design Methodology, Functional Design, Physical Structures, Geo-technical Engineering Investigation, Construction Site Environment, Value Engineering, Construction Planning, Industrialized Construction and Pre-fabrication.

UNIT III: LABOR, MATERIAL AND EQUIPMENT UTILIZATION

Labor Productivity, Factors Affecting Job, Site Productivity, Labor Relations in Construction, Problems in Collective Bargaining, Materials Management, Material Procurement and Delivery, Inventory Control, Tradeoffs of Costs in Materials Management, Construction Equipment, Choice of Equipment and Standard Production Rates, Construction Processes Queues and Resource Bottlenecks.

UNIT IV: COST ESTIMATION

Costs Associated with Constructed Facilities, Approaches to Cost Estimation, Type of Construction Cost Estimates, Effects of Scale on Construction Cost, Unit Cost Method of Estimation, Methods for Allocation of Joint Costs, Historical Cost Data, Cost Indices, Applications of Cost Indices to Estimating, Estimate Based on Engineer's List of Quantities, Allocation of Construction Costs Over Time, Estimationof Operating Costs.

UNIT V: SAFETY IN CONSTRUCTION

Causes, classification, cost and measurement of an accident, safety programme for construction, protective equipment, accident report, safety measures for storage and handling of building materials, Construction of elements of a building, demolition of buildings. Safety lacuna in Indian scenario.

Text Books :

1. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, TataMcGraw-HillPublishing Company, New Delhi, 1998.
2. Choudhury, S, Project Management, Tata McGraw-Hill Publishing Company, New Delhi, 1988.

Reference Books :

1. Harold Kerzner, Project Management – A Systems Approach to Planning, Scheduling and Controlling,CBS Publishers & Distributors, Delhi, 1988.
2. Joy, P.K., Total Project Management – The Indian Context, Macmillan India Ltd., New Delhi, 1992.

Semester: MTECH- I   **Branch: Civil Engineering**

Subject: Limit State Design of Steel Structures   **Code: MT04115(1)**

Total Theory Periods: 40   **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: MATERIALS AND METHODS OF ANALYSIS

Properties of Structural Steel, I. S. Specification for Rolled Sections, Elastic Analysis, Plastic Analysis for steel beams and frames - plastic hinges, Collapse mechanism, plastic modulus, shape factor.

Introduction to working stress method and Limit state method of design of steel structures, Classificationof rolled sections, types of loads and load combinations.

UNIT II: FASTENERS AND TENSION MEMBERS

Riveted, Bolted and Welded Connections, Strength, Efficiency and Design of Joints, Advantages and Disadvantages of Welded Joints, Design of Fillet and Butt Welds, Design of Eccentric Connections, Highstrength friction grip bolts.

Net Sectional Area of Tension Members, Design of Axially Loaded Tension Member, Steel Angles undertension

UNIT III: COMPRESSION MEMBERS

Modes of Failure of a Column, Buckling Failure: Euler's Theory, Effective Length, Slenderness Ratio,

I.S. Code approach for design of Compression Members, Design of Built-Up Compression Members.

UNIT IV: BEAMS

Design Procedure, laterally supported and laterally unsupported beams, Web Crippling, WebBuckling, Design of Built-Up Beams, Curtailment of Flange Plates

UNIT V: BEAM COLUMNS AND CLOUMN BASES

Design of Member Subjected to combined forces, Eccentricity of Load, Interaction Formulae. Slab and Gusseted Bases, Eccentrically Loaded Base Plates.

Text Books:

1. Teaching Resource for Structural Steel Design, Volumes I – III, Institute for Steel Developmentand Growth, Kolkata.

2. Various Indian Standard codes of practice on steel structures.

Reference Books:

1. Davidson B. and Owens, G.W., Steel Designers' Manual, Blackwell Publishing, UK

2. Proceedings of recent seminars / workshops / conferences and Papers from relevant NationalandInternational Journals.

Semester: MTECH- I **Branch: Civil Engineering**

Subject: Advanced Design of Steel Structures **Code: MT04115(2)**

Total Theory Periods:40 **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: PLATE AND GANTRY GIRDERS

Design of Plate Girders, Vertical and Horizontal Stiffeners for plate girders, Connections and Splices. Forces acting on gantry girders, Cross sections for Gantry Girders, Design Considerations.

UNIT II: INDUSTRIAL BUILDINGS

Single storey Industrial buildings and bents, Design of Trusses, Purlins, Louver rails, Gable column etc.,Analysis of Gable Frames, check for deflection.

UNIT III: HIGH RISE BUILDINGS

Design of members subjected to lateral loads and axial loads, Sway and non-sway frames, Permissiblesway.

UNIT IV: CONNECTIONS

Types of connections, Design of framed and seated beam connections, Unstiffened and Stiffened seat connections, Continuous beam-to-beam connections and continuous beam-to-column connection, moment resisting connections, welded and bolted connections.

UNIT V: LIGHT GAUGE STEEL STRUCTURES

Types of cross sections, local bucking and lateral bucking, concepts of Effective width, Design of compression and tension members, Beams, Deflection of beams and design of beam webs. Combined stresses and connections.

Text Books:

1. Teaching Resource for Structural Steel Design, Volumes I – III, Institute for Steel DevelopmentandGrowth, Kolkata.

2. Various Indian Standard codes of practice on steel structures.

Reference Books:

1. Davidson B. and Owens, G.W., Steel Designers' Manual, Blackwell Publishing, UK

2. Proceedings of recent seminars / workshops / conferences and Papers from relevant NationalandInternational Journals.

Semester: MTECH- I   Branch: Civil Engineering

Subject: Theory of Elastic Stability   Code: MT04115(3)

Total Theory Periods: 40   Total Tutorial Periods: 12

Total Marks in End Semester Exam:70

Minimum number of class tests to be conducted: 02

UNIT I: STABILITY OF COLUMNS

Concepts of Elastic Structural stability, Analytical approaches to stability, characteristics of stability analysis,Elastic Buckling of columns, Equilibrium, Energy and Imperfection approaches, Non-prismatic columns, Built up columns, orthogonality of buckling modes, Effect of shear on buckling load, Large deflection theory.

UNIT II: METHODS OF ANALYSIS

Approximate methods, Rayleigh and Galerkin methods, numerical methods, Finite difference and finiteElement, analysis of columns, Experimental study of column behaviour, South well plot, Column curves,Derivation of Column design formula, Effective length of Columns.

UNIT III: BEAM COLUMNS AND FRAMES

Beam column behaviour, standard cases, Continuous columns and beam columns, Column on elastic foundation, Buckling of frames, Single storey portal frames with and without side sway, Classical and stiffness methods, Approximate evaluation of critical loads in multistoried frames

UNIT IV: BUCKLING OF BEAMS

Lateral buckling of beams, Energy method, Application to Symmetric and simply symmetric I beams, simply supported and Cantilever beams, Narrow rectangular cross sections, Numerical solutions, Torsional buckling, Uniform and non-uniform Torsion on open cross section, Flexural torsional buckling,Equilibrium and energy approach.

UNIT V: BUCKLING OF THIN PLATES

Isotropic rectangular plates, Governing Differential equations, Simply Supported on all edges, Use of Energy methods, Plates with stiffeners, Numerical Techniques.

TEXT BOOKS:

1. Ashwini kumar, "Stability of Structures", Allied Publishers Ltd.
2. Stephen P. Timoshenko and Gere "Theory of Elastic stability", McGraw-Hill Company.

REFERENCES BOOKS:

1. Smitses, Elastic Stability of Structures, Prentice Hall.
2. NGR Iyengar, "Structural Stability of Columns and Plates" Affiliated East- West Press Pvt. Ltd

Semester: MTECH- I   **Branch: Civil Engineering**

Subject: Applied Fuzzy Logic and Fuzzy Sets   **Code: MT04115(4)**

Total Theory Periods: 40   **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: CLASSIFICATION OF SETS AND FUZZY SETS

Basic concepts of classical set and Fuzzy set, Basic operations and properties of classical and Fuzzy sets,Basic concepts of classical relation & Fuzzy relation.

UNIT II: MEMBERSHIP FUNCTION AND FUZZY ARITHMETIC

Features of the Membership Function, Standard Forms land Boundaries, Fuzzification, Membership value Assignments, Extension Principle, Fuzzy Transform, Fuzzy Numbers, Approximate Methods of Extension, Fuzzy Vectors.

UNIT III: CLASSICAL LOGIC, FUZZY LOGIC & FUZZY RULE BASED SYSTEMS

Classical Predicate logic, Fuzzy Logic, Approximate Reasoning, Fuzzy Tautologies, Contradictions, Equivalence & Logical Proofs, Natural Language, Linguistic Hedges, Rule-based Systems.

UNIT IV: FUZZY NON LINEAR SIMULATION & FUZZY OPTIMIZATION

Fuzzy Relational Equations, Partitioning, Non linear simulation using Fuzzy Rule-Based systems, Fuzzy Synthetic Evaluation, Fuzzy ordering, Preference & Consensus, Fuzzy Bayesian Decision method.

UNIT V: FUZZY CONTROL SYSTEM & FUZZY OPTIMIZATION

Simple Fuzzy logic controllers, Industrial Applications, Fuzzy Optimization, Fuzzy One Dimensional Optimization, Fuzzy maximum & minimum.

Text Books:

1. Zimmermann H.J., Fuzzy set Theory and its Application, Allied Publishers Ltd.
2. Ross T. J., Fuzzy Logic with Engineering Applications, McGraw Hill Publications

Reference Books:

1. Fuzzy sets & Fuzzy Logic, Theory & Applications – G.J. Klier, Boyuan – Prentice Hall of India

2. Proceedings of recent seminars / workshops / conferences and Papers from relevant NationalandInternational Journals.

Semester: MTECH- I   **Branch: Civil Engineering**

Subject: Advanced Concrete Technology and Admixtures Lab   **Code: MT04116**

Total Marks in End Semester Exam: 70

Experiments to be performed (Minimum 10 experiments to be performed)

1. Tests for properties of Cement.

2. Tests for properties of Fine Aggregates.

3. Tests for properties of Coarse Aggregates.

4. Tests for properties of Admixtures.

5. Tests for strength of Concrete.

6. Tests for Flexural Strength of Concrete

7. Tests for Modulus of Elasticity of Concrete.

8. Concrete mix design (without Admixtures) and Trial Mixes.

9. Concrete mix design (with Admixtures) and Trial Mixes.

10. Non-destructive testing methods.

11. Behaviour of Concrete under different curing conditions.

12. Behaviour of Concrete under different exposure conditions.

13. Behaviour of Concrete under different placing conditions.

14. Residual Strength of existing concrete structures.

15. Comparison of properties of concrete prepared with materials from different locations.

List of Equipments / Machine Required:

1. Compression Testing Machine 100 T capacity

2. Cube Moulds 150 x 150 x 150 mm 12 nos.

3. Cube Moulds 100 x 100 x 100 mm 6 nos.

4. Cube Moulds 70 x 70 x 70 mm 12 nos.

5. Sieves of Various Sizes

6. Slump Cone Apparatus

7. Compaction Factor Apparatus

8. Moulds for Flexural Strength of Concrete

9. Cylindrical Moulds for Compressive Strength of Concrete

10. Mixing Tray, Trovels etc.

Recommended Books:

1. Neville A.M., Properties of Concrete, Pearson Education
2. SP23, Handbook on Concrete Mixes, Bureau of Indian Standards, New Delhi.

Semester: MTECH- I   **Branch: Civil Engineering**

Subject: Matrix Methods of Structural Analysis Lab   **Code: MT04117**

Total Marks in End Semester Exam: 70

Experiments to be performed (Minimum 10 experiments to be performed)

1. Introduction to Software for Structural Analysis, such as SAP2000

2. Analysis of Continuous Beams on SAP2000 (Support Conditions and Loading type I)

3. Analysis of Continuous Beams on SAP2000 (Support Conditions and Loading type II)

4. Analysis of Continuous Beams on SAP2000 (Support Conditions and Loading type III)

5. Analysis of Plane Frames (Rigid Jointed) on SAP2000 (Support Conditions and Loading type I)

6. Analysis of Plane Frames (Rigid Jointed) on SAP2000 (Support Conditions and Loading type II)

7. Analysis of Plane Frames (Rigid Jointed) on SAP2000 (Support Conditions and Loading typeIII)

8. Analysis of Plane Frames (Pin Jointed) on SAP2000 (Support Conditions and Loading type I)

9. Analysis of Plane Frames (Pin Jointed) on SAP2000 (Support Conditions and Loading type II)

10. Analysis of Plane Frames (Pin Jointed) on SAP2000 (Support Conditions and Loading type III).

11. Behaviour of Frames under Dead and Live Loads.

12. Behaviour of Frames under Wind Loads.

13. Behaviour of Frames under Earthquake Loads.

14. Behaviour of Frames under combinations of Dead Load, Live Load and Wind Load.

15. Behaviour of Frames under combinations of Dead Load, Live Load and Earthquake Load.

List of Equipments / Machine Required:

1. PIV Computers with 17" Colour Monitors & UPS

2. SAP2000 Software.

Recommended Books:

1. Users Manual for SAP2000 Software Package, Computers and Structures Inc., Berkley.

2. Verification Manual for SAP2000 Software Package, Computers and Structures Inc., Berkley.

BHARTI UNIVERSITY, DURG

Scheme of Teaching & Examination

M.TECH. (Civil) with Specialization in Structural Engineering

II SEMESTER

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks
				L	T	P	ESE	CT	TA	
1	Civil Engg.	**MT04121**	Advanced Design of Concrete Structures	3	1	-	70	10	20	100
2	Civil Engg.	**MT04122**	Earthquake Effects on Structures	3	1	-	70	10	20	100
3	Civil Engg.	**MT04123**	Finite Element Analysis of Structures	3	1	-	70	10	20	100
4	Civil Engg.	**MT04124**	Maintenance and Rehabilitation of Structures	3	1	-	70	10	20	100
5	Refer Table - II		Elective II	3	1	-	70	10	20	100
6	Civil Engg.	**MT04126**	Advanced Design of Structures Lab	-	-	10	70		30	100
7	Civil Engg.	**MT04127**	Structural Experimentation Lab	-	-	10	70		30	100
	Total			15	5	20	490	50	160	700

L- Lecture   T- Tutorial   P- Practical ,

ESE- End Semeste Exam   CT- Class Test   TA- Teacher's Assessment

Table -II

S.No.	Board of Study	SubjectCode	Subject
		ELECTIVE II (MT04125)	
1	Civil Engg.	**MT04125(1)**	Advance Foundation Engineering
2	Civil Engg.	**MT04125(2)**	Design of Industrial Structures
3	Civil Engg.	**MT04125(3)**	Fabrication and Erection of Structures
4	Civil Engg.	**MT04125(4)**	Composite Construction using Structural Steel

Note (1) –   1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session .

Note (2) –   Choice of elective course once made for an examination cannot be changed in futureexaminations.

Semester: M.TECH. II   Branch: Civil Engineering

Subject: Advanced Design of Concrete Structures   Code: MT04121

Total Theory Periods: 40   Total Tutorial Periods: 12

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: DESIGN OF BEAMS

Behaviour of RCC beams under combined Shear, Torsion and Bending, Modes of Failures, Inter action effects, Analysis and design of beams circular in plan, Design calculation of deflections and crack width.

UNIT II: DESIGN OF SLENDER COLUMNS

Behaviour of slender RCC Columns, Failure modes and Interaction curves, Additional Moment method, Comparison of codal provisions, calculation of design moments for braced and unbraced columns, Principles of Moment magnification method, design of slender columns.

UNIT III: DESIGN OF SPECIAL RC ELEMENTS

Design and detailing of Concrete walls according to IS code, Classification of shear walls, design principles, design of rectangular shear walls, Analysis of forces, Approximate analysis and design of Gridfloors.

UNIT IV: DESIGN OF FLAT SLABS

Design of Flat slabs according to IS method, Shear in Flat Slabs.

UNIT V: INELASTIC BEHAVIOUR

Inelastic behaviour of concrete beams-moment-rotation curves, moment redistribution, Design of cast- in- situ joints in frames. Detailing requirements for ductility, durability and fire resistance

Text Boks:

1. Varghese, P.C. "Advanced Reinforced Concrete Design", Prentice Hall of India.
2. Krishna Raju, N., "Advanced Reinforced Concrete Design", CBS Publishers and Distributers.

Reference Books:

1. Purushothaman, P, Reinforced Concrete Structure Structural Elements: Behaviour Analysis andDesign,Tata McGraw-Hill.

2. Arthur H.Nilson "Design of Concrete Structures", Tata McGraw-Hill.

Semester: M.TECH. II   **Branch: Civil Engineering**

Subject: Earthquake Effects on Structures   **Code: MT04122**

Total Theory Periods: 40   **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: ENGINEERING SEISMOLOGY

Elements of Engineering Seismology, Characterization of ground motion, Earthquake intensity and magnitude, Recording instruments and base line correction, Predominant period and amplification through soil, Earthquake spectra for elastic and inelastic systems, Response Spectrum, Indian Standard Codes on Earthquake Engineering, Seismic Zoning Map of India.

UNIT II: CASE STUDIES

Earthquake History, Behaviour of Structures in the past Earthquakes, Case Studies and Remidial Measures.

UNIT III: DESIGN CONCEPTS

Seismic Design Concepts, Cyclic load behaviour of structural elements, Design spectrum, Principles ofcapacity design.

UNIT IV: CODAL PROVISIONS

Idealization of structural systems for low, medium and high rise buildings, Provisions of Seismic Code (IS 1893), Building systems frames, shear walls, Braced Frames. Ductility requirements for framed structures.

UNIT V: SPECIAL PROBLEMS

Structural Configuration, Seismic performance, Irregular Buildings, Soil performance, Modern Concepts, Base Isolation, Adoptive system

Text Books:

1. Agrawal P. and Srikhande M., Earthquake Resistant Design of Structures, Prentice hall of IndiaPrivateLimited, New Delhi.
2. Indian Standard Codes / Handbooks on Eqartquake Engineering.

Reference Books:

1. Chopra A.K., Dynamics of Structures – Theory and applications to Earthquake Engineering,PrenticeHall Inc.

2. Proceedings of recent seminars / workshops / conferences, Papers from relevant NationalandInternational Journals and Material from NICEE, IIT Kanpur.

Semester: M.TECH. II　　　　　　　　　　**Branch: Civil Engineering**

Subject: Finite Element Analysis of Structures　　**Code: MT04123**

Total Theory Periods: 40　　　　　　　　**Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: BASIC CONCEPTS

Review of solid mechanics, Displacement model, shape functions, Lagrange and Serendipity elements. Element properties, isoperimetric elements, numerical integration technique assemblage of elements andsolution technique for static analysis.

UNIT II: ANALYSIS OF BEAMS

Finite Element formulation and Analysis of beams by Finite Element method.

UNIT III: ANALYSIS OF RIGID JOINTED PLANE FRAME

Finite Element formulation and Analysis of rigid jointed plane frame by Finite Element method.

UNIT IV: ANALYSIS OF PIN JOINTED PLANE FRAME

Finite Element formulation and Analysis of pin jointed plane frame by Finite Element method.

UNIT V: INTRODUCTION TO PLATE AND SHELL ELEMENTS

Analysis of plane stress / strain and ax symmetric solids-triangular, quadrilateral and isoperametric elements, Analysis of plate bending, basic equations of thin plate theory, Reissinner-Mindlin theory, plate elements and applications. Analysis of shells, degenerated shell elements.

Text Books:

1. Chandrupatla T.R., Belegundu A.D., Introduction to Finite Elements in Engineering, PrenticeHall ofIndia Private Limited, New Delhi.
2. Desai C.S., Abel J.F., Introduction to the Finite Element Method, CBS Publishers & Distributors, Delhi.

Reference Books:

1. Krishanmurthy, C.S., Finite Element Analysis – Theory and Programming, Tata McGraw HillPublishingCompany Limited, New Delhi.

2. Finite Element Analysis – Theory and Programming by Cook R.D. et.al., Concepts andApplications ofFinite Element Analysis, John Wiley

Semester: M.TECH. II   Branch: Civil Engineering

Subject: Maintenance and Rehabilitation of Structures   Code: MT04124

Total Theory Periods: 40   Total Tutorial Periods: 12

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: QUALITY ASSURANCE

Quality assurance for Concrete and Steel construction, Properties such as strength, permeability, thermalproperties and cracking. Corrosion prevention.

UNIT II: INFLUENCE ON SERVICEBILITY AND DURABILITY

Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection.

UNIT III: MAINTENANCE AND REPAIR STRATEGIES

Definitions: Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration - testing techniques.

UNIT IV: MATERIALS FOR REPAIR

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, Sulphur infiltrated concrete, ferro cement, Fiber reinforced concrete.

UNIT V: TECHNIQUES FOR REPAIR

Rust eliminators and polymers coating for rebar's during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

Text Books:

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures", Materials, Maintenance andRepair,Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, "Repair of Concrete Structures", Blakie and Sons, UK, 1987.

Reference Books:

1. M.S.Shetty, "Concrete Technology - Theory and Practice", S.Chand and Company, New Delhi, 1992.
2. Raikar, R.N., "Learning from failures - Deficiencies in Design", Construction and Service - R & DCentre(SDCPL), Raikar Bhavan, Bombay, 1987.

Subject: Advance Foundation Engineering   Code: MT04125(1)

Total Theory Periods: 40   Total Tutorial Periods: 12

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: PRINCIPLES OF FOUNDATION ENGINEERING

Functions of foundations, Types of foundations, Principal modes of failure, Estimation of allowable bearing pressures, calculation of ultimate bearing capacity by theoretical and empirical methods, settlement of foundations, Factors to be considered in foundation design.

UNIT II: SOIL STRUCTURE INTERACTION

Introduction to soil-foundation interaction problems – Soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, Soil response models, Elastic continuum, two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour.

UNIT III: BEAMS ON ELASTIC FOUNDATION

Infinite beam, two parameters, Isotropic elastic half-space, Analysis of beams of finite length,Classification of finite beams in relation to their stiffness.

UNIT IV: PILE FOUNDATIONS

Purpose/Uses of pile foundations, Classification of piles, Concrete and Steel Piles, their advantages and disadvantages, behaviour of pile and pile groups under load, interaction analysis, Estimation of carrying capacity of piles and pile groups. Load deflection prediction for laterally loaded piles.

UNIT V: SPECIAL CONSIDERATIONS

Improvement of foundation soils - Purpose, Improvement of Granular Soils, Improvement ofCohesive soils, Grouting, Geosynthetics, Specific Applications.

Text Books:

1. Bowles J.E., Foundation Analysis and Design, Mc-Graw Hill International Edition.
2. Varghese P.C., Foundation Engineering, Printice Hall of India Private Limited.

Reference Books:

1. Tomlinson, Foundation Design and Construction, ELBS Longman, 1996.
2. Singh & G.R. Chowdhry, Soil Engineering in Theory and practice, CBS Publishers, 1990.

UNIT I: PLANNING AND FUNCTIONAL REQIREMENTS

Classification of Industries and Industrial structures - planning for Layout Requirements regarding Lighting,Ventilation and Fire Safety - Protection against noise and vibration - Guidelines from FactoriesAct.

UNIT II: INDUSTRIAL BUILDINGS

Roofs for Industrial Buildings, Trusses and domes, Gantry Girders, Machine Foundations.

UNIT III: Bunkers and Silos

Analysis and Design of Bunkers and Silos.

UNIT IV: POWER PLANT STRUCTURES

Chimneys and Cooling Towers, High Pressure boilers and piping design, Nuclear containment structures.

UNIT V: POWER TRANSMISSION STRUCTURES

Cables, Transmission Line Towers, Substation Structures, Tower Foundations, Testing Towers.

Text Books:

1. Indian Standard Codes and Handbooks on Industrial Structures
2. Relevant Publications from Institute for Steel Development and Growth, Kolkata

Reference Books:

1. P.Srinivasulu and C.V. Vaidyanathan, Handbook of Machine Foundations, Tata McGraw-Hill 1976.
2. S.N. Manohar, Tall Chimneys – Design and Construction, Tata McGraw-Hill, 1985.
3. A.R. Santhakumar and S.S. Murthy, Transmission Line Structures, Tata McGraw-Hill

1992.

4. Dr. K. Rajagopalan – Storage Structures – Oxford IBH Publishing Company Ltd.

Semester: MTECH - II   Branch: Civil Engineering

Subject: Fabrication and Erection of Structures   Code: MT04125(3)

Total Theory Periods: 40   Total Tutorial Periods: 12

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT 1: GENERAL

Various slopes, size and properties of rolled steel sections, tubes and hollow rectangular sections: Chemical composition, physical properties and weldability of various types of structures steel, their suitability for various purposes.

Various operations like interpretation of drawings, shop-floor operations, fastenings, assembling, finishing and shipping, sub-assemblies and main assemblies.

UNIT 2: FABRICATION DRAWINGS

Structural connections, their classification, symbols for their representation, layout of an industrial building, preparation of fabrication drawing and detailing for columns, trusses, beams and cladding, detailing of truss- joints, column bases, beam to beam and column to beam connection (Seated and framed).

UNIT 3: ERECTION PROCESS

Principle of erection, Erection organisation, Preparation and reading of erection drawing, Assembly marks, common types of structures to be erected, erection of tackle and false work equipments for liftingand rigging, Code provisions for erection.

Methods of erection, levelling and alignment, setting out and grouting, allowable tolerances for plumbing, levelling and alignment.

UNIT 4: TOOLS FOR ERECTION

Miscellaneous small tools for erection like drifts, shakles and grips, erection of shed type buildings, portal frames, multi-storeyed buildings, prefabricated tanks, towers and chimneys.

UNIT 5: INSPECTION, QUALITY CONTROL AND SAFETY

Code provisions for tolerances and deviations, Inspection of welds, radiographic and ultrasonic techniques, Various stages of inspection, Quality control departments, methods of rectification of defects. Accidents and their causes, Various unsafe acts and precautions for

their prevention, Rules for safety for cranes, winches, etc. Safety during electrical operations and while using X-ray equipments, Maintenance of erected structures, surface treatment against corrosion, etc.

Text Books:

1. Structural Steel Fabrication and Erection – S.K. Saxena and R.B. Asthane (Somaiya Publications,172,Mumbai Marathi Granth, Sangrahalaya Marg, Dadar, Bombay-14)
2. Guide Book for Fabrication and Erection of Steel Structures, Institute for Steel Development andGrowth,Kolkata

Reference Books:

1. Shivagunde R.B. and Asthana R.B., Structural Steel Drafting and Detailing, Somaiya Publications,NewDelhi.
2. Steel Designer's Manual: Edited by Graham W. Owens & Peter R. Knowles, 5th Edition, BlackwellScientificPublications, London.

Semester:- MTECH II   **Branch: Civil Engineering**

Subject: Composite Construction using Structural Steel   **Code: MT04125(4)**

Total Theory Periods: 40   **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: INTRODUCTION

Introduction to steel - Concrete composite construction, Theory of composite structures, Seismicbehaviour of composite structures.

UNIT II: DESIGN OF COMPOSITE MEMBERS

Behaviour of composite beams and Columns, Design of composite beams, Steel - Concretecomposite columns, Design of composite trusses.

UNIT III: DESIGN OF CONNECTIONS

Types of connections, Design of connections in the composite structures, Shear connections,Design ofconnections in composite trusses.

UNIT IV: COMPOSITE BRIDGERS

Introduction, Behaviour of composite bridges, Design concepts.

UNIT V: CASE STUDIES

Case studies on steel - Concrete composite construction in buildings and bridges.

Text Books:

1. Johnson R.P., Composite structures of steel and concrete, Blackwell Scientific Publications(Second Edition), UK, 1994.

2. Handbooks Published by Institute for Steel Development and Growth, Kolkata

Reference Books:

1. Owens, G.W. and Knowels.P. Steel Designers manual (Fifth edition), Steel Concrete Institute(UK),Oxford Blackwell Scientific Publications, 1992.

2. Proceedings of recent seminars / workshops / conferences and Papers from relevant NationalandInternational Journals.

Semester: M.TECH.II   **Branch: Civil Engineering**

Subject: Advanced Design of Structures Lab   **Code: MT04126**

Total Marks in End Semester Exam: 70

Experiments to be performed (Minimum 10 experiment to be performed)

1. Introduction to latest version of a Standard Structural Engineering Design Package such as STAAD Pro.

2. Modelling of RCC Frame on latest version of a Standard Structural Engineering Design Packagesuch asSTAAD Pro. (including Earthquake and Wind Loads)

3. Analysis and Interpretation of Results of Analysis on RCC Frame on latest version of a StandardStructural Engineering Design Package such as STAAD Pro.

4. Design and Interpretation of Results of Design of RCC Frame on latest version of a StandardStructuralEngineering Design Package such as STAAD Pro.

5. Modelling, of Steel Frame on latest version of a Standard Structural Engineering Design Packagesuch asSTAAD Pro. (including Earthquake and Wind Loads)

6. Analysis and Interpretation of Results of Analysis on Steel Frame on latest version of aStandardStructural Engineering Design Package such as STAAD Pro.

7. Design and Interpretation of Results of Design of Steel Frame on latest version of a StandardStructuralEngineering Design Package such as STAAD Pro.

8. Case Study of design of a RCC Multistorey Building / Steel Industrial Building on latest version of aStandard Structural Engineering Design Package such as STAAD Pro.

9. Introduction to latest version of Finite Element Package such as ANSYS.

10. Modeling of an Steel Angle section on ANSYS and viewing the results.

11. Design of Multistorey Building for Dead Loads and Live Loads.

12. Design of Multistorey Building for Dead Loads, Live Loads and Wind Loads.

13. Design of Multistorey Building for Dead Loads, Live Loads and Earthquake Loads.

14. Modelling of Steel Connections in Finite Element Package ANSYS.

15. Introduction to Non-Linear Finite Element analysis of structures on ANSYS

List of Equipments / Machine Required:

1. PIV Computers with 17" Colour Monitors & UPS

2. STAAD Pro Software

3. ANSYS Software

4. Recommended Books:

5. Users Manuals for STAAD Pro Software.

6. Users Manuals for ANSYS Software.

Experiments to be performed (Minimum 10 experiment to be performed)

1. Study of Strain gauges – Principles and applications, mechanical, optical and electrical strain gauges,

2. Study of Strain recording instruments.

3. Study the response of RCC Beams using dial gauges, load cells etc. on a loading Frame.

4. Study the response of structural members RCC Columns using dial gauges, load cells etc. on aloading Frame.

5. Study the response of Steel Beams using dial gauges, load cells etc. on a loading Frame.

6. Study the response of Steel Columns using dial gauges, load cells etc. on a loading Frame.

7. Study the response of Steel Trusses using dial gauges, load cells etc. on a loading Frame.

8. Testing and recording of stress strain curve of steel specimens on Universal Testing Machine.

9. Testing of steel connections to demonstrate single shear / Double shear failure ofbolts on Universal TestingMachine.

10. Use of static and dynamic data recording and processing systems.

11. Comparison of behaviour of steel beam (laterally supported and laterally unsupported) on aloading frame

12. Load carrying capacity of RCC Columns of various cross-sections such as plus shape, circular shape, etc.

13. Preparation of moment-rotation curves for framed steel connections.

14. Preparation of moment-rotation curves seated steel connections.

15. Preparation of moment-rotation curves for moment-resistant connections.

List of Equipments / Machine Required:

1. Loading frame (50T capacity)

2. Universal testing machine 100 T capacity

3. Strain gauges

4. Dial gauges

5. Load cells

Recommended Books:

1. Dally J.W. and Riley W.F., Experimental stress analysis, McGraw-Hill Inc., New York.

2. Rangan Csetal, Instrumentation-Devices & Systems, Tata McGraw Hill Publishing Co. Ltd., NewDelhi.

BHARTI UNIVERSITY, DURG

Scheme of Teaching & Examination

M.TECH. (Civil) with Specialization in Structural Engg.

II SEMESTER

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks
				L	T	P	ESE	CT	TA	
1	Civil Engg.	**MT04131**	Structural Dynamics	3	1		70	10	20	100
2	Refer Table III		Elective III	3	1		70	10	20	100
3	Civil Engg.	**MT04133**	Preliminary work on Dissertation	-	-	28	140		60	200
4	Civil Engg.	**MT04134**	Seminar Based on Dissertation	-	-	3	-	-	100	100
Total				**6**	**2**	**31**	**280**	**20**	**200**	**500**

L- Lecture   T- Tutorial   P- Practical ,

ESE- End Semester Exam   CT- Class Test   TA- Teacher's Assessment

Table III			
ELECTIVE III(MT04132)			
S.No.	**Board of Study**	**Subject Code**	**Subject**
1	Civil Engg.	**MT04132(1)**	Optimization Techniques
2	Civil Engg.	**MT04132(2)**	Theory of Plates and Shells
3	Civil Engg.	**MT04132(3)**	Pre-Stressed Concrete

Note (1) – 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session .

Note (2) – Choice of elective course once made for an examination cannot be changed in future examinations.

Semester: M.TECH. III　　　　　　　　　　**Branch: Civil Engineering**

Subject: Structural Dynamics　　　　　　　**Code: MT04131**

Total Theory Periods: 40　　　　　　　　　**Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70

Minimum number of class tests to be conducted: 02

UNIT I: BASIC CONCEPTS

Types and sources of dynamic loads, Methodology for dynamic analysis, Study of IS-1893,fundamentals of rigid and deformable dynamics.

UNIT II: SINGLE DEGREE OF FREEDOM SYSTEMS

Free and forced response, effect of damping, Analysis of undamped and viscously damped single degree of freedom. Response of single degree freedom systems to Harmonic loading, support motions and Transmissibility, Duhamel's integral.

UNIT III: MULTI –DEGREE OF FREEDOM SYSTEMS

Free vibrations of lumped mass multi degree freedom systems, analysis of undamped and viscously damped multi degree of freedom. Rayleigh's method, Orthogonality criteria.

UNIT IV: IDEALIZATION OF STRUCTURES

Mathematical models, Mode superposition methods, Distributed mass properties.

UNIT V: APPLICATION TO EARTHQUKE ENGINEERING

Introduction to vibrations due to earthquake, Response spectra. Response spectrum method for seismicdesign of structures.

Text books:

1. Chopra, A. K., Dynamics of Structures - Theory and Applications to Earthquake Engineering, Second Edition, Prentice Hall, 2001.
2. Rao, S. S., Mechanical Vibrations, Third Edition, Addison-Wesley Publishing Co., 1995

Reference Books:

1. Clough, R. W., and J. Penzien, Dynamics of Structures, Second Edition, McGraw-Hill, 1993.

2. Mario Paz, Structural Dynamics – Theory and Computations, Third Edition, CBS publishers,1990.

UNIT I: OPTIMIZATION TECHNIQUES

Basic Concepts and introduction of engineering optimization, single-variable optimization, Multivariable optimization with no constraints, equality constraints and inequality constraints.

UNIT II: LINEAR PROGRAMMING

Basic concepts of Linear programming, Applications of Linear Programming, standard forms of aLinear programming problems, solution of a system of linear simultaneous equations, Decomposition principle, Quadratic programming.

UNIT III: NON LINEAR PROGRAMMING

Basic concepts of Non-linear programming, Uni-modal function, Elimination methods, Interpolation methods, classification of unconstrained minimization methods- Direct search methods, Indirect search methods, characteristics of a constrained problem-Direct methods, Indirect methods.

UNIT IV: GEOMETRIC PROGRAMMING

Unconstrained minimization problem, constrained minimization, Applications of Geometric programming.

UNIT V: SPECIAL OPTIMIZATION TECHNIQUES

Separable programming, transformation of a non-linear function to separable form, multi objective optimization, calculus of variations, optimal control theory.

Text Books:

1. Rao S.S., Engineering Optimization Theory and Practice, New Age Publishers, Delhi
2. Deb K., Optimization for Engineering Design, Algorithms & examples, Prentice Hall of India,Delhi

Reference Books:

1. Arora J.S., Introduction to optimum Design, TMH, Delhi
2. Fox R.L., Optimization methods for Engineering Design, Addison Wesley Publishing

UNIT I: BASIC CONCEPTS

The fundamental elasticity equations. Theory of elasticity and real structures. The fundamental elasticityproblems. Boundary conditions. Compatibility equations. Applications.

Calculation of displacement components. The plane stress and plane strain problem.

UNIT II: ANALYSIS OF PLATES

Equation of equilibrium and deformation of plates, Bending of rectangular plates and circular plates.Energy method, finite difference and finite element methods for solution of plate bending problems.

UNIT III: FOLDED PLATES

Analysis and design of folded plates, Detailing of Reinforcement in folded plates.

UNIT IV: ANALYSIS OF SHELLS

Geometry of shells, Classification of Shells, membrane theory of circular and cylindrical shells,Introductionto the bending theory of shells.

UNIT V: CYLINDRICAL SHELLS

Analysis and design of cylindrical shells, Detailing of Reinforcement in shells.

Text Books:

1. Timoshenko S.P. and Woinoswski-Krieger S., Theory of Plates and Shells. McGraw-Hill.
2. Gould Philipp L., Analysis of Shells and Plates. Springer Verlag New York.

Reference Books:

1. Reddy J. N.,Theory and Analysis of Elastic Plates. Taylor and Francis, London.
2. Szilard R., Theory and Analysis of Plates. Prentice-Hall, Englewood Cliffs.

Semester: M.TECH. III	**Branch: Civil Engineering**
Subject: Pre-stressed Concrete	**Code: MT04132(3)**
Total Theory Periods: 40	**Total Tutorial Periods: 12**
Total Marks in End Semester Exam: 70	
Minimum number of class tests to be conducted: 02	

UNIT I: INTRODUCTION AND CODAL PROVISIONS

Principles of Prestressing, types and systems of prestressing, need for High Strength materials, Analysismethods losses, deflection (short-long term), camber, cable layouts. Behaviour under flexure,- codal provisions (IS, British ACI and DIN), ultimate strength.

UNIT II: DESIGN PRINCIPLES

Design of flexural members, Design for Shear, bond and torsion. Design of End blocks and their importance, Design of tension members, application in the design of prestressed pipes and prestressedconcrete cylindrical water tanks.

UNIT III: DESIGN OF COMPRESSION MEMBERS

Design of compression members with and without flexure, its application in the design piles, flagmastsand similar structures.

UNIT IV: CONTINUOUS BEAMS

Application of prestressing in continuous beams, concept of linear transformation, concordant cable profile and cap cables.

UNIT V: COMPOSITE BEAMS

Composite beams, analysis and design, ultimate strength, their applications. Partial prestressing,itsadvantages and applications.

Text Books:

1. Prestressed Concrete by Krishna Raju, Tata McGraw Hill Publishing Co.
2. Fundamentals of Prestressed Concrete by N.C.Sinha & S.K.Roy S.Chand & Co.

Reference Books:

1. T.Y.Lin, Design of Prestressed Concrete Structures, John Wiley and Sons, Inc.
2. Evans, R.H. and Bennett, E.W., Prestressed Concrete, Champman and Hall, London.

BHARTI UNIVERSITY, DURG

Scheme of Teaching & Examination

M.TECH. (Civil) with Specialization in Structural Engg.

IV SEMESTER

S.No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination			Total Marks
							Theory / Practical			
				L	T	P	ESE	CT	TA	
1	Civil Engg.	**MT04141**	Dissertation + Seminar	6	-	34	350	-	150	500
Total				**6**	**-**	**34**	**350**	**-**	**150**	**500**

Note (1) – 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session .

Note (2) – Choice of elective course once made for an examination cannot be changed in futureexaminations.

Scheme of Marks allotment

Semester	Total Marks	Grand Total
I	700	
II	700	2400
III	500	
IV	500	