SCHEME OF SYLLABUS FOR M. TECH. IN STRUCTURAL ENGINEERING

FIRST SEMESTER

CORE COURSES

Course No	Subject	No of Credits		
		Theory	Practical	Total
CSE-101	Matrix Structural Analysis	3	0	3
CSE-102	Dynamics of Structures	3	0	3
CSE-103	Concrete Technology	3	1	4

Electives

a) Elective I

MTHM-104	Numerical Methods	3	0	3
CSE-105	Pre Stressed Concrete	3	0	3
CSE-106	Computer Applications	3	0	3

b) Elective-II

CSE-107	Hydraulic structures	3	0	3
CSE-108	Theory of Plates and Shells	3	0	3
CSE-109	Seismic Microzonation	3	0	3

Total Credits 16

SECOND SEMESTER

CORE COURSES

Course No	Subject	No of Credits		
		Theory	Practical	Total
CSE-201	Finite Element Analysis	3	0	3
CSE -202	Earthquake Resistant Design	3	0	3
CSE-203	Advanced Concrete Design	4	0	4

Elective –III

CSE-204	Solid Mechanics	3	0	3
CSE=205	Foundation Engineering	3	0	3
CSE-206	Soil Structure Interaction	3	0	3

Elective-IV

CSE-207	Construction Techniques and Management	3	0	3
CSE-208	Rock Mechanics and Tunneling	3	0	3
CSE-209	Design of Tall Buildings	3	0	3
	Total Credits			16

3RD SEMESTER

CORE COURSES

Course No	Subject	No of Crdits		
		Theory	Practical	Total
CSE-301	Design of Industrial Structures	3	0	3
CSE-302	Bridge Analysis and Design	3	0	3
CSE-303	Seminar	2	0	2
CSE-304	Mid Term Evaluation of Dissertation	8	0	8
	Total credits			16

FOURTH SEMESTER

CSE-401	Dissertation	0	0	12

Grand Total of Credits 60

Dissertation: The topic of dissertation must be primarily of Structural Engineering Related either theoretical or experimental or both which a student has to carry out under the supervision of a faculty member/s of the Department.

Part time students will be eligible to join the 3rd Semester regular in their 5th semester only after successful completion of Ist semester and second semester.

SYLLABUS FOR M.TECH. IN STRUCTURAL ENGINEERING

MATRIX STRUCTURAL ANALYSIS

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-101	3	0	0	3

1. General Introduction. A Few Historical Remarks. Matrix Methods of Analysis of Skeletal Structures. Methods of Analysis. Displacement Method: Stiffness Relationships.

2. The Matrix Displacement Approach. Introduction. Stiffness Matrix of a Bar Element subjected to Axial Force. Co-ordinate Transformations. Global Stiffness Matrix. Application to Pin-Jointed Frames. Stiffness Matrix of a Beam Element. Application to Continuous Beams.

3. Matrix Displacement Analysis of Planar Rigid-Jointed Frames. Neglect of Axial Strain in the Analysis of Planar Rigid-Jointed Frames. Inclined Supports. Other Kinds of Loading & Other Kinds of Frames.

4. Matrix Displacement Analysis of Grillage or Grid. Co-ordinate Transformations. Element Stiffness Matrix & its Application.

5. Matrix Displacement Analysis of Three-Dimensional Structures. Co-ordinate Transformations. Application to Space Trusses & Space Frames.

6. Computer Applications & Use of Computer Packages.

Books Recommended

Matrix & Finite Element Displacement Analysis of Structures:	D.J.Dawe.
Computer Analysis of Structural Systems:	John F. Fleming.
Matrix Methods of Structural Analysis:	C.K.Wang.
Matrix Analysis of Framed Structures:	Gere & Weaver.
Introduction to Matrix Methods of Structural Analysis:	Martin,H.C.

DYNAMICS OF STRUCTURES

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-102	3	0	0	3

Nature of dynamic loading: Harmonic, Earthquake and blast loading, Single degree of freedom systems, Free vibrations and Forced vibrations: Harmonic force, Periodic force, Impulse, and General type of loading.

Multi-degree of freedom system: Free and Forced vibrations of lumped MDOF Systems, numerical techniques for finding natural frequencies and mode shapes, orthogonality relationships of principal modes, Rayleighs Principal and its application for determination of fundamental frequency. Evaluation of dynamic response by mode superposition method.

Continuous Systems: Equation of motion: Undamped Free vibrations: Forced Vibration of bars and beams.

Introduction to wind loads.

Books recommended:

Dynamics of Structures	By	Anil K. Chopra
Dynamics of Structures	By	Clough and Penzien
Structural Dynamics	By	Mario Paz
Dynamics of Structures	By	J. L. Humour

CONCRETE TECHNOLOGY

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-103	3	0	1	4

Concrete Making Materials:

Aggregates – Classification, IS specifications, Properties, Grading, Methods of combining aggregates, specified gradings, Testing of aggregates.

2. Cement:

Chemical compoisition, Hydration of cement, structure of hydrated cement, special cements, water chemical admixtures.

Concrete:

Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and Shrinkage, Variability of concrete strength.

Mix Design:

Principles of concrete mix design, Methods of concrete mix design, Testing of concrete.

Special Concretes:
Light weight concrete, Fibre reinforced concrete, Polymer concrete, Super plasticized concrete, Properties and applicatons.

Concreting Methods:
Process of manufacturing of concrete, Methods of Transportation, placing and curing. Extreme weather concreting, Special concreting methods.

REFERENCES:

1. Neville, A.M. and Brookes, J.J. "Concrete Technology", Pearson Publishers,New Delhi,1994.
2. Neville, A.M. "Properties of Concrete" Pearson Publishers,New Delhi, 2004.
3. Shetty,M.S. "Concrete Technology", S.Chand & Company, New Delhi,2002.
4. Gambhir, M.L. "Concrete Technology", Tata McGraw Hill New Delhi, 1995.
5. Rudhani,G."Light Weight Concrete", Academic Kiado Publishing Home of Hungarian Academy of Sciences,1963.

NUMERICAL METHODS (ELECTIVE-I)

SEMESTER: IST	L	T	P	C
COURSE NO. MTHM-104	3	0	0	3

Numerical analysis, finite differences, interpolation, numerical solution of algebraic and transcendental equations, iterative algorithms, convergence, Newton-Rapjson procedure, solution of polynomial and simultaneous linear equations, numerical integration, Euler-Maclaurin formula, Newton-Cotes formula, error estimates, numerical solutions of ordinary differential equations: method of Euler, Taylor, Adams Runge-Kutta and predictor-corrector procedures, stability of solution, solution of boundary value problems, finite differences techniques, stability and convergence of solution, finite element method. **Special functions.** Legendre's special function, Rodrigue's formula, generating functions for Legendre's polynomials and recurrence formulae, Bessel's function, recurrence formulae, Bessel's function of integral order.

Books recommended:

Numerical methods for Scientists and Engineers by M.K. Jain, S.R. Iyengar & R.K. Jain, Wiley Eastern Ltd.

Mathematical Numerical Analyis By S.C. Scarborough, Oxford and IBH Publishing Company.

Introductory methods in Numerical Analysis by S.S. Sastry, Prentice Hall of India.

Theory and problems in Numerical Methods by T. Veeranjan and T. Ramachandran, Tata McGraw-Hill Publishing Company, New Delhi-2004.

Numerical Methods for Mathematics Sciences and Engineering 2nd ed. By John H. Mathews, Prentice Hall of India, New Delhi 2003.

Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, Narosa-2001.

PRE-STRESSED CONCRETE (ELECTIVE-I)

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-105	3	0	0	3

Pre-stressing systems and end anchorages, losses of pre-stress.

Analysis and design of members for flexure, shear, bond and bearings. Cable layouts. Design of circular systems, domes and slabs.

Design of Pre-stressed Bridges, (Super-structure only).

Design of continuous beams.

Books recommended:

Design of Pre-stressed Concrete Structures	By	Lin, T.Y. and Burns, N.H
Design of Pre-stressed Concrete Structures	By	Krishna Raju

COMPUTER APPLICATIONS (ELECTIVE-I)

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-106	3	0	0	3

Introduction:

Digital Computer Systems, problem solving techniques, introduction to programming languages, computer language and C++, source programme, Compilation and debugging.

C++ Programming Basics:

Using Turbo C++ , Basic program construction, preprocessor directive, #include, #define, Header and Library functions, Keywords, INPUT-OUTPUT Statements, comments, Constants, Variables, and operators, Formatting statements, ENDL and SETW manipulators.

Loops, Decision and Arrays:

WHILE, DO-WHILE and FOR loops, general structure and control. IF, IF-ELSE statements, SWITCH, BREAK, CONTINUE statements, GOTO and labels, ARRAY fundamentals, types, use and manipulation of 2-D arrays as Matrices.

FUNCTIONS:

Concept of modularization of structured programming. Basics of functions, their types declaration, definition and structure.

Object Oriented Programming Concept:

General concepts of Object Oriented Programming , Objects and Classes, Member Functions , user defined data , Pointers ,etc.

File Processing:

Streams , String I/O, Character I/O, Object I/O, input-output with Multiple objects, File Pointers, Disk I/O with Member Functions, Error Handing, Printer Output.

Practical Applications:

Programming for mathematical models of Civil Engineering problems and Management information systems, use of general purpose programmes.

Books recommended:

1 Object Oriented Programming with C++ by Robert Lafore
2. Object Oriented Programming with C++ by S.K. Panday.

HYDRAULIC STRUCTURES (ELECTIVE-II)

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-107	3	0	0	3

Design procedure for irrigation channels, Irrigation outlets, Canal masonary works, - principles of design, use of flow net, Khosla's theory , Regulation works - Falls, distributory head regulators, Cross regulators, Cross drainage works, Canal head Works, Earth Dams, Gravity Dams, Spillways and Energy dissipators , Escapes , Trench weirs , Supply channel and head regulator.

Books recommended:

R.S. Varshney, S.C. Gupta and R.L. Gupta; Theory and Design of Irrigation Structures, Nemchand & Brothers ,Roorkee, 1992.

R.k. Sharma; Irrigation Engineering and Hydraulic Structures, Oxford and IBH Publishing Co., New Delhi, 1984.

Arora, K.R. " Irrigation water power and Water Resources Engineering", Standard Publishers Distributors, Delhi,2002.

THEORY OF PLATES AND SHELLS (ELECTIVE-II)

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-108	3	0	0	3

Prismatic folded plate systems, governing equations, analysis and design, numerical method and energy procedures, finite difference method, plates of various shapes; shell types and characteristics, classification, membrane analysis, bending analysis of shells of revolution and cylindrical shells, shell equations, solutions., analysis and design of cylindrical shells, approximate design methods for doubly curved shells.

Books recommended:

Theoru of Plates and Shells	By	Timoshenko and Woinowsky-Krieger
Design of Thin Shells	By	Hass A. M.
Design and Construction of Concrete Shell Roof	By	Ramaswamy G. S.

SEISMIC MICROZONATION (ELECTIVE-II)

SEMESTER: IST	L	T	P	C
COURSE NO. CSE-109	3	0	0	3

Earthquake source: Earthquake source mechanisms. Review of moment tensors. Seismic inversion problem for a flat structure. Strong motion seismology. Reservoir-Induced earthquakes.

Prediction of Strong ground motion: A theoretical study of the dependence of the Peak Ground Acceleration on source and structure parameters. High frequency earthquake strong ground motion in laterally varying media and the effect of fault zone. Physical mechanisms contributing to the seismic attenuation in the crust. Dynamic fracture mechanics. Near-field and far-field ground motions.

Strong motion data: Data acquisition and processing in strong motion seismology. Array analysis and synthesis mapping of strong seismic motion. Accelerogram spectral properties and prediction of peak values. Statistical model for peak ground motion from local to regional distances. Seismic intensity and its applications to engineering: a few case studies from Japan and Turkey.

Complete strong motion synthetics: Numerical modelling of realistic fault rupture processes: Kinematic dislocation models, 3-D modelling of spontaneous fault rupture processes. Stochastic simulation of high frequency ground motions based on seismological models of radiated spectra. Use of random vibration theory to predict peak amplitudes of transient signals. SHAKE?91. Fault surface integral and techniques for earthquake ground motion calculation with applications to source parameterization to finite faults. Path effects in strong motion seismology.

Hazard assessment: Probabilistic models for assessment of strong ground motion. Seismic source regionalization. Seismic risk and its estimation.

Site response and engineering application: Site response analysis using classical spectral ratio, generalized inverse technique, horizontal-to-vertical spectral ratio or receiver function, network average and Nakamura ratio. Determination of in-situ shear-wave velocity and Q-factor. Site amplification and its relation to surficial geologic condition. Constitutive relationships for soil dynamics. Soil structure interaction effects on strong ground motion. Engineering uses of strong motion data and seismic microzonation.

BOOKS RECOMMENDED:

1. Fundamentals of earthquake engineering by Newmark N.M. and Rosenblueth E.
2. Geotechnical Earthquake Engineering By Kramer, S.L
3. Wai-Fah Chen & Scawthorn, Charles. " Earthquake Engineering Handbook", CRC Press London.

FINITE ELEMENT ANALYSIS

SEMESTER: 2ND	L	T	P	C
COURSE NO. CSE-201	3	0	0	3

Introduction to Finite Element Method. Brief History of the Development. Advantages & Disadvantages of Finite Element Method. Finite Element Method- The Displacement Approach.

Foundations of the FEM- Energy Principles.

One Dimensional Finite Elements. Stiffness Matrix for the basic Bar & Beam Element Representation of Distributed Loading. The Assembly Process within the PMPE Approach. Element Stresses.

Shape Functions & Interpolation Polynomials. Refined One Dimensional Elements.

Finite Elements for Two Dimensional Planar Bodies. Triangular Elements for Plane Stress or Strain Conditions. Higher Order Triangular Elements. Rectangular Elements for Plane Stress or Strain Conditions. Higher Order Rectangular Elements : Lagrange Element Family.

Finite Elements for Three Dimensional Analysis. Tetrahedral Elements. Higher-Order Tetrahedra. Rectangular Hexahedral Elements. Higher-Order Rectangular Hexehedra: Lagrange Element Family.

Advanced Concepts In The Formulation of Two & Three Dimensional Elasticity Elements. Natural Co-ordinates. Area or Triangular Co-ordinates. Serendipity Rectangles & Hexahedra. The Isoparametric Concept. Properties of Isoparametric Elements. Numerical Integration.

Finite Elements For Plate Bending Analysis. A 12-Degree-Of-Freedom Rectangular Element (R1). Triangular Elements.

Books recommended:

Matrix & Finite Element Displacement Analysis of Structures: D.J.Dawe.
Matrix Finite Element Computer & Structural Analysis: M.Mukhopadhyay.
Finite Element Structural Analysis: T.Y.Yang.
Concepts & Applications of Finite Element Analysis: Robert D.Cook.

EARTHQUAKE RESISTANT DESIGN (ELECTIVE-IV)

SEMESTER: 2ND	L	T	P	C

COURSE NO. CSE-202	3	0	0	3

Introduction to Seismicity, Earthquake Motion and Response, Response Spectra, Philosophy of Capacity Design.

Concepts of seismic design: Earthquake resistant design of R.C.C Structures and IS:1893.

Earthquake resistant construction of R.C.C. Elements: Detailing aspects and IS:13920

Earthquake resistant design of Brick Masonry Structures and IS: 4326

Introduction to Indian Standards, related to Earthquake Engineering.

Earthquake resistant design of Bridges.

Books recommended:

1. Fundamentals of earthquake engineering — Newmark N.M. and Rosenblueth E.
2. Earthquake Design practice for Buildings — Key, D
3. Dynamics of Structures — Anil K. Chopra
4. Dynamics of Structures — Clough and Penzien
5. Seismic design of R.C.C & Masonry Structures — Pauley, T. and Priestley
6. Bridge Engineering: Seismic Design — W.F. Chen & Lian Duan

ADVANCED CONCRETE DESIGN

SEMESTER: 2ND	L	T	P	C
COURSE NO. CSE-203	4	0	0	4

OVERALL REVIEW:

Review of Limit State Design of Beams, Slabs & Columns according to IS 456-2000. Calculation of Deflection & Crack Width according to IS 456-2000.

DESIGN OF SPECIAL RC ELEMENTS:

Design of Slender Columns, Grid Floors, Curved Beams, Deep Beams, Plain & Reinforced Concrete Walls, Corbels & Edge (Spandrel) Beams.

SLABS:

Design of Circular & Flat Slabs . Yield Line Analysis of Slabs.

FOLDED PLATES:

General Features . Structural Behaviour, Analysis & Design of Folded Plates.

Books recommended:

Advanced Reinforced Concrete Design, N.Krishna Raju (CBS Publishers & Distributors),
Advanced Reinforced Concrete Design, P.C.Varghese(Prentice Hall of India)

SOLID MECHANICS (ELECTIVE-III)

SEMESTER: 2ND	L	T	P	C
COURSE NO. CSE-204	3	0	0	3

Analysis of Stress and Strain:

Analysis of stress and strain, stress-strain relationship. Generalized Hook's law. Plane stress and plain strain.

2D Problems:

two dimensional problems in Cartesian and polar co-ordinates for simple problems.

Torsion:

Torsion of non-circular sections: methods of analysis- membrane analogy- torsion of thin rectangular and hollow thin walled sections.

Energy methods:

Energy methods: Principles of virtual work- energy theorm- Rayleigh-Ritz method- Finite difference method.

Introduction to problem in Plasticity:

Physical assumptions – criterion of yielding, yield surface, Flow rule (Plastic stress and strain relationship). Elastic plastic problems of beams in bending – plastic torsion.

Books recommended:

Theory of Elasticity	By	Timoshenko, S. and Goodier T.N.,
Theory of Elasticity	By	Chenn, W. P and Henry D. J
Theory of Elasticity	By	Sadhu Singh.

FOUNDATION ENGINEERING (ELECTIVE-III)

SEMESTER: 2ND	L	T	P	C

COURSE NO. CSE-205 3 0 0 3

Overview of basic principles of geotechnical engineering, Geotechnical site investigations,

Introduction to Foundation Engineering

- Construction materials, Engineered structures, foundation materials.
- Load transfer device/interfacing element, superstructures, foundation structures/sub-structures, Need for load transfer device , objectives.
- Principles of foundation Engineering, challenging problems.
- Design requirements/ information needed for foundation design.
- Classification of foundations (Flexible, rigid, shallow and deep foundations).

Terminology involved in Foundation Analysis and Design

Gross bearing capacity, ultimate bearing capacity, net-ultimate bearing capacity, safe bearing capacity, net safe bearing capacity, safe bearing pressure, allowable bearing pressure.

Design Criteria for Foundation Design

Locatoin and depth criteria, shear failure criteria (safe bearing capacity criteria), settlement criteria (safe bearing pressure criteria).

Factors for Selection of Type of Foundation

Function of the structure and the loads it must carry, sub-surface condition of the soil, cost of super-structure.

Basic Design parameters for safe foundation design

- service loads (DL,LL,WL,EQL,SL,etc and their combination and reduction factors)
- safe bearing capacity
- size of footing (structural design by limit state design as in case of other RC members)
- soil pressure on foundation
- conventional analysis of foundations subjected to vertical loads and moments
- thickness of footing and its requirements
- minimum reinforcement requirement (IS:456)

Bearing Capacity of Shallow foundations

1. Bearing capacity based on the classical earth pressure theory of Rankine
2. Semi-empirical solutions based on theory of plasticity

(a). Prandtl's theory (b). Terzaghi's theory (c). Meyerhof's theory
(d). Brinch Hansen's theory (e). Vesic's theory (f). Balla's theory
(g). Skempton's theory (h). Caquot & Kerisel's theory
(i). Frochlicl's theory

3. Exact methods based on theory of plasticity:
   (a). Sokolovski's theory (1960) (b). KO etal's (1973) Non-dimensional sol.
4. Semigraphical methods of :
   (a). Fellinius for clay soils, and
   (b). Button, Brown, Meyerhof and Vesic for two layer stratified deposits.
5. Penetration Tests (insitu-tests):
   (a). SPT- Standard penetration test,

(b). SCPT- Static cone penetration test
(c). DCPT- Dynamic cone penetration test
(d). PMT- pressure meter test.
(e). VST- vane shear test.
(f). PLT- plate load test (Insitu- test).

Settlement of shallow foundations, Need for Raft foundations and design methods.

Pile Foundations

Types of piles, selection and installation, behaviour of single pile under vertical load : load transfer mechanism, methods of determining ultimate load bearing capacity of a single pile (c, c-ϕ & ϕ soils)- skin resistance (straight shaft, tapered piles) point bearing capacity, vertical bearing capacity of pile groups, settlement of pile groups, effect of negative skin friction on bearing capacity.

Vertical Piles Subjected to lateral loads:

Solution for laterally loaded single pile, closed form solution for pile of infinite length, P-y curves for the solution of laterally loaded piles in sand and clay, modulous of subgrade reaction, finite difference method,

Pile groups subjected to vertical and lateral loads.

Design and construction of well foundations/caissons

Foundations on expansive and collapsible soils.

Foundation soil improvements.

Books Recommended:

Kasmalkar, J.B. (1997). Foundation Engineering, Pune Vidyarthi Graha Prakashan-1786, Pune-411030.

Bowels, Joseph E.(1996). Practical Foundation Engineering Handbook. 5th edition, McGraw-Hill, New York.

Das, Braja M. (1999). Principles of foundation Engineering, 4th edition, PWS publishing, Pacific Grov. Calif.

Peck, Ralph B., Hansen, Walter E., and Thornburn, Thomas H. (1974). Foundation Engineering. John Wiley & Sons, New York.

Praksh, Shamsher, and Sharma, Hari D. (1990). Pile foundation in Engineering Practice, John Wiley & Sons, New York.

Som, N.N., and Das, S.C. (2003). Foundation Engineering: Principles and Practice. Prentice –Hall of India Pvt. Ltd. New Delhi-001.

Varghese, P.C. (2005). Foundation Engineering Prentice –Hall of India Pvt. Ltd. New Delhi-001.

Tomlonson, Michael J. (1995). Foundation Design and Construction. 6th edition. John Wiley & Sons, New York.

SOIL STRUCTURE INTERACTION (ELECTIVE-II)

SEMESTER: 2ND	L	T	P	C
COURSE NO. CSE-206	3	0	0	3

Soil foundation Interaction:

Introduction to soil foundation interaction problems, soil behaviour, foundation behaviour, interface behaviour, scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elastic model, Elastic Plastic behaviour, Time dependent behaviour.

Beam on Elastic foundation-soil models:

Infinite beam, two parameters, Isotropic elastic half space, analysis of beams of finite length, classification of finite beams in relation to their stiffness.

Plate on Elastic medium:

Infinite plate, Winkler, two parameters, isotropic elastic medium, thin and thick plates, analysis of finite plates: rectangular and circular plates, Numerical analysis of finite plates, simple solutions.

Elastic analysis of piles:

Elastic analysis of single pile, theoretical solutions for settlement and load distributions, analysis of pile group, interaction analysis, load distribution in groups with rigid cap.

Laterally loaded pile:

Load deflection prediction for laterally loaded piles, sub-grade reaction and elastic analysis, interaction analysis, pile raft system, solution through influence charts.

Books recommended:

Elastic analysis of soil foundation interaction By Selva durai, A.P.S.

Pile Foundation Analysis and Design By Poulos, H.G. & Davis E.H.

Foundation Analysis By Scott, R.F.

Structure Soil Interaction- State of Art Report, Institution of Structural Engineers, 1978

Geotechnical Earthquake Engineering By Kramer, S.L

CONSTRUCTION TECHNIQUES AND MANAGEMENT (ELECTIVE-IV)

SEMESTER: 2ND	L	T	P	C
COURSE NO. CSE-207	3	0	0	3

Construction planning-Construction facilities, Schedules, Layout of Plant utilities, Construction methods: Excavation and handling of Earth and Rock; Production and handling of Aggregartes and Concrete , cooling of concrete in dams, Drainage treatment of aquifers/sub-terrainean reservoirs; Tunneling, Tunneling in soft rocks-Grouting , chimney formation,etc ; Construction control and management-CPM/PERT, Human Factors, Organisation.

References:

1. Peurifoy, R.L. and Ledbetter, W.B.; Construction Planning ,Equipment and Methods, McGraw Hill Singapore, 1986.

2. Robertwade Brown; Practical Foundation Engineering Handbook, McGraw Hill Publications , 1995.
3. Joy, P.K.; Total Project Management- The Indian Context, New Delhi, MacMillan India Ltd., 1992.
4. Uliman, John.E, et al; Handbook of Engineering Management, Wiley, New York , 1986.
5. Neville, A.M.; Properties of Concerte, Pitman Publishing Ltd.,London, 1978.

ROCK MECHANICS AND TUNNELLING (ELECTIVE-IV)

SEMESTER: 2ND	L	T	P	C
COURSE NO. CSE-208	3	0	0	3

Rock Mechanics

Classification and index properties of rocks, Rock strength and failure criteria, initial stresses in rocks, influence of joints and their orientation in distribution of stresses-deformability of rocks.

Measurement of insitu, laboratory and insitu measurements of shearing, tensile and compressive strength, deformability of rocks.

Simple engineering applications in rock mechanics, underground openings, rock slopes, foundations, mining subsidence – case studies,

Rock bolt systems- installation techniques, testing of rock bolts, choice of rock bolts.

Tunnelling

Tunnel Engineering: Necessity, planning of tunnels, site investigation for tunnels, types of tunnels, tunnel alignment and grade, size and shape of a tunnel, method of constructions, methods of tunneling in hard rocks - full face method - heading and bench method - drift method - different methods of tunneling in soft soils including compressed air and shield tunneling - shafts in tunnels - ventilation of tunnel and various methods - lining of tunnels - drainage and lighting of tunnels, problems in tunnel constructions, boom tunnelling machines, full face tunnel boring machines; support of tunnels; adverse ground conditions; ground treatment and hazards in tunnelling.

Books Recommended

1. Godman, P.E."Introduction to Rock Mechanics", John Wiley, New York,1989.
2. Jager, G. "Rock Mechanics and Engineering", Cambridge University Press, 1972.
3. Stillborg, B. "Professional user handbook for racok bolting", Tran Tech publications, 1986.

4. Hock, E. and Brown, E.T. "Underground excavation in rock", Institute of Mining and Metallurgy,1980.
5. Hock, E. and Bray, J. "Rock slope Engineering", Institute of Mining and Metallurgy,1981.
6. Bickel, J.O., T.R. Kuesel, and E.H. King, "Tunnel Engineering Handbook", Chapman & Hall/ITP Publishing Company, 1996, 544 pp.
7. Parker, A. D."Planning and Estimating Underground Construction", McGraw-Hill, 1970.

DESIGN OF TALL BUILDINGS (ELECTIVE-IV)

SEMESTER: 2ND	L	T	P	C
COURSE NO. CSE-202	3	0	0	3

Structural Systems and concepts. Loading: Gravity, wind and earthquake loading. Matrix and Approximate methods, Interaction of frames, shear-wall frames, Twist of frames. Analysis of coupled shear walls. Tubular Buildings. Sequential loading, creep and shrinkage effects on tall buildings. Overall buckling analysis of frames, wall-frames, second order effects of gravity loading, P-Delta analysis.

Books recommended:

1. High Rise Building Structures — Schuellar, W
2. Structural Analysis & Design of tall Buildings — B.S. Taranath
3. Handbook of Concrete Structures — M. Fintal.
4. Tall Building Structures: Analysis & Design — B. Stafford Smith & A. Coule
5. Advances in Tall Buildings, — CBS Publishers and Distributors Delhi, 1986.

DESIGN OF INDUSTRIAL STRUCTURES

SEMESTER: 3RD	L	T	P	C
COURSE NO. CSE-301	3	0	0	3

1. Planning of Industrial Structures.
2. Design of Single & Multi-bay Industrial Structures in Concrete & Steel.
3. Bunkers & Silos.
4. Chimneys.
5. Towers.
6. Hyperbolic Cooling Towers.

Books recommended:

1. Advanced Reinforced Concrete Design, By N. Krishna Raju (CBS Publishers & Distributors).
2. Design of Steel Structures, By Ram Chandra.
3. Design of Steel Structures, By Duggal.

BRIDGE ANALYSIS AND DESIGN

SEMESTER: 3RD	L	T	P	C
COURSE NO. CSE-302	3	0	0	3

Introduction and selection of type of Bridges, Loads and forces, Theories of Lateral Load distribution, and design of Super-Structure. Grillage Analogy. Design of Composite Bridges (Steel and Conc.), Box girder bridges in concrete. Design of Abutments, Piers and their foundations. Design of Bearings. Construction methods and maintenance of Bridges.

Books recommended:

Concrete Bridge Design By Rowe, R.E
Design of Bridges By Victor Johnson
Concrete Bridge Practice Analysis, Design and Economics By Raina V.K.