CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Scheme of Teaching & Examination

M.E. (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	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Civil Engg.	550111 (20)	Advanced Concrete Technology and Admixtures	3	1	-	100	20	20	140	4
2	Civil Engg.	550112 (20)	Matrix Methods of Structural Analysis	3	1	-	100	20	20	140	4
3	Civil Engg.	550113 (20)	Instrumentation and Experimental Techniques	3	1	-	100	20	20	140	4
4	Civil Engg.	550114 (20)	Advanced Construction Management	3	1	-	100	20	20	140	4
5	Refer Table –I		Elective I	3	1	-	100	20	20	140	4
6	Civil Engg.	550121 (20)	Advanced Concrete Technology and Admixtures Lab	-	-	10	75		75	150	5
7	Civil Engg.	550122 (20)	Matrix Methods of Structural Analysis Lab	-	-	10	75		75	150	5
Total				**15**	**5**	**20**	**650**	**100**	**250**	**1000**	**30**

L- Lecture T- Tutorial
P- Practical , ESE- End Semester Exam
CT- Class Test TA- Teacher's Assessment

Table-I

ELECTIVE I			
S.No.	**Board of Study**	**Subject Code**	**Subject**
1	Civil Engg.	550131 (20)	Limit State Design of Steel Structures
2	Civil Engg.	550132 (20)	Advanced Design of Steel Structures
3	Civil Engg.	550133 (20)	Theory of Elastic Stability
4	Civil Engg.	550134 (20)	Applied Fuzzy Logic and Fuzzy sets

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.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **ME- I** Branch: **Civil Engineering**
Subject: **Advanced Concrete Technology and Admixtures** Code: 550111(20)
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam: **100**
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, No fines 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 National and International Journals.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester- M.E. - I
Subject: **Matrix Methods of Structural Analysis**
Total Theory Periods: **40**
Total Marks in End Semester Exam: **100**
Minimum number of class tests to be conducted: **02**

Branch: **Civil Engineering**
Code: 550112 (20)
Total Tutorial Periods: **12**

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 flexibility method.

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- Hill Publishing Company Limited, New Delhi
2. Weaver W. and Gere J. M., Matrix Analysis of Framed Structures, CBS Publishers and Distributors, Delhi

Reference Books:

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

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M.E. -I** Branch: **Civil Engineering**
Subject: **Instrumentation and Experimental Techniques** Code: 550113 (20)
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam: **100**
Minimum number of class tests to be conducted: **02**

UNIT I: MEASUREMENT

Basic Concept in Measurements, Measurement of displacement, strain pressure, force, torque etc, Types of 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 and Isochromatics, 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., New Delhi, 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.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M.E. - I**
Branch: **Civil Engineering**
Subject: **Advanced Construction Management**
Code: 550114 **(20)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam: **100**
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, Effects of 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, Estimation of 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, Tata McGraw-Hill Publishing 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.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M.E. - I** Branch: **Civil Engineering**

Subject: **Limit State Design of Steel Structures** Code: 550131 (20)

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

Total Marks in End Semester Exam: **100**

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, Classification of 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, High strength friction grip bolts.

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

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, Web Buckling, 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 Development and 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 National and International Journals.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **ME- I** Branch: **Civil Engineering**
Subject: **Advanced Design of Steel Structures** Code: 550132 (20)
Total Theory Periods:**40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam: **100**
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, Permissible sway.

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:

3. Teaching Resource for Structural Steel Design, Volumes I – III, Institute for Steel Development and Growth, Kolkata.
4. Various Indian Standard codes of practice on steel structures.

Reference Books:

3. Davidson B. and Owens, G.W., Steel Designers' Manual, Blackwell Publishing, UK
4. Proceedings of recent seminars / workshops / conferences and Papers from relevant National and International Journals.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M.E. - I**
Branch: **Civil Engineering**
Subject: **Theory of Elastic Stability**
Code: 550133 (20)
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam: **100**
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 finite Element, 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

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M.E. - I**
Branch: **Civil Engineering**
Subject: **Applied Fuzzy Logic and Fuzzy Sets**
Code: 550134(20)
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam: **100**
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 National and International Journals.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester**: M.E. - I** Branch: **Civil Engineering**
Subject: **Advanced Concrete Technology and Admixtures Lab** Code: 550121 (20)
Total Marks in End Semester Exam: **75**

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.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **M.E. I** Branch: **Civil Engineering**
Subject: **Matrix Methods of Structural Analysis Lab** Code**: 550122 (20)**
Total Marks in End Semester Exam: **75**

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

a. Introduction to Software for Structural Analysis, such as SAP2000
b. Analysis of Continuous Beams on SAP2000 (Support Conditions and Loading type I)
c. Analysis of Continuous Beams on SAP2000 (Support Conditions and Loading type II)
d. Analysis of Continuous Beams on SAP2000 (Support Conditions and Loading type III)
e. Analysis of Plane Frames (Rigid Jointed) on SAP2000 (Support Conditions and Loading type I)
f. Analysis of Plane Frames (Rigid Jointed) on SAP2000 (Support Conditions and Loading type II)
g. Analysis of Plane Frames (Rigid Jointed) on SAP2000 (Support Conditions and Loading type III)
h. Analysis of Plane Frames (Pin Jointed) on SAP2000 (Support Conditions and Loading type I)
i. Analysis of Plane Frames (Pin Jointed) on SAP2000 (Support Conditions and Loading type II)
j. Analysis of Plane Frames (Pin Jointed) on SAP2000 (Support Conditions and Loading type III).
k. Behaviour of Frames under Dead and Live Loads.
l. Behaviour of Frames under Wind Loads.
m. Behaviour of Frames under Earthquake Loads.
n. Behaviour of Frames under combinations of Dead Load, Live Load and Wind Load.
o. Behaviour of Frames under combinations of Dead Load, Live Load and Earthquake Load.

List of Equipments / Machine Required:

a. PIV Computers with 17" Colour Monitors & UPS
b. 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.