|| अंतरी पेटवू ज्ञानज्योत ||

North Maharashtra University,

Jalgaon

Syllabus for Second Year Engineering
Degree Course in

CIVIL ENGINEERING

(w.e.f. July, 1999)

STRUCTURE FOR
B.E. (Civil Engineering)

SEMESTER – II

Subject Code No.	Subject	Teaching Scheme hours/Week		Examination Paper Duration	Scheme Maximum Marks			
		Lectures	Practicals	Hours	Paper	Term Work	Practical	Oral
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Theory of Structures-I	04	01 (T)	03	100	25	--	--
	Building Design and Town planning	03	04	04	100	25	--	25
	Concrete Technology & Contruction Materials	04	04	03	100	25	--	25
	Highway, Airport & Bridges	04	01(T)	03	100	25	--	--
	Fluid Mechanics	04	02	03	100	25	--	25
	Total	19	12	--	500	125	--	75
	Grand Total	31		--	700			

Note:- (T) denotes Tutorial.

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STRUCTURE FOR
S.E. (Civil Engineering)

SEMESTER - I

Subject Code No.	Subject	Teaching Scheme hours/Week Lectures	Practicals	Examination Paper Duration Hours	Scheme Maximum Marks Paper	Term Work	Practical	Oral
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Engineering Mathematics III	04	01 (T)	03	100	25	—	--
	Mechanics of Structures	04	02 (alternate week)	03	100	25	--	—
	Building Construction	04	04 ‡	03	100	25	--	25
	Geotechnical Engineering	04	02	03	100	25	--	25
	Surveying	04	04	03	100	25	25	—
	Total	20	12	--	500	125	25	50
	Grand Total	32		--	700			

Note :- (‡) 2 Periods in Computer Lab
(T) denotes Tutorial.

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ENGINEERING MATHEMATICS-III
Teaching Scheme: Theory 4+1(T) hours/week
Examination Scheme: a)Theory paper:100 Marks,
3 hours duration
b)Term Work:25 marks.

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Unit 1 :- (10 hours)

a) Linear Differential Equation:

1. Linear differential equation of nth order with constant coeffeciants.

2. Method of variation of parameters.

3. Homogeneous Linear differential equation, Legendre's Linear Differential equation.

b) Applications of linear differential equations to cantilever. loaded beams,whirling of shafts.

Unit 2 :- (10 hours)

a) Simultaneous Linear differential equation of the form
(i) $f_1(D)x+f_2(D)y=\emptyset_1(t)$

$f_1(D)x+f_2(D)y=\emptyset_1(t)$ where D=d/dt

(ii) dx/P=dy/Q=dz/R (symmetrical form)

(b) Differential equation of 1 st order and higher degree (Clauriat's form)

(c) Application of partial differential equations to :
(i) Vibration of strings or wave equations:

$$\frac{\partial y}{\partial t^2} = \alpha^2 \frac{\partial^2 y}{\partial x^2}$$

(ii) One dimensional heat flow equation:

$$\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$$

(iii) Lapalace equation,Two dimensional heat flow equation:

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

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(10 hours)

Unit 3 :-

(a) Vector Differentiation:
(i) Differentiation of vector function.
(ii) Tangential and normal components of Linear acceleration, Radial & transverse components of linear velocity and acceleration and law of central orbits.
(iii) Grandient of a scale point function, Divergence and curl of a vector point function, Irrotational and solenoidal vectors identities.

(b) Application of vectors analysis to fluid mechanics:
Equation of stream lines, streak lines, stream tube, continuity equation, Euler's equation of motions, Bernoulli's equation of motions.

(10 hours)

Unit 4:

(a) Vector Integration:
(i) Line integral, surface integral, volume integral.
(ii) Green's, Lemma, Stoke's theorem and Gausse's Divergence Theorem.

(b) Fourier Transform:
(i) Fourier Integaral Theorem (statement),
(ii) Fourier Transform, Fourier sine and cosine transforms.

(10 hours)

Unit 5:-
Probabitily and statistics:

(a) Theorems on probability, Binomial distribution, Poission distribution, Normal distribution.
(b) Co-efficient of co-relation, coefficient of regression, Line of regression, Testing of hypothesis, Decision and quality control.

Books Recommended:

(i) A Text Book of Engg.Mathematics by - P.N.Wartikar & J.N. Wartikar.
(ii) Higher Engg.Mathematics - By Wyle.
(iii) Advance Engg.Mathematics - Erwin Kreyszig.
(iv) Statistical methods - by S.P.Gupta.
(v) Adavnce Engg.Mathematics by-Wyle

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MECHANICS OF STRUCTURES

Teaching scheme : Theory- 4 Hours/Week

Practicals- 2 Hrs (Alternate Week)

Examination scheme: a) Theory paper : 100 marks

3 hours duration

b) Term work   : 25 marks.

UNIT-I

a) Stress & Strain :- Concept of stress and strain Hooke's law. Poission's ratio. Modulus of elastisity, modulus of rigidity. stress strain behaviour of ductile & brittle materials. Factor of safety & working stress, generalised Hookes's law concept of 3-D stress state,Bulk modulus,interrelation between elastic constants

b) Axial force diagrams. Stress strain and deformations in determinate. homogeneous and composite bars of following types. i) prismatic, ii) linearly varying and iii) stepped sections, under concentrated load & self weight.

c) Axial stresses and strains in indeterminate members:- Axial stress strain and deformation in following indeterminate, homogenious and composite bars.i) prismatic ii) linearly varying and iii) stepped bars, due to concentrated loads, self weight. and temp. changes.

UNIT-II

a) Shear force and bending moment diagrams:- Concept and definitions of shear force and bending moment in determinate beams due to concentrated loads, U.D.L., U.V.L and couples. Relation between S.F., B.M. and intensity of loading. To draw S.F.D. and B.M.D. for cantilevers. Simple beams, compound beams and bends defining critical and maximum values and positions of points of contraflexure. Construction of loading diagrams and B.M.D. from S.F.D., Construction loading diagram & S.F.D. from B.M.D.

b) Bending Stress :- Theory of Simple bending, assumptions, derivation of flexure formula, second moment of area of common cross sections w.r.t. centroidal and parallel axis. Bending stress distribution diagram, M.R. and section modulus,calculation of force on partial area of cross section and M.R.offered by partial areas bending of composite beams.

c) Shear Stresses :- Concept, derivation of shear   stress distribution diagram for symmetrical sections. Max. and average shear stress, shear connection between flange and web.

UNIT-III

a) Principal stresses and strain :- Normal and shear stresses on any oblique planes, Concept of principal planes, derivation of expressions for principal stresses and max. shear   stress, position of principal planes and planes of maximum shear stress Graphical solution using Mohr's circle of stresses, Combined effect of shear and bending in beams.

b) Strain Energy and Impact :- Concept of strain energy, derivation and use of expressions for deformations of axially loaded members under gradual,sudden & Impact loads. Strain energy due to self weight.

        Theories of failure - Max. Stress, Max. Strain, Max.shear stress, Maximum strain energy.

UNIT-IV

a) Axially loaded columns, concept of buckling of columns, derivation Euler's formula for critical load for column,concept of equivalent length for various end conditions, Rankine's formula, safe load on columns limitations of Euler's formula, Johnson's parabolic formula, Choice of a column formula.

b) Direct and Bending stresses in short columns and other structural components, stress distribution diagram,axial loads with single and double eccentricity on self weights combined with lateral loads. Concept of core of a section.

c) Slope and deflection of beams:-Relation between B.M.,slope and deflection for determinate beams, double integration method (Macaulay's method) derivation of formula for slope and deflection for standard cases.

UNIL-V

a) Thin walled pressure vessels :- stresses, strains and deformations in thin walled seamless cylindrical & spherical vessles due to internal fluid pressures, change in volume effect of additional compressible and incompressible fluids injected under pressure.

b) Torsion of Circular Shafts:- Stresses, strain and deformations in determinate and indeterminate shaft of hollow or solid, homogenious or composite circular cross sections subjected to twisting moment derivation of torsion formula, stress due to combined torsion and bending and axial forces for shaft.

TERM WORK .- The term work shall consist of the practicals listed below.

1. Tension test on steel wire to determine modulus of elasticity by Searle's apparatus.
2. Hardness test on metal
3. Modulus of elasticity of beam simply supported at ends
4. Shear test on metal
5. Spring test.
6. Fatigue test on metal specimen
7. Verification of forces in a framed structure.
8. To determine buckling load on column
9. Unsymmetrical bending

Reference Book :
1) Strength of materials   by Singer.
2) Strength of materials   by Timoshenko.

Text Book
1)Strength of material &
   Mechanics of structures   by B.C.Punmia.
2)Strength of material   by Ramamrutham.

BUILDING CONSTRUCTION

Teaching scheme:Theory 4 hours/week
Practical 4 hours/week
Examination scheme: a) Theory paper:100 marks,
3 hours duration.
b) Term work :25 marks.
Oral/sketches : 25 marks.

UNIT -1   (9 hours)

a) Types of building, load bearing, framed structure, steel structure,timber structure,composite structure. Various parts of building — sub structure & Super structure, plinth and plinth level,sill and sill level, lintel and lintel level, floor & floor level, roof and roof level, plinth height, plinth protection, cornice, coping etc. function of each.

b) Foundation -purposes and classification (detailed), advantages and disadvantages of each and circumtances under which each is used. Factors considerations for selection of foundation.
    Design considerations for spread footing (load bearing structure) Design of wall footing.

c) Bearing capacity of soil,safe B.C.of soil, factor of safety, methods of improvement of B.C. of soil, types of soil and bearing capacity of each type of soil.

UNIT 2   (10 hours)

a) Masonry : Principles of Masonry construction, types of masonry, Types of walls i.e. Load bearing, partition and retaining walls, Various tyes of partition walls such as brick partition, timber partition, glass partition etc.

b) Stone Masonry: Types of stone masonry and construction method, Dressing and bonding, Precast stone masonry, Through stone, proportions of mortars used for stone Masonry.

c) Brick and Block Masonry :- Various types of bonds in brick masonry, Reinforced brick masonry, precautions to be taken in Masonry constructions, composite masonry,solid and hollow blocks. Used for masonry, methods of preparation of blocks, cavity wall and cavity wall construction.

d) Design consideration for load bearing structures, effective height/thickness or length/thickness ratio of wall,wall thickness. Slenderness ratio,basic stress,load coming on wall and its design.

UNIT -3   (10 hours)

Super-structure

a) Types of lintels and arches stability consideration for arches, laying of arch, detailing of R.C.C.lintel and chhajja.

b) Doors and windows : Types of each and circumstance under which
each is used, minimum area of windows openings for different
climatic conditions, various materials used for doors and windows,
fixtures and fastening used. I.S.notations for doors and windows.

Special flooring - marble , Granite , kota ,ceramic tiles ,
artificial granite, acid proof floors.

c) Circulation:- Horizontal and vertical,Stair and staircase
planning & Design, Types of staircases as per shape and
material used. Design of staircase .
    Details of ramps, ladders, lifts and escalators used for
vertical circulation.

d) Floor and Roof:- Ground floor, upper floors, mezanine floor,
Design and construction requirements, Various type of floor
finishes used, advantages and disadvantages and
circumstances under which each is used. Damp proof Construction
of floors, walls and finishes.
    Types of roof and roof covering , flat roof and its
drainage, water proofing , false ceiling and method of fixing .
    Different types of shell structures, barrel arch, cone,
hyperbolic,parabolic,folded plate, space frame, and their uses.

UNIT-4   (10 hours)
a) Steel Trusses, various sections used for steel work method of
connections i.e.rivetted, bolted and welded, Types of trusses and
their uses, Roofs , covering materials and method of fixings
tubular structures.

b) Building finishes, objective and processes, pointing,
Plastering and painting , white wash and colour wash, Distempering
etc. on old and new surfaces, Repairs and maintenances.

c) Scaffolding, shoring , under pinning and struting,types,
purposes and precautions.

d)R.C.C. framed structure, column, beam, footing , slab and their
connections, general requirement and details.
Industrialization of building :-
    Modular Co-ordination : modular planning and recommendation,
modular tolerances, prefabrication, advantages of prefabrication,
prefabrication systems, principles of design of prefabrication ,
components precast costruction, ferro cement and ferro concrete
construction.

UNIT = 5   (9 hours)

Construction Equipment :-
a) Introduction, classification, hauling equipment, earth
moving machines, hoisting equipments, excavating and hauling
equipment, earth compactors, compressed air, conveying equipment,

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rock drilling and blasting equipment, pile driving equipment, crushers, concrete production plant, grouting and grouting equipment, dredger and dredging.

b) Form and form work: functions of form, form erection, oiling and stripping of form, requirement of form and form work, form work for various civil engineering structures, Materials used for form work, slip form constuction.

Term-Work
1) sketch Books _ 1/4 Imperial size
2) Drawing file - Imperial size

Sketch book:
1) free hand sketching practice:different type of lines , squares, rectangle, circles,Plans of buildings.
2) Lettering 6 mm, 4mm, 2mm with technical
   terms regarding construction.   -- Graph paper
3) Different types of lines, method of
   Dimensioning as per I.S. code.   -- Graph paper
4) Symbols and Conventional sign of
   materials.   -- Graph paper
5) Orthographic, Isometric, Oblique and
   Axonometric views.   -- Graph paper
   sketches after actual measurements (6to9)on Drawing sheets.
6) C.C.T.W.Panelled Door:plan, Elevation, Section.
7) Flush Door:Plan,Elevation,Section.
8) Arches in stone and brick.
9) Stone Masonry: U.C.R.,C.R., Ashlar.
10)Bonds in Brick work with Isometric view for one bone for one brick.
11)Different type of roofs.
12)Steel trusses, shells, folded plate, spaace frames etc. orthographic and three dimensional sketches.
13)Types of stairs.
14)Report regarding visits to the construction sites-- Ruled paper
15)Materials and their rates, details about work in progress (minimum two visits).
16)Introduction to CAD,Autocad menu, various commands, use and practice of OSNAD SETUP, BLOCKS, DIR, DISPLAY, DRAW, EDIT ENQUARY, LAYER,SETTINGS, PLOT AND UTILITY COMMAND.
     To draw and develop sektches by use of AUTOCAD:
foundation, Line plan, Doors & windows, Bonds,staircase, roof and floors etc.   (Any five)
17)Collection of advertisements for materials, machinery etc. used in the construction work (Ten advertisements).

18) Drawing Files :- (On Graph/Drawing paper.)
1) Residential building with load bearing structure partly flat and partly pitched roof.Drawings to be prepared from the given line plan and data. Individual drawing work is expected. Separate plan to be given.

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Plan,Front elevation, sections-Scale 1.50,Site plan -1:100,
Construction notes, schedules for doors, windows and room
finishes. Calculation of built up area.

2) Foundation plan of building in sheet No. 1, Roof plan of
building in sheet No. 1, Axonametric view showing different
members of Roof construction, walls, openings etc.

3) Two storeyed residetial building with R.C.C.framed structure
from the given line plan and data Idividual drawing work from
separate plan is expected.

Plan,front Elevation, Sections- one section passing through
staircase-Scale 1:50,site plan- 1:100, construction notes,
schedules, calculation of built up area. Use of Software for
building planning.

Books recommened

1 Building construction by   Rangwala
2 ------------------"------------   Sushil Kumar
3 ------------------"------------   Bindra and Arora
4 ------------------"------------   Punmia
5 ------------------"------------   A.K.Sharma.

GEOTECHNICAL ENGINEERING
Teaching scheme:Theory 4 hours/week
Practical 2 hours/week
Examination scheme: a) Theory paper:100 marks,
3 hours duration.
b) Term work :25 marks.
Oral   : 25 marks

UNIT-1
a)Soil as engineering Material:- Origin and Formation of soil,
geological processes,soils of India,Geotechnical problems,three
phase system,definitions and functional relationships.

b)Geotechnical properties:-Physicochemical properties engineering
properties, volume weight relationships.Atterberg's limits, sieve
analysis,identification of soil,I.S. classification system.

UNIT-2
a) Stresses in soil :-   Geostatics stresses,stresses due to
surface loading,Boussinesq's Westerguard's theories,point load,
area load and strip load,Newmark's chart,stress-strain relation-
ship soil modulus,elastic settlement.

b) Soil Compaction,M.D.D. and O.M.C.,standard proctor's test
heavy compaction test,concept of stabilisation,different
methods of stabilisation.

UNIT = 3
a) Flow of water through soils:-Soil water,capillarity,Darcy's Law
Laboratory   measurement of permeability,flow   through Layered
soils,simple field measurement,Laplace equation,Flow   net,it's
construction and uses,seepage force,quick sand,Critical gradient,
reverse filters.

b) Definition of consolidation,spring analogy, compressibility
qu,cu,mu,theory of consolidation.

UNIT = 4
a) Shear Resistance in soils :- Pore pressure and effective
stresses failure theories,Mohr-Coulomb's Law of shear strength
direct shear test,traxial test,unconfined compression test,vane
shear test, drained loading,factors affecting the shear strength.

UNIT = 5
a) Earth pressures:- Rankine's state of plastic equilibrium at
rest,active and passive states,effect of surcharge,wall friction,
back fill behind smooth wall, Rankine's theory ,coulomb's theory
determination of lateral earth pressure by analytical   and
graphical methods.(Culmann's and Poncelete's constuction.

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b) Stability of slopes :- Finite and infinite slopes,natural and man made slopes,modes of failure,slip circle method,swedish circle method,method of slices,critical height of slopes,stability number,Landslides,Remedial measures.

Term-Work:- Termwork shall comprise of following set of experiment.

Compulsory:-
(1)Field density by core cutter method,sand replacement method and clod method.

(2)Sieve analysis and particle size determination/ hydrometer analysis.

(3)Specific gravity determination by voluminometer/ pychnometer.

(4)Determination of liquid limit and plastic Limit.

(5)Determination of shrinkage limit.

(6)Determination of Co-efficient of Permeability by Constant head and by varible head permeameter.

(7)Direct Shear test.

(8)Unconfined compression test.

(9) Vane shear test.

(10) Proctor's test.

Desirable:- It is desirable that students may perform the following experiments also;
1) Differential free swell test.
2) Tri- axial test.
3) C.B.R. Test, and
4) Swelling
5) Consolidation test.

Reference Book
1.Soil Mechanics and foundation Engineering
   by - B.C.Punmia.
2.Geotechnical Engineering
   by - Garg.
3.Soil Mechanics and foundation Engineering
   by - VMS Murthy.
4.Modern Geotechnical Engineering
   by - Alam Singh.
5.Soil Mechanics in theory and practice
   by - Alam Singh
6.A text book of Geotechnical Enginnering
   by - Iqbal khan(prentice hall of India)
7.Soil mechanics and foundation Engineering
   by - Singh & Prakash
   (Nemchand & Brothers, Roorkee)
8. Soil Mechanics
   by - R.F.Craig
      E&FN SPON

Teaching scheme:Theory 4 hours/week
                 Practical 2 hours/week
                 Drawing 2hours/week
Examination scheme: a) Theory paper:100 marks,
                                   3 hours duration.
                    b) Term work :25 marks.
                       Practical : 25 marks

UNIT 1
Levelling :

a. Instruments used in levelling, Dumpy level (revision)
   Automatic level, Types of levelling staves.

b. Principal axes of Dumpy level. Testing and adjustments of Axis
   of bubble tube, a line of collimation of dumpy level.

c. Reciprocal levelling, curvature and refraction correction,
   Distance to the visible horizon.

d. Profile levelling: L-section and cross-sections.

Route Survey :

Reconnaissance survey; locating obligatory points, Preliminary
Survey, fixing gradients, paper and field location survey;
plotting L-section and cross-sections, construction survey.

UNIT = 2
Theodolite :

a. Principal axes and permanent adjustments of transit
   theodolite.

b. Uses of theodolite : Measurement of horizontal angles,
   vertical angles,magnetic bearings,prolonging a line,lining in,
   measuring deflection angles, setting out the angles,
   finding out elevations of high objects (Base accessible or
   inaccessible) by trigonometrical observations.

c. Theodolite Traversing : Computation of consecutive and
   independent co-ordinates, Adjustment of closed traverse, Sales
   Traverse by co-ordinate method, omitted measurements.

UNIT = 3
* Tacheometry:

a. Principle of stadia method, fixed hair method with vertical
   staff to determine horizontal distances and elevations of the
   points.

b. Use of Tacheometry in Surveying, Tacheometric contour survey,
   use of Tacheometric tables.

UNIT- 4
Curves :
a. Horizontal and vertical curves and their purposes.
b. Simple circular curves- Elements and setting out by linear &
   angular methods.
c. Compound Curves-Elements and setting out of compound curves.

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d. Introduction to reverse curves (No numerical problem to be asked). Elements, location and uses.

e. Transition curves- Types and uses, Length of transition curves, Elements of cubic parabola,Length of combined curve, setting out the combined curve by deflection angle method.

UNIT-5

Plane Table Survey:

a. Objective and equipment required for plane table survey.
b. Methods of plane Tabling - Radiation, Intersection, Traversing and Resection.
c. Two point & Three point problems and their solutions by different methods, strength of fix.
d. Advantages, disadvantages, limitations and Errors of Plane Tabling Survey.

Minor Instruments:

Study and use of Abney level,Box sextant,Indian Pattern clinometer and Pantagraph.

Term Work:

Details of Practical Exercises and Projects:

1. Measurement of horizontal and vertical angles by Transit Theodolite.
2. Measurement of horizontal angles of a traingle by repitation method.
                        Project - 1

3. Theodolite Traverse Survey project of a closed traverse with at least four sides.
4. Computation of horizontal distances and elevations by Tacheometry for horizontal and inclined sights.

                        Project - 2
5. Tacheometric Contouring Project with at least two instrument stations at 60 m apart.

6. Radiation and intersection methods in Plane Table Survey.

                        Project - 3

7. Plane Table Survey Project of a closed traverse of minimum four sides.
8. Solution of three - point problem in plane tabling.
9. Setting out of simple circular curve by Rankine's method of deflection angles or by offsets from chords produced.
10.Use of box sextant and Abney level.
11.Study and use of Indian pattern clinometer and pantagraph.
                        Project-4
12.Road project for minimum length of 500m,including fixing of alignment,profile levelling,and cross-sectioning.

    Note: The Termwork will consist of :
(i)Field book containing record of all exercises and projects listed above.
(ii)File of full imperial size drawing sheets as mentioned below
    1) Theodolite Traverse Survey project ... 1sheet.
    2) Tacheometric Contouring project   ... 1sheet.
    3) Plane Table Traverse survey project... 1sheet.

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4) Solution of three-point problem   ... 1sheet.
5) Road Project showing L-section,plan
   of road and Typical cross-section. ... Min-1-sheet.

References Books

1) Surveying and Levelling Vol.I&II-prof.T.P.Kanetkar and Prof.
   S.V.Kulkarni.
2) Surveying,Vol.I&II-Prof.B.C.Punmia.
3) Plane ad Geodetic Surveying for Engineers, Vol.I - Late David
   Clark.
4) Principles of Surveying - Cliver and Clendening.
5) Advance Surveying, Vol. I & II - P.B.Shahani.

Handbook

A handbook of accurate surveying methods - S.P.Collins.

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THEORY OF STRUCTURE-I
Teaching scheme:Theory 4+1(T) hours/week
Examination scheme: a) Theory paper:100 marks,
3 hours duration.

b) Term works :25 marks.

UNIT - I

a)Deflection of Beams:-
Concept of moment area method, Mohr's theorm. Use of moment area method to calulate deflections of beam such as simply supported, over hanging and of uniform cross sections and different cross sections.conjugate beam method.Principle relation between real and conjugate beam. Support conditions. Application of conjugate beam method to simply supported,overhanging and compound beams.propped contilevers.

b) Energy methods for deflection -
Concept of strain energy ,strain energy due to bending, shear and torsion. Maxwell's reciprocal theorm of deflection. castiglino's theorm. Use of strain energy and unit load methods for finding out of deflections for beams bends. Rectangular portal frame analysis.

UNIT- II
a) Deflection of trusses:-
Use of energy methods for finding out deflections of statically determinate plane trusses. Unit load method.

b) Three hinged arch:-
Concept of three hinged arch as a haunched beams, support reaction.B.M.,S.F. and axial thrust diagrams for circular and parabolic. three hinged arches.Influence lines for B.M.,S.F. and axial thrust maximum B.M., S.F. and axial thrust due to point loads & UDL only .

UNIT III
a) Unsymmetrical bending & concept of shear centre:-
Bending axis and shear flow position of shear centre.Shear centre of:i)Channel sections ii) Angle sections iii)T-sections iv) Un-symmetrical I sections and v) symmetrical sections.

b) Theory of Elasticity:- Concepts of stress,stress components, stress equilibrium equations,concept of strain,strain components, stress displacement relations, compatibility conditions, generalised Hook's law,Plain stress & plain strain problem, strain rosette analysis.

UNIT-IV
a) Influence lines:- Basic concept,influence line for reactions, B.M.& S.F. for simply supported, overhanging, compound beams. Influence lines for member statically determinant plane trusses.
Calculations for S.F & B.M for beam and for force in the truss member using influence lines.
b) Moving loads:- Introduction,conductions for maximum BM and maximum S.F.at 0 section due to moving point loads,UDL,longer or shorter than span and train of moving loads.Absolute maximum B.M. & S.F., Construction of Max. B.M. diagram.

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UNIT-V

a) Fixed Beams:- Concept,adavantages and disadvantages.Nature of B.M.Diagrams.Fixed end moment due to various types of loads such as point,uniformly distributed,Uniformly varying,couples for beams of uniform c/s and stepped cross sections.Effect of sinking of support.B.M.D & S.F.D.

b)Continuous Beams:- Concept, Nature of B.M. diagrams,Claperon's theorm of three moments for beams of constant cross section for different c/s,for different spans due to concentrated load, UDL, couples.Effect of sinking of supports,plotting of B.M. & S.F. diagrams.

Term Work :-

Term work shall consist of assignment given on the syllabus given above.

Reference Books:-

1) Analysis of structure by V.N.Vazirani & M.M.Ratwani (Volume -I&II)
2) Theory of structure by - S.Rammamrutham.
3) Basic structural analysis by C.S.Reddy.
4) Indeterminate structures by C.K.Wang.

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BUILDING DESIGN,DRAWING AND TOWN PLANNAING
Teaching scheme:Theory 3 hours/week
Practical 4hours/week
Examination scheme: a) Theory paper:100 marks,
4 hours duration.
b) Term works :25 marks.
oral :25 marks.

SECTION - A

UNIT - 1
a) Building: definition and types of buildings as per occupancy, principles of planning of building .Principles of architectural planning,form follows function,Anthropometric studies and its importance in planning,Laws of composition, plan sanctioning, tracings and blue prints.

b) Building Byelaws,Necessary of laws,plot size,road width,open areas,F.A.R./F.S.I., marginal distances, building lines, control lines,Height regulations,size of room,Built-up area floor area, plinth area,carpet area,Rules for these are as per town. ventilation and lighting requirements,drainage and sanitation, parking.

c) 1) Strucural safety,construction safety, fire safety, 2) fire escape health safety regulation for high rise buildings and their fire protection.

d) Working drawings and its importance type of working drawings, schedule of doors & Windows,schedule of areas,schedule offloors, foundation plan,layout plan etc.

e) Planning of residential,commercial,office,institutional, industrial and other buildings.
        planning of living area, sleeping area, working area etc and their grouping,common/broad aspects of vastu shastra.

f) Introduction to computer graphics and study of any one software for planning of residential buildings.

 Note:- There will be one question of forty marks, consisting of planning of any one type of building and drawing its plan,section, elevation to an appropriate scale and including various schedules.

SECTION - B

UNIT - 2
a) Ventilation and air conditioning of buildings,necessity of ventilation,functional requirements,systems of ventilation and their choice,movement of wind through buildings,wind effect,stack effect,effect of various surrounding and other bodies on air movement,air changes and its necessity.
        Air conditioning: classification, comfort   and   comfort conditions,principles and system of comfort,object and necessity of air conditioning,industrial air conditioning, air   cooling system.Factors affecting air conditioning   and cooling systems of office buildings,cinema halls,residential buildings,hospitals, nursing homes etc.

b) Thermal Insulation of building,climate,thermal comfort, heat exchange of buildings,general principles and means of thermal insulation,structural control,heat insulation of roofs and exposed walls,use of sun breakers,chhajja and insulating glass.

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c) Fire protection,fire load and fire safety,grading of occupancy by fire load,considerations in fire protection,properties of fire resistance, construction walls and columns,floors and roofs,wall openings,fire-escape elements,fire hydrants,fire drains,sprinklers system,fire extinguisher system.

d) Acoustics absroption defects of sound and its reverbration, Sabine's formula, acoustical sound absorption,acoustical design of cinema hall and class rooms.
    Noise,effects,types,noise control and insulation of stuctures against air borne and structural borne noise,transmission of noise, acceptable noise level.

UNIT -3
a) Lighting,natural and artificial,Design of windows for clear daylight,sky daylight factor,necessity of artificial light,maximum light required at working table.

b) Building services and plumbing,constructional requirement for different building services electrical installation, air conditioning and heating work,lifts and escalators,design of lift capacity.
Plumbing services: Layout of water supply and drainage system of building,Rate of water supply and storage of water one pipe and two pipe system, vent and siphonage pipes traps,sanitary fitting and their levels system of plumbing,use of septic tank.

c) Non-conventional energies for design of building different forms of energies,solar,wind,Biomass,solar water heaters,types and plumbing,energies from night soil and garbages,its system and use of plotting line Diagram for any building with given data,foundation plan.

UNIT -4
Perspective drawing,one point,two point and multi-point perspective, method of drawing,perspective view for various objects and buildings.Birds eye view and its importance, Axnometric view and its importance.

UNIT -5   TOWN PLANNING
a) Introduction:- Object of town planning,principles of town planning. Necessity of town planning,origin of towns,stages in town development,distribution of landuses, forms of planning, site for an ideal town,requirements of new towns,planning of the modern towns,present position of planning in India.

b) Surveys :- Necessity,collection of data ,types of surveys,uses of surveys, methods adopted to collect data,drawings,report.

c) Zoning:-Meaning of the term,usesof land,objects,principles of zoning,Advantages of zoning ,importance of zoning ,aspects of zoning ,transition Zone,Economy of Zoning,Zoning Powers,maps for Zoning.

d) Slums:- General,causes of slum,characteristics of slums Effect of slum ,slum clearance,works of improvement,open plots scheme,slum clearance and rehousing,prevention of slum formation,Resources for slum clearance programmes,the Indian slum.

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e) Parks and playgrounds:-Types of recreation,Location of urbangreen spaces,classification of parks systems,park design, finance for park, parkways, Boulevards, playgrounds, space standards, landscape architecture.

f) Industries :- Classification of Industries concentration of Industries Requirements of an industry, site location of an industry, measure to control location of industries, Industrial townships,Treatment of industrial wastes.

g) Re-planning existing towns:-
Objects of replanning, Defects of existing towns, data to be collected, Urban renewed Projects, Decentralization and Recentralization,Garden City, Surface drains, Refuse of town.

h) Master plan :-
Objects, necessity, data to be collected,drawings to be prepared, Features of master plan, Planning standards, Reports, stages of Preparation, method of execution, conclusion. Case study of planning of Chandigarh, Bangalore, and Bhubaneshwar.

Sheets

1. Layout Plan showing different buildings, Drawing Sheet.
   Internal roads, compound wall,entrance gates, garden,Electrical poles, free plantations etc.

2. Working Drawings.

3. a) Plan / typical floor plan scale 1:50   Drawing Sheet.
   b) Elevation- scale 1:50   Tracing Paper
   c) Car parking plan /Terrace plan as per requirment   Tracing Paper
   d) Foundation plan - scale 1:50   Tracing Paper
   e) Structural Plan - scale 1:50   Tracing Paper
   f) Sections and details 1:50   Tracing Paper
   g) Layout Plan showing water supply and drainage arrangement   Tracing Paper
   h) Axenometric view.   Tracing Paper

Report file

Report file consist of -

1. a) Data given for project
   b) Analysis of the programme
   c) Planning consideration , line plans.
   d) Approximate cost of the building .

2. Report regarding visit to construction sites, Preferably visit to the type of building given for the project (Minimum two)

3. Advertisements / brochures regarding materials construction machinery , schemes of promoters and builders (minimum ten)

Assessment

Term work shall be assessed with reference to draughtsmanship dimensioning composition of different details, views and sufficient notes and dimension for preparing estimate colouring with pencils and sketch pens recommended as per colours suggested by I.S.code.
    Study of any one software for building planning.

Term work

Term work shall consist of drawing file of imperial size and report file.

Drawing file

Sheet No.01 :- Planning of a small bungalow from the given data. Load bearing /framed structure. Plan showing furniture arrangement, front elevation and site plan. Built up area calculation and schedules.

Sheet No.2 :- Perpective view of first sheet plan

Assignment : 1 Computer graphics (Autocad)
Project work - Project work shall consist of Preparation of Working drawings after planning and designing building from given data.

Any one types to be given.
Number of buildings in one plot to be stated for preparing layout plan

1. Residential buildings :
   a) Bungalows b) Row houses c) Ownership flats d) Apartments

2. Nursery School / Primary School - with staff quarters.

3. Hostel buiding with Rector's and servants quarters.

4. Lodge / Hotel building

5. Primary health centre , staff quarters.

6. Factory building -Administrative block and factory

7. Bus stand

8. Library building

9. Commercial complex building.

10. Bank building with staff quarter

Students are supposed to prepare their industrial plan.

Books recommended

1) Building Drawing -
        M.G.Shah, C.M. Kale , S.Y.Patki.

2) Planning & Designing Building
        Y.S.Sane

3) Civil Engineering Drawing S.V.Deodhar

4) Town Planning - Rangwala

5) Town Planning - Hiraskar

6) Town and country planning by Modak and Ambedkar.

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CONCRETE TECHNOLOGY AND CONSTUCTION MATERIALS
Teaching scheme:Theory 4 hours/week
Practical 4hours/week
Examination scheme: a) Theory paper:100 marks,
3 hours duration.
b) Term works :25 marks.
Oral :25 marks.

UNIT = 1
Cement : process of manufacture of cement; raw materials used,
Boques compound, clinker formation, storage of cement; chemistry
of Portland cement, Hydration of cement; setting and hardening;
effect of other materials on hydration of cement, types of cement,
grades of cement, properties and testing of cement,
various factors affecting strength of cement, field testing, soil
cement and ferro-cement.
Water - its quality for its suitability to be used in concrete.
Admixtures - their effect and classification.
Lime - Properties and uses, Burning of limestone and
classification of lime, testing of lime, laboratory and field
test.

UNIT = 2
Stone and aggregates-
Brief classification of Rock, Quarry and Quarrying, conversion of
Rock into stone, classification of stone as per its formation and
use like stone, slab, rubble, aggregate etc. Use of stones,
properties and testing of stone; Various stones used.
Aggregate - Classification as per size boulder, rubble, coarse
and fine aggregates, classification as per shape - angular,
rounded, flaky; grading of aggregates and sieve analysis,
fineness modulus of cores, fine and all in aggregate, bleeding of
aggregate, properties and testing of fine and coarse aggregate,
bulking of sand, requirement of aggregate for mortar and
concrete.

UNIT = 3
Concrete: Its constituents, grades of concrete, manufacture of
concrete and concreting processes, mixing good concrete,
concreting under special conditions, like hot weather concrete,
cold weather concrete, concreting under water, etc. Properties
and testing of concrete, non-destructive testing of concrete,
workability, durability, permeability , shrinkage and creep of
concrete, water-cement ratio, structural properties of concrete,
types of concrete and circumstances under which each is used
including their properties, construction joints in concrete,
ferro-concrete, lime-concrete - its properties and uses.

UNIT- 4
Method of proportioning of concrete, concrete mix design,
procedure of mix design, statistical quality control in mixed
design; Road note no. 4, American Concrete Institute, Indian road
concrete and Indian standard methods of mix design, method of
rapid estimation of mix design and mix design based on
flexural strength.

UNIT = 5
Bricks and tiles - Process of manufacture of bricks, soil
available in India and manufacture of bricks from various soils
available in India; constituents of good bricks earth; I.S.
classification of bricks, properties and testing of bricks,
characterstics of good bricks.

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Other types of bricks; Engineering bricks, Metric bricks, Refractory bricks, Fire bricks, etc.
Other clay products - Pozzolona and Ceramics, Terracota, glazeware, stoneware, earthware, etc.
Flooring and roofing tiles; testing and I.S. classification.
Cement concrete blocks, solid and hollow.

Timber: properties and uses, testing, conversion and sawing, defects in timber, Veneers, plywood and block board, particle board, artificial timber.

Practicals :
1. Testing of cement - a. Fineness of cement
                       b. setting time
                       c. compressive strength
                       d. soundness

2. Testing of aggregate a. fineness modulus and sieve analysis , b. crushing value, c. impact value d. moisture content, e. abrasion test, f. shape test, g. specific gravity and water absorption.

3. Testing of concrete
a. Workability of concrete
   (Slump cone and compaction factor).
b. Compressive strength (cubes and cylinders)
c. Split test ie tensile test of cylinders
d. Modulus of rupture (flexural strength)
e. Concrete mix design by I. S. method.
f. Non Destructive Test.

4. Testing of Bricks - a. Water absorption of brick
                       b. Compressive strength

5. Testing of tiles - a. Transverse strength for roofing tile.
                      b. Abrasion and transverse test for flooring tiles.

6. Testing of timber - a. Moisture content
                       b. Bending

7. Testing of metals - a. Tension test (M.S.,Tor steel)
                       b. shear test(single and double)
                       c. Torsion test (M.S. and cast iron)
                       d. Impact test(Izod and Charpy)on M.S.,
                          C.I., Brass, Al., Copper.

8. Bitumen testing - Penetration, ductility, softening point, specific gravity, flash and fire point, viscosity test.

9. Marshal - Stability test on Bitumen premix.

Method of submission of testing report of various materials (Proforma of test report may be based on standard practice followed in govt. organisation).

Reference Books:
Concrete Technology by M.S. Shetty
                       S.V. Deodhar
Civil Engineering Materials by Janardhan Jha
_____"_____"_____ Sushilkumar Shinde
_____"_____"_____ Vazirani and Chandola
_____"_____"_____ Rangwala
_____"_____"_____ S.V. Deodhar
_____"_____"_____ D.S. Arora

HIGHWAY,AIRPORT AND BRIDGES
Teaching scheme:Theory 4+1(T) hours/week
Examination scheme: a) Theory paper:100 marks,
3 hours duration.
b) Term works :25 marks.

UNIT - 1
a) Principles of highway planning, road development and planning in India, Highway financing.

b) Highway alignment - requirements, factors controlling highway alignment, engineering surveys for highway location, basic requirments for an ideal alignment, special requirement for hill roads.

c) various types of roads, method of construction, quantity of material required and quality control.

d) Geometric design - cross section, element width, camber, design speed, sight distance, overtaking sight distance, super elevation, gradient, requirement and design of horizontal and vertical alignment.

UNIT-2
a) Traffic Engineering - Traffic characteristics, vehicle characteristics, traffic studies and the use, traffic operation, traffic control devices, types of road intersection.

b) Behaviour of highway materials - properties of subgrade and pavement components, materials, material interaction. Test on subgrade soil, aggregate and bitumen material, test on bitumen and aggregate; requirments of bitumen mixes, Marshal tests, stabilized soil mixes.

c) Introduction of pavement of design - factors in design of flexible and rigid pavement. Group index and C.B.R. method, Westergaurd analysis of wheel load stresses in rigid pavement I.R.C. recommendations.

d) Typical problems in highway - Drainage surface and subsoil, pavement failure, evaluation, maintenance.

UNIT-3
a) Airport Planning - the important characteristics of aircraft which influence judicious and scientific planning of airport selection of site for airport important term.

b) Airport Layout -Location of terminal building, aprons and hangers, Design criteria, characteristics of good layout for an airfield, zoning requirements regarding the permissible height of constructions and the land use within the airport boundry.

c) Aviation organisation and their function, airport drainage surface, subsurface drainage. Airport Authority of India's byelaws.

d) Runway and taxiway - Influence and wing characteristics on orientation of runways, use of windrose diagrams basic patterns of runways, basic recommendation regarding length, width and gradients of runways and taxiways.
   Lighting, marking and signs - Approach, runway, taxiway lighting, runway taxiway marking, taxiway sign system.

e) Heliports – Main characteristics of Helicopters, nature of helicopters transport, site selection for helicopters. Typical layouts, protection of approach and departure paths, elevated heliports.

UNIT-4
a) Classification of bridges, selection of site, determination of design discharge, linear waterway, economical span, location of piers and abutment, afflux, scour depth.

b) Standard specification for bridges –I.R.C.-bridge code, width of carrigeway and clearance, loadings, Indian Railway bridge loading, forces acting on bridge structures, design consideration, aesthetics of bridge design.

UNIT-5
a) Various types of bridges, culverts–slab, pipe and box type, R.C.C. bridge–'T' beam, half hollow girder, balanced cantilever, continuous girder, rigid framed arch, bow string girder, prestressed concrete bridges, steel bridges, plate girder, box girder, truss, arch cable stayed, cantilever and suspension bridges, temporary and movable bridges, floating pontoons bridges.

b) Selection of a suitable type of bridge, types of bridge foundation, their choice and methods of constuction, bearing and their types, design consideration.

Introduction to different techniques of erection of bridge super structure and bridge maintainance.

Term Work :
T.W. Shall be based on practicals performed in list of experiments given in CONCRETE TECHNOLOGY AND CONSTRUCTION MATERIALS and three assignment sheet based on respective portion on syllabus .

Reference Books

1. Highway Engineering by Justo Khanna.

2. Highway Engineering by Rangwala.

3. Highway Engineering and Airports by K.L.Bhanot & S.B.Sehgal.

4. Airport Engineering by Rangwala.

5. Airport Engineering by G.Venkatappa Rao.

6. Bridge Engineering by S.P.Bindra.

7. Bridge Engineering by S.Ponnuswamy.

FLUID MECHANICS
Teaching scheme: Theory 4 hours/week
Practical 2 hours/week
Examination scheme: a) Theory paper:100 marks,
3 hours duration.
b) Term works :25 marks.
Oral :25 marks.

UNIT-1
a) Introduction - Scope and application of fluid mechanics, Newton's law of viscosity, classification of fluids, Newton's and non-Newtonion fluids, ideal and real fluids. Physical properties of fluids- density, specific weight, specific volume, specific gravity, dynamic and kinematic viscosity, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure, perfect gas law.

b) Fluid statics - fluid pressure, pressure head, measurement of pressure, manometers and Bourdon's pressure gauge, civil engineering applications of pressure forces on plane and curved surfaces and buoyancy and floation.

UNIT - 2
a) Kinematics of fluid flow - velocity of fluid particles, types of fluid flow - steady and unsteady; uniform and nonuniform; laminar and turbulent; one, two, three dimensional flow; rotational and irrotational flows; stream lines and equipotential lines.
Equation of continuity for one-dimensional and three-dimensional flows. Flow net, electrical analogy method of drawing flow net related to civil engineering.

b) Dynamics of fluid flow - Forces acting on fluids in motion, Bernoulli's theorem, simple applications of continuity and Bernoulli's equation such as Pitot tube, venturimeter, orificemeter, cavitations. Introduction to linear momentum theorems, introduction to Navier - Stoke's equation.

UNIT - 3
a) Dimensional analysis and Hydraulic similitude - Dimensions of physical quantities, dimensional homogeneity, Buckingham pie-theorem, important dimensionless parameter and their significance.
Model analysis, geometric, kinematic and dynamic similitude, model laws, types of models.
Application of dimensional and model analysis to fluid flow problems.

b) Laminar flow - Flow through pipes, flow between parallel plates, Stoke's law, various methods of measurement of viscosity, flow through porous media, Darcy's law, Reynold's experiment, transition from laminar to turbulent flow.

UNIT - 4
a) Flow through opening - Orifices, co-efficient of viscosity, contraction and discharge, external cylindrical mouth piece, sluice gates.
B. Flows over notches and weir - Rectangular, triangular and trapezoidal notches and weirs, Cipolleti weir, emperical formulae for discharge over rectangular weirs, corrections for velocity of approach and end contractions, broad crested weirs, Sutro weir, stepped notch.

UNIT - 5

Open Channel flow - Classification, geometric elements, steady, unsteady, uniform and nonuniform flow, subcritical critical and supercritical flow, continuity and energy equations, kinetic energy and momentum correction factors.

Uniform flow concept of normal depth, Chezy and Manning's equations, roughness co-efficients.

Economic sections, specific energy, specific energy diagrams, critical, subcritical flow, conditions for critical depth in rectangular and trapezoidal channel.

Practicals :

Experiments will be based on the critical portion as detailed below. Experiments given below will have to be performed.
1. Measurement of viscosity.
2. Study of pressure measuring devices.
3. Buoyancy.
4. Study of Bernoulli's theorem.
5. Calibration of Venturimeter or Orificemeter.
6. Electrical analogy.
7. Study of laminer flow / Haleshaw's apparatus.
8. Cd of Orifice / Mouthpiece / notches.
9. Impact of jet.
10. Study of uniform flow in open channel / velocity distribution in open channels.
11. Specific energy and specific force.

Termwork : Termwork will consist of a journal giving detail of experiments performed. Minimum 10 experiments should be performed.

Oral : Oral shall be based on term work.

Reference Books :

1. Fluid Mechanics by Subramanya.
2. Hydraulic and Fluid Mechanics by Dr. P. N. Modi,
                                                    Dr. S. M. Seth.
3. Hydraulic and Fluid Mechanics by R. K. Bansal.
4. Fluid Mechanics Hydraulic and Hydraulic Machine by K.R.Arora.
5. Fluid Mechanics by A. K. Jain.
6. Hydraulic Fluid Mechanics and Fluid Machines by Ramamurthum.
7. Fluid Mechanics by Garde and Mirajgaokar.
8. Fluid Mechanics by Streter and Wylie.
9. Theory and applications of Fluid Mechanics by K.Subramanya.

Computerised Type setting work done by:-

1] Prof.P.M.Patil.

2] Shri.Jitendra Patil.

3] Shri.Sharad Mahale.