SHIVAJI UNIVERSITY, KOLHAPUR

S. E. (Civil) SYLLABUS STRUCTURE

SEMESTER-III (Part I)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory Paper	TW	POE	OE	Total
1	Engg. Math-III	3	---	01	---	4	100	25	---	---	125
2	Surveying-I	3	4	---	---	7	100	50	50	---	200
3	Strength of Material -I	3	2	---	---	5	100	25	---	25	150
4	Fluid Mech-I	3	2	---	---	5	100	25	25	---	150
5	Building Constructions & MATERIALS	3	---	---	2	5	100	50	---	---	150
6	Numerical Methods	2	2	---	---	4	---	25	---	---	25
Total		**17**	**10**	**01**	**2**	**30**	**500**	**200**	**75**	**25**	**800**

SEMESTER-IV (Part II)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Structural Mechanics	4	---	---	---	4	100	---	---	---	100
2	Surveying -II	4	2	---	---	6	100	50	25	---	175
3	Concrete Technology	3	2	---	---	5	100	50	--		150
4	Fluid Mech-II	3	2	---	---	5	100	25	---	---	125
5	Building Design & Drawing	4	---	---	4	8	100	50	50	---	200
6	CAD	---	2	---	---	2	---	50	---	---	50
Total		**18**	**8**	**---**	**4**	**30**	**500**	**225**	**75**	**---**	**800**

Dr. Patil P. S.

Chairman

B. O. S. Civil Engineering

SHIVAJI UNIVERSITY, KOLHAPUR

T. E. (Civil) SYLLABUS STRUCTURE

SEMESTER-VI (Part I)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Water Resource Engg-I	3	2	---	---	5	100	50	---	---	150
2	Design of Steel Structures	4	---	--	---	4	100	--	---	---	100
3	Environmental Engg-I	3	2	---	---	5	100	25	25	---	150
4	Geotechnical Engg-I	3	2	---	---	5	100	50	25	---	150
5	Engineering Geology	3	2	---	---	5	100	50	---	--	150
6	Building Planning & Design	2	---	---	4	6	---	50	50	---	100
Total		**18**	**8**	**--**	**4**	**30**	**500**	**175**	**100**	**25**	**800**

SEMESTER-VII (Part II)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Theory of Structures	4	2	---	---	5	100	25	---	---	125
2	Geotechnical Engg-II	3	2	---	---	5	100	50	---	---	150
3	Engineering Management -I	3	---	---	---	4	100	---	---	---	100
4	Transportation-I	3	2	---	---	5	100	25	---	25	150
5	Environment Engineering-II	3	2	---	---	5	100	25	---	---	125
6	SDD-I	---	---	---	4	4	---	50	---	25	75
7	Seminar	---	2	---	---	2	---	50	---	---	50
Total		**16**	**10**	**---**	**4**	**30**	**500**	**250**	**---**	**50**	**800**

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B. E. (Civil) SYLLABUS STRUCTURE

SEMESTER-VII (Part I)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Design of Steel Structures	3	4	---	---	7	100	50	---	---	150
2	Earthquake Engineering	3	2	---	---	5	100	25	---	---	125
3	Quantity Surveying & Valuation	4	2	---	---	6	100	50	**25**	---	175
4	Engineering Management-II	3	2	---	---	5	100	25	---	---	125
5	Elective-I	3	2	---	---	5	100	25	---	25	150
6	PROJECT	---	2	---	---	2	---	50	**25**	---	75
Total		**16**	**14**	**--**	**---**	**30**	**500**	**225**	**50**	**25**	**800**

SEMESTER-VIII (Part II)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Design of Concrete Structures-II	4	2	---	---	6	100	25	---	---	125
2	Water Resource Engineering -II	3	2	---	---	5	100	25	---	25	150
3	Trensportation -II	3	---	---	---	3	100	---	---	---	100
4	Elective-II*	3	---	---	---	3	100	---	---	---	100
5	Elective –III**	3	---	---	---	3	100	---	---	---	100
6	SDD-II	---	2	---	2	4	---	50	---	25	75
7	PROJECT	---	4	---	---	4	---	50	100	---	150
Total		**16**	**12**	**---**	**2**	**30**	**500**	**150**	**100**	**50**	**800**

*Elective from structure group, **Elective from non-structure group

Dr. Patil P. S.

Chairman , B. O. S. Civil Engineering

SHIVAJI UNIVERSITY, KOLHAPUR
S. E. (Civil) SYLLABUS STRUCTURE

SEMESTER-III (Part I)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory Paper	TW	POE	OE	Total
1	Engineering Mathematics -III	3	---	1	---	4	100	25	---	---	125
2	Surveying-I	3	4	---	---	7	100	50	50	---	200
3	Strength of Materials	3	2	---	---	5	100	25	---	25	150
4	Fluid Mechanics -I	3	2	---	---	5	100	25	25	---	150
5	Building Construction and Materials	3	---	---	2	5	100	50	---	---	150
6	Numerical Methods	2	2	---	---	4	---	25	---	---	25
Total		**17**	**10**	**01**	**2**	**30**	**500**	**200**	**75**	**25**	**800**

SEMESTER-IV (Part II)

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Structural Mechanics	4	---	---	---	4	100	---	---	---	100
2	Surveying -II	4	2	---	---	6	100	50	25	---	175
3	Concrete Technology	3	2	---	---	5	100	50	---	---	150
4	Fluid Mechanics -II	3	2	---	---	5	100	25	---	---	125
5	Building Design and Drawing	4	---	---	4	8	100	50	50	---	200
6	Computer Aided Drawing	---	2	---	---	2	---	50	---	---	50
Total		**18**	**8**	**---**	**4**	**30**	**500**	**225**	**75**	**---**	**800**

PART I

ENGINEERING MATHEMATICS – III (REVISED)

Teaching Scheme
Lectures: 3 hours/week

Examination Scheme:
Tutorial: 1 hour/week
Theory: 100 marks (3Hrs Duration)

Course Outcomes:
After completing of this course, student will be able to:

1. Apply basic mathematical tools for solving engineering problems.
2. Develop logical and critical thinking and the ability to reflect critically upon their work.
3. Provide skills in vector calculus and linear differential equations which would enable them to devise engineering solutions for given situations they may encounter in their profession.
4. Cover the topics in probability and statistics with emphasize on the application of probability theories and statistical techniques to practical engineering problems.
5. Deploy skills effectively in the solution of problems, principally in the area of engineering.

SECTION – I

Unit 1 Linear Differential Equations **8hrs**

1.1. Linear Differential Equations with constant coefficients Definition, Complementary function and Particular integral (without method of variation of Parameters).

1.2 Applications of Linear Differential Equations with constant coefficients:

1.2.1 Cantilever
1.2.2 Strut
1.2.3 Beam

Unit 2 Vector Calculus **6hrs**

2.1 Differentiation of vectors
2.2 Gradient of scalar point function and Directional derivative
2.3 Divergence of vector point function and Solenoidal vector fields.
2.4 Curl of a vector point function and Irrotational.

Unit 3 Curve Fitting **6hrs**

3.1 Lines of regression of bivariate data,
3.2 Fitting of Curves by method of Least-squares.
3.2.1 Fitting of Straight lines
3.2.2 Fitting of Parabola
3.2.3 Fitting of exponential curves.

SECTION – II

Unit 4 Probability Distributions **6hrs**

4.1 Random variable
4.2 Binomial Distribution
4.3 Poisson Distribution
4.4 Normal Distribution

Unit 5 Laplace Transform **7hrs**

5.1 Definition, Transforms of elementary functions, Properties of Laplace transform.
5.2 Transforms of derivatives and Integral.
5.3 Inverse Laplace transforms formulae.
5.4 Inverse Laplace transforms by using partial fractions and Convolution theorem.
5.5 Solution of Linear differential equation with constants coefficients by Laplace transforms method.

Unit 6 Calculus of Complex Functions **8hrs**

6.1 Functions of complex variable,
6.2 Analytic function, necessary and sufficient conditions for f (z) to be analytic (without proof), Cauchy-Riemann equations in polar coordinates.
6.3 Milne- Thomson method to determine analytic function f (z).
6.4 Harmonic function, orthogonal trajectories.
6.5 Complex integration, Cauchy's theorem and Cauchy's integral formula (without proof)

General Instructions:

1. For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch should be as per university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

Nature of Question paper:

1. There will be two sections carrying 50 marks each.
2. Each section should have three questions having internal option.

Reference Books:

1. A text book of Applied Mathematics: Vol. I, II and III by J. N. Wartikar & P. N. Wartikar, Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal.
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4. Advanced Engineering Mathematics, by H. K. Das (S. Chand Publication.).
5. Advanced Engineering Mathematics, by Merle C. Potter (OXFORD University Press)

SURVEYING-I (REVISED)

Teaching Scheme:
Lectures: 3 Hours per week
Practical: 4 hour per week

Examination Scheme:
Theory paper: 100 marks
Term work: 50 marks
Practical-Oral: 50 Marks

Course Outcomes:

After completing of this course, student will be able to:

1. Determine linear and angular measurements
2. Record various measurements in the field book
3. Find areas of irregular figures
4. Prepare plans and sections required for civil engineering projects

SECTION I

Unit 1- Levelling and Contouring **9hrs**

a) Types, components and use of levels, Types of levelling, objectives and applications
b) Adjustments of dumpy and tilting level
c) Sensitivity of bubble tube, Corrections – curvature and refraction
d) Contouring – methods and applications

Unit 2 – Areas and volumes **5hrs**

a) Planimeter – types and applications
b) Trapezoidal and Simpsons rule
c) Capacity contouring

Unit 3 – Plane Table Surveying **4hrs**

a) Principles, accessories, significance and adjustments
b) Methods and applications of plane table survey

SECTION - II

Unit 4 – Theodolite **6hrs**

a) Vernier theodolite – components, uses and adjustments
b) Applications – Trigonometrical levelling

Unit 5 – Theodolite traversing **7hrs**

a) Objectives, traverse table, plotting
b) Omitted measurements

Unit 6 – Applications **5hrs**

a) Usage of minor instruments for different surveys
b) Hydrographic survey
c) Tunnel survey
d) Reconnaissance, preliminary and detailed survey for road and railway projects

Term Work:

1. Differential and reciprocal levelling with dumpy, tilting and autolevel 3
2. Sensitivity of bubble tube 1
3. Permanent adjustments of dumpy and tilting levels 1
4. Area measurements by mechanical and digital planimeter 2
5. Methods of plane table survey 2
6. Measurement of horizontal angles by different methods by theodolite 3
7. Measurement of vertical angles by theodolite 1
8. Measurement of bearing, deflection angle, and prolonging of line by theodolite 1
9. Trigonometrical levelling – both planes by theodolite 2
10. Usage of minor instruments 1
11. Project drawings

Survey Projects:

1. Block contouring project for at least 100m x 100m
2. Theodolite traverse – Pentagon

References:

1. Surveying Vol. I, II and III - Dr. B.C. Punmia, Laxmi Publishers, New Delhi.

2. Surveying and Levelling Vol. I and II - T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruha

3. Surveying Vol. I, II and III - Dr. K.R. Arora, Standard Book House, New Delhi.

4. Surveying Vol. I and II - S. K. Duggal, Tata Mcgraw Hill, New Delhi.

5. Surveying and Levelling - N.N. Basak, Tata Mcgraw Hill, New Delhi.

6. Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi

7. Plane surveying – David Clark.

STRENGTH OF MATERIALS (REVISED)

Teaching Scheme:
Theory : 3 Lecture Hours / Week
Practical : 2 Hours / Week

Examination Scheme:
Theory : 100 marks
Term Work: 25marks
Oral : 25 marks

Course Outcomes:
After completion of the subject, Student will able to:

1. Calculates the response of elastic body for external actions.
2. List the different engineering properties and behavior of the materials
3. Computes the design forces.
4. Analyze the stress, strain and deformation of elastic bodies under external actions

SECTION I

Unit 1 : Engineering properties of different materials, St.Venant's principle, simple stress and strain, Hooke's law, elastic behavior of the body under external actions , composite sections under axial loading, temperature stresses , elastic constants , normal stresses and strains in three dimensions . **9hrs**

Unit 2: Analysis of statically determinate beams S.F. and B.M. diagrams, virtual work approach for computation of shear force and bending moment. **6hrs**

Unit 3: Analysis of circular shafts subjected to torsion, power transmitted. Analysis of thin walled cylinders. **5hrs**

SECTION II

Unit 4: Bending Stresses in beams, simple design problems **6hrs**

Unit 5: Shear stress distribution in beams **5hrs**

Unit 6: Strain energy due to different types of actions, impact loading.Strain energy method for deflection of determinate beams, bents and trusses **9hrs**

Term Work:

Term work shall comprise of –

A) Any Seven
   i) Study of Universal Testing Machine .
   ii) Tensile test on Mild steel and TMT steel.
   iii) Compression test on M.S. and C.I, cement bricks or paving blocks
   iv) Compression test on timber.
   v) Direct shear test on M.S.
   vi) Charpy or Izod Impact test on different metals.
   vii) Bending test on M.S. bar and Timber.
   viii) Water absorption and compression test on burnt bricks.
   ix) Hardness test on metals.
   x) Torsion test Mild steel.

B) At least one assignment on each unit.

References:

1) "Mechanics of Structure" (Vol. I and II) - Junnarkar S.B. and Advi, Charotar Publication.
2) "Mechanics of Materials" - R.C. Hibbler, Pearson Education.
3) "Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
4) "Mechanics of Materials" Vol I and II - Punmia, Jain, Laxmi Publications.
5) "Strength of Materials" - S Ramamrutham, DhanapatRai Publications.
6) "Strength of Materials" - Bhavikatti S.S., New Age Publications.
7) "Strength of Materials" - R.K.Rajput., S.Chand Publications.
8) "Strength of Materials" - R.K.Bansal., Laxmi Publications.
9) "Structural Analysis" - Bhavikatti S.S, Vikas Publications house New Dehli.
10) "Introduction to Mechanics of Solids" - J.B. Popov, Prentice – Hall publication.
11) "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
12) "Strength of Material" – Debabrata Nag, A. Chanda, 2nd Edition, Wiley India publication.
13) "Mechanics of Material" - Beer and Johnston, M.

FLUID MECHANICS-I (REVISED)

Teaching Scheme:

Lectures: 3 Hours per week

Practical: 2 Hours per week

Examination Scheme:

Theory paper: 100 marks

Term work: 25 marks

Practical/Oral: 25 marks

Course Outcomes:

After successful completion of this course, student will be able to:

1. Know the processes and science of fluids.
2. Study the basic properties of fluids and their behavior under application of various force systems.
3. Discuss the basic concepts and principles in fluid statics, fluid kinematics and fluid dynamics with their applications in fluid flow problems.
4. Identify and obtain values of fluid properties and relationship between them.
5. Recognize the principles of continuity, momentum and energy as applied to fluid in motion.
6. Recognize the principles written in form of mathematical equations and to apply these equations to analyze problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.

SECTION-I

Unit-1: **6hrs**

A. Introduction: Physical Properties of Fluids (Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity: Dynamic and Kinematic Viscosity, Compressibility, Surface tension, Capillary Effect, Vapour Pressure and Cavitation), Newtons law of viscosity, Types of Fluids.

B. Dimensional Analysis: Dimensions and Dimensional Homogeneity, Importance and Use of Dimension Analysis, Buckingham's Pie Theorem, Dimensionless Numbers and Model Laws.

Unit-2: **7hrs**

A. Fluid Statics: Types of Pressure, Pascal's Law, Hydrostatic Law, Pressure Measurement Devices, Pressure Head, Pressure Diagram, Centre of Pressure, Forces on Plane and Curved Surfaces.

B. Buoyancy and Floatation: Archimedes's Principle, Metacentre, Stability of Submerged and Floating Bodies.

Unit-3: **5hrs**

Fluid Kinematics: Types of Flows, Stream lines, Equipotential lines, Steak Line, Path Line, Stream Tube, Stream Bundle, Stream Function and Velocity Potential Function, Flow Net- (Properties and Uses), Continuity Equation (3-D Cartesian Form).

SECTION-II

Unit-4: **6hrs**

A. Fluid Dynamics: Forces Acting on Fluid in Motion, Euler's Equation along a Streamline, Bernoulli's Theorem, Limitations.
B. Bernoulli's Applications: Venturimeter (Horizontal andVertical), Orificemeter, Orifices, Time required for Emptying the Tank, Concept of HGL and TEL.

Unit-5: **6hrs**

A. Laminar Flow and Turbulent Flow: Reynold's Experiment, Hazen Poisulle's Equation for Viscous Flow through Circular Pipes, Prandtl Mixing Length Theory, Darcy-Wiesbach Equation, Introduction to Moody's Chart.
B. Boundary Layer Theory: Concept, Various Thicknesses (Nominal, Displacement, Momentum, Energy), Hydraulically Smooth and Rough Boundaries, Separation of Boundary Layer, Control of Separation.

Unit-6: **6hrs**

A. Losses in Pipes: Major and Minor Losses, Concept of Equivalent Pipe, Dupit's Equation.
B. Pipes in Series, Parallel and Syphon, Two Reservoir Problems, Concept of Water hammer. Surge Tanks (Function, Location and Uses).

Term work:

At Least Eight Experiments from the Following:

1. Study of Pressure Measuring Devices
2. Calibration of Measuring Tank
3. Measurement of Discharge
4. Determination of Metacentric Height for Floating Bodies
5. Verification of Bernoulli's Theorem
6. Calibration of Venturimeter
7. Calibration of Orificemeter
8. Determination of Hydraulic Coefficients of Orifice

9. Reynold's Experiment
10. Determination of Friction Factor for Given Pipe.
11. Determination of Minor Losses in a Given Pipe.
12. Study of Moody's Chart.

References:

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi/Seth – Standard Book House, Delhi
3. Fluid Mechanics – S. Nagrathanam – Khanna Pub., Delhi
4. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
5. Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo
6. Fluid Mechanics – Garde-Mirajgaonkar – Nemchandand Bros., Roorkee
7. Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland
8. Fluid Mechanics – Arora
9. Fluid Mechanics through Problems – Garde R. J.
10. Fundamentals of Fluid Mechanics, Munson, Young, Okiishi, Huebesch, Wiley Publication.

BUILDING CONSTRUCTION AND MATERIALS (REVISED)

Teaching Scheme:
Lectures: 3 Hours per week
Drawing: 2 hour per week

Examination Scheme:
Theory paper: 100 marks (4 Hrs Duration)
Term work: 50 marks

Course Outcomes:
After successfully completing the course, Student will able to:

1. Know the building Materials.
2. Describe properties and suitability of various building materials.
3. State the different building components.
4. Demonstrate different bonds in brick masonary.
5. Produce drawings of different building components.
6. Explain different types of roof coverings.
7. Describe different types of flooring.

SECTION I

Unit: 1 **8 hrs**

Engineering properties and use of following materials.
Stones – Requirements of good building stone, uses of building stones.
Bricks – Manufacturing, Types(clay bricks, fly ash, cellular light weight concrete brick, aerated cement concrete brick or autoclave brick) and Engineering Properties.
Aggregates - Fine Aggregates and coarse aggregates - Origin, types, particle size and shape, mechanical and physical properties, artificial sand.
Timber – Natural and Artificial wood and their application in Civil Engineering.
Steel – Standard structural sections, steel as reinforcement. High Yield Strength Steel and high tensile steel, uses of steel in Building Construction.
Cement- types.
Tiles - Ceramic, Vitrified, Natural Stone, Paving Blocks etc.
Miscellaneous – Aluminium, Glass, Plastic, Admixtures: chemical(plasticiser and super plasticisers), Minerals(fly ash, microcilica) .

Unit: 2 **6hrs**

Basic requirements of a building as a whole: strength and stability, Dimensional stability, comfort and convenience, damp prevention, water-proofing techniques, heat insulation, day lighting and ventilation. Sound insulation and anti termite treatment.
Building components and their basic requirements : Foundations, plinth, walls and columns in superstructure, floors, doors and windows, sills, lintels and weather sheds, roofs, steps and stairs, utility fixtures.
Formwork: materials (wooden, steel and aluminium).
Foundations: Types and their suitability (Stepped, isolated, combined, strip, raft, strap or cantilever, pile.)

Unit: 3 **4hrs**

Stone masonry – Random Rubble, Uncoursed Rubble, Coursed Rubble and Ashlar Masonry.
Brickwork and Brick Bonds - English, Flemish, Rat trap bond (one brick thick).
Composite masonry, various partition walls, brick, aluminiumand timber

SECTION II

Unit: 4 **6hrs**

Arches: Arches and their stability consideration, technical terms in arches,types of arches,methods of construction.
Lintel: Necessity, Materials: wood, stone, brick, steel, R.C.C. and reinforcedbrick lintels.
Doors – Classification, T.W. Paneled Door, Flush Door, Aluminum Glazed Doors, Steel Doors, fixtures and fastening.
Windows - Classification, T.W. Glazed Windows, Aluminum Glazed Windows, Steel Windows, fixtures and fastening.

Unit: 5 **5hrs**

Stairs: Technical terms, requirements of a good stair, uses, types, materials for construction. Design of stairs (Dog Legged, quarter turn and Open Well), Ramps, lifts and escalator.

Unit: 6 **7hrs**

Roofs and Roof coverings: Terms used. Roof and their selection, pitched roofs and their types, Steel Trusses types and their suitability, roof covering, material, details, fixtures-manglore tiles, A. C., G. I. and Precoated sheets, concept of proflex (truss less) roof and their selection.
Concrete Flooring (Tremix Flooring)
Construction of upper floors: R.C.C. slabs, R.C.C. beams and slab. Flat slab floor.
Waterproofing:materials, methods and systems.

Term Work:

1. Drawing to a scale, draw on half imperial drawing sheet.
A. Foundations: - Isolated, Combined Footing, Under Reamed Piles.
(With reinforcement details)
B. Stone Masonry: UCR, Course Rubble
C. Brick masonry: English bond, Flemish bond, rat trap bond.
D. Doors: T.W. Paneled Door.
E. Windows: T.W., Glazed and aluminium Window.
F. Stairs: Dog legged, quarter turn and Open well.
G. Lift and Ramp

2. Sketch Book :
A. Lettering, Symbols, Types of lines and dimensioning as per IS 962.
B. Doors: Flush doors, Revolving door, Collapsible door and rolling shutter.
C. Windows: Louvered window, Sliding Window, Bay window, Casement window, Dormer Window, Corner Window.
D. Roofs: Line Sketches of steel trusses for different spans.
E. Stairs: Quarter turn, bifurcated, Spiral, Geometrical.
F. Formwork: footing, column and beam.

3. Site visits (minimum two) and detailed report.

References:

1. Building Construction – B.C.Punmia (Laxmi Publications)
2. Basic Civil Engineering – G. K. Hiraskar (DhanpatRai Publications)
3. A Text Book of Building Construction – S.P. Arora, S.P. Bindra (DhanpatRai Publications)
4. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
5. A to Z of Practical Building Construction and Its Management- Sandeep Mantri(SatyaPrakashan, New Delhi)
6. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
7. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
8. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
9. Civil Engineering Drawing – M. Chakraborty.
10. Engineering Materials – R.K.Rajput(S. Chand)
11. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P) Ltd.)

PART II

STRUCTURAL MECHANICS (REVISED)

Teaching Scheme:
Theory: 4 Lecture Hours / Week

Examination Scheme:
Theory: 100 marks

Course Outcomes:

After successfully completing the course, Student will able to:

1. Identify the response of elastic body for external actions.
2. Distinguish engineering properties of the materials are understood
3. Compute the design forces in the structures.
4. Analyze the stress, strain and deformation of elastic bodies under external forces

SECTION I

Unit 1: Principal stress and strain in two dimensions, Introduction to graphical method. Principal stress in beams and thin cylinders. **8hrs**

Unit 2: Combined direct and bending stresses, eccentric loads, stability analysis of gravity dams, retaining walls and chimneys. **7hrs**

Unit 3: Influence line diagrams for determinate compound beams and trusses **9hrs**

SECTION II

Unit 4 : Slope – deflection of determinate beams - double integration method, Macaulay's method, moment-area method and conjugate beam method. **(11)**

Unit 5: Combined bending, torsion and axial thrust. Theories of failure. **8hrs**

Unit 6 : Analysis of long columns, Euler's theory and Rankine's theory **5hrs**

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Note- At least one Home assignment on each unit.

References:

1. "Mechanics of Structure" (Vol. I and II) - Junnarkar S.B. and Advi, CharotarPublication.
2. "Mechanics of Materials" - R.C. Hibbler, Pearson Education.
3. "Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
4. "Mechanics of Materials" Vol I and II - Punmia, Jain, Laxmi Publications.
5. "Strength of Materials" - S Ramamrutham, DhanapatRai Publications.
6. "Strength of Materials" - Bhavikatti S.S., New Age Publications.
7. "Strength of Materials" - R.K.Rajput., S.Chand Publications.
8. "Strength of Materials" - R.K.Bansal., Laxmi Publications.
9. "Structural Analysis" - Bhavikatti S.S, Vikas Publications house New Dehli.
10. "Introduction to Mechanics of Solids" - J.B. Popov, Prentice – Hall publication.
11. "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
12. "Mechanics of Material" - Beer and Johnston, M
13. "Basic structural analysis" - C.S.Reddy, Tata McGraw Hill pub.

SURVEYING-II (REVISED)

Teaching Scheme:
Lectures: 4 Hours per week
Practical: 2 hour per week

Examination Scheme:
Theory paper: 100 marks
Term work: 50 marks
Practical-Oral: 25 Marks

Course Outcomes:

After successful completion of this course students will be able to:

1. Adopt the principles of advanced surveying instruments.
2. Formulate triangulation stations, Flight planning and Ground control points (GCPs)
3. Apply GIS and GPS concepts to civil engineering problems.
4. Apply aerial photogrammetry to civil engineering problems

SECTION- I

Unit 1-Measurement of distances and elevations **10hrs**

a) i) Tacheometry – principles, suitability, methods
   ii) Stadia diaphragm, Stadia formulae
   iii) Tacheometric contouring
b) Electronic distance measurements – principle, construction and use of Geodimeter, Tellurometer, Distomat and Total station

Unit 2 – Geodetic Surveying **9hrs**

a) Triangulation Principle and Classification, system , Selection of station , Base line Measurement, correction and use of subtense bar,
b) Signals, satellite station, reduction to center, spherical excess, angular observations, Trilateration.

Unit 3 – Field Astronomy **5hrs**

Terms, co-ordinate systems, true bearing by observation on the sun and pole star.

SECTION- II

Unit 4 – Curves **9hrs**

a) Significance of curves and curve setting
b) Type of horizontal curve, elements of simple, compound, transition and combined curve, setting out of simple curve by linear and angular methods.
c) Vertical curves – types, lengths of vertical curves

Unit 5 – Photogrammetry **7hrs**

a) Types of photogrammetry and photographs.
b) Aerial photogrammetry – scale of vertical photographs, flight planning and mosaic
c) Stereoscopy and interpretations

Unit 6 – Modern methods of surveying **8hrs**

a) Remote sensing – Definition, relevance, types, electromagnetic radiation and spectrum, energy sources and its characteristics, image acquisition and image interpretation, applications to civil engineering
b) GPS – basic principles, GPS segments, receivers, applications in survey
c) GIS – Terminology, advantages, basic components of GIS, data types, GIS analysis, applications of GIS software.

Term work:

1. Tacheometry 3
    a. Determination of tacheometric constants
    b. Determination of grade of a given line
    c. Determination of area of polygon
2. Experiments using total station 2
3. Setting out of simple and combined curves 3
4. Observation of aerial photographs under stereoscope 1
5. Use of GPS 1
6. Project drawings

Survey Projects:

1. Road project – at least 500m
2. Radial contouring

References:

1. Surveying Vol. I, II and III - Dr. B.C. Punmia, LaxmiPublishers,New Delhi.
2. Surveying and Levelling Vol. I and II - T.P Kanetkar and S.V Kulkarni, Pune VidhyarthiGruha.
3. Surveying Vol. I, II and III - Dr. K.R. Arora, Standard Book House,New Delhi.
4. Surveying Vol. I and II - S. K. Duggal, Tata Mcgraw Hill, New Delhi
5. Elements of Photogrammetry - Paul R. Wolf, McGraw Hill Publication
6. Remote sensing and Geographical Information System- A. M. Chandra and S. K. Ghosh, Narosa Publishing House
7. Advanced Surveying -Total Station, GIS and Remote Sensing - SatheeshGopi, R. Sathikumar and N. Madhu , Pearson publication
8. The GIS Book, 5Th Edition, George B. Korte, PE onwards press

CONCRETE TECHNOLOGY (REVISED)

Teaching Scheme:
Lecture : 3 hours per week
Practical : 2 hours per week

Examination scheme:
Theory paper: 100 marks
Term Work : 50 marks

Course Outcomes:
At the end of the course the student should be able to:
1) Impart knowledge of physical properties of ingredients of concrete and their effect on strength and durability.
2) Explain the fundamentals of process of making good quality concrete and its elastic properties.
3) Enhance the confidence level of students to design the concrete mix proportion as per Indian standard code of practice.
4) Demonstrate Non Destructive Testing (NDT) and evaluate quality of existing concrete.

SECTION I

Unit 1 - Concrete materials: Cement **6hrs**

Ordinary Portland, Portland Pozzolana, chemical composition, grade of cement,hydration,tests for cement,fineness, soundness, compressive strength,setting.Aggregates: classification, requirements, size, shape, texture, Tests for coarse aggregates:specificgravity,grading of aggregate, Flakiness index, Elongation Index, Impact value,abrasion value, crushing value,alkali aggregate reaction. Tests for fineaggregates: specific gravity, sieve analysis,fineness modulus, bulking of sand,Water: general requirements, quality of water.

Unit 2 - Fresh Concrete: **8hrs**

Workability, factors affecting, measurement of workability, different tests for workability, segregation, bleeding,process of manufacture of concrete -batching, mixing, transportation, compaction, curing of concrete, curing methods, admixtures in concrete - air entraining agents, plasticizer and super plasticizer,accelerators,retarders,workability agents. Mineral admixtures: fly ash, silica flumes, Ground Glass Blast Furnace Slag, Metakoline.

Unit 3 - Properties of Concrete: **6hrs**

Strength of concrete: w/c ratio, gel/space ratio,gain of strength with age, maturity concept of concrete, effect of maximum size of aggregate on strength, relation between compressive and tensile strength,factors affecting modulus of elasticity,definition and factors affecting creep and shrinkage.

SECTION II

Unit 4 - Durability of concrete: **8hrs**

Strength and durability relationship, effect of w/c on durability, different exposure condition as per IS 456 minimum and maximum cement content,effect of permeability, sulphate attack, methods of controlling sulphate attack. Durability of concrete in sea water, Test on hardened concrete - flexural strength, comparison of cube test and cylinder test,Schmidt's rebound hammer,Ultrasonic pulse velocity method.

Unit 5 - Special Concrete: **5hrs**

Light weight concrete, no-fines concrete, high density concrete, fiber reinforced concrete, self-compacting concrete, high strength concrete, high performance concrete, manufacturing of ready mix concrete,cold weather concreting, hot weather concreting, pavement quality concrete.

Unit 6 - Concrete Mix Design: **7hrs**

Objectivesof mix design, different methods of mix design, factors affecting mix proportions, quality control of concrete,statistical methods,acceptance criteria, Numerical on mix design by ACI 211.1-91, IS 10262- 2009andIS 456. Mix design of fly ash concrete by IS 10262 – 2009.

Practical Exercises: (Any 12 experiments out of 14)

1. To determine the standard consistency of cement using Vicat's apparatus.
2. To determine fineness of cement by Sieve analysis and Blaine's air permeability method.
3. Determination of soundness of cement by Le-Chatelier's apparatus and Auto Clave.
4. To determine initial and finalsetting time of cement.

5. To determine compressive strength of cement.
6. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
7. Determination of specific gravity of fine aggregates
8. Determination of specific gravity and water absorption of aggregates
9. To determine flakiness and elongation index of coarse aggregates
10. To determine workability of fresh concrete by using slump cone.
11. To determine compaction factor for workability of fresh concrete.
12. To determine workability of fresh concrete by using Vee Bee Consitometer.
13. Non destructive test on concrete by:
    a) Rebound Hammer Test
    b) Ultrasonic Pulse Velocity Test
14. Tests for compressive strength of concrete cubes for M20 or M30 (ACI 211.1-91, IS 10262 - 2009andIS 456)

References:

Text books:

1. Naville, A.M., Concrete Technology, Pearson Education.

2. Santakumar, A.R., Concrete Technology, Oxford University Press.

3. Shetty, M.S., Concrete Technology, S. Chand Publication.

4. Gambhir, M.L., Concrete Technology, Tata McGraw Hill.

IS codes:

1. IS: 10262,2009, Recommended guidelines for Concrete Mix Design

2. IS: 456, 2000, Indian Standard Plain and Reinforced Concret

Instructions for Paper Setting:

1. One question on each unit.
2. Optional question should be given on Unit 2 and 4.

Numerical on mix design should be asked with required table and chart in question paper (ACI 211.1-91, IS 10262 - 2009)

FLUID MECHANICS-II (REVISED)

Teaching Scheme:

Lectures: 3 Hours per week

Practical: 2 Hours per week

Examination Scheme:

Theory paper: 100 marks

Term work: 25 marks

Course Outcomes:

After successful completion of this course, student will be able:

1. To provide students with basic knowledge of fluid properties and utilizing principles developed in fluid mechanics.
2. To develop the principle and equation for pressure flow and momentum analysis.
3. Provide the students with the analytical knowledge of pressure and velocity distribution in an open channel in order to solve practical problems.
4. To illustrate and develop the equations and design principles for open channel flows, including sanitary and storm sewer design and flood control hydraulics.

SECTION I

Unit-1: **6hrs**

A. Uniform Flow in Open Channel: Introduction, Difference between Pipe Flow and Open Channel Flow. Types of Open Channels, Types of Flows In Open Channel, Geometric Elements, Velocity Distribution, Measurement of Velocity- (Pitot Lube, Current Meter)

B. Steady and Uniform Flow: Chezy'sand Manning's Formula, Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal)

C. Depth Energy Relationship in Open Channel Flow: Specific Energy (Definition and Diagram, Critical, Sub-Critical, Super-Critical Flow), Specific Force (Definition and Diagram)

Unit -2: **5hrs**

Gradually Varied Flow (GVF): Definition, Classification of Channel Slopes, Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF Profiles- Practical Examples, Direct Step Method of Computation of GVF Profiles

Unit-3: **7hrs**

A. Rapidly Varied Flow (RVF): Definition, Hydraulic Jump- Phenomenon, Conjugate Depth Relationship, Characteristics, Uses andTypes of Hydraulic Jump, Hydraulic Jump as an Energy Dissipater

B. Spatially Varied Flow: Basic Principles and Assumptions, Dynamic Equation and Analysis of Flow Profiles, Isoclinal Method, Spatially Varied Steady and Unsteady Surface Flows.

SECTION II

Unit-4: **6hrs**

Notches and Weirs: Types, Derivation of Discharge Equation, Velocity of Approach, Francis Formula, Calibration of Notches, Errors in Measurement of Discharge, Sharp, Broad and Round Crested Weirs, Calibration of Weir, Time of Emptying Tank with Weir.

Unit-5: **6hrs**

Impact of Jet: Impulse Momentum Principle, Impact of Jet on Vanes- Flat, Curved (Stationary and Moving), Inlet and Outlet Velocity Triangles, Series of Flat, Curved Vanes Mounted on Wheel.

Unit-6: **6hrs**

A. Hydraulic Turbines: Importance of Hydro-Power, Classification of Turbines- Pelton, Francis and Kaplan Turbine (Detailed Design Need Not To Be Dealt With), Unit Quantities, Specific Speed, Performance Characteristics, Selection of Type of Turbine, Concept of Draft Tube.

B. Centrifugal Pump: Classification, Component Parts, Working of Centrifugal Pump, Performance Characteristics, Common Pump Troubles and Remedies, Net Positive Suction Head (NPSH).

Term Work:

A. Any three of the Following :
   1. Study of Specific Energy Curve for Different Discharges
   2. Calibration of V-Notch / Rectangular Notch.
   3. Study of Hydraulic Jump.
   4. Study of Flow over Weirs.
   5. Impact of Jet.

B. Study of Turbines (Demonstration).
C. Test on Centrifugal Pump.
D. Visit to Hydropower Plant.
E. Simple Computer Program.
F. Assignments on GVF and SVF.

References:

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi
3. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
4. Open Channel flow – Rangaraju – Tata McGraw-Hill Pub. Co., Delhi
5. Fluid Mechanics – K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi
6. Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi / seth – Standard Book House, Delhi
7. Flow in open channel – V. T. Chaw - McGraw-Hill International Book Co., Auckland
8. Flow in open channel - K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi

BUILDING DESIGN AND DRAWING (REVISED)

Teaching Scheme:
Lectures: 4 Hours per week
Drawing: 4 hour per week

Examination Scheme:
Theory paper: 100 marks (4 Hrs Duration)
Term work: 50 marks
Practical Oral: 50 marks

Course Outcomes:
After successfully completing the course, Student will able to:

1. Know principles of building planning.
2. Describe Building By-Laws and regulations.
3. To plan and draw residential building considering principle of planning and Building By-Laws and regulations.
4. Explain techniques of maintenance, repair and rehabilitation of structure.
5. Draw the working drawing of foundation detail, plumbing and electrification of building.
6. Illustrate the concept of ventilation, air conditioning and thermal insulation.
7. Describe different types of building finishes.

SECTION I

Unit: 1 **5hrs**

Site Selection criteria.
Principles of Building planning. Significance Sun path diagram. Wind Diagram.
Orientation, Factors affecting, criteria under Indian condition.

Unit: 2 **10hrs**

Building Planning Byelaws and regulations as per SP-7, 1983 National Building code of India group 1 to 5.
Planning of Residential Building (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, significance of commencement, plinth completion or occupancy certificate.

Unit: 3 **5hrs**

Low cost Housing-Materials and Methods (conceptual introduction only)
Maintenance, Repairs, Rehabilitation of Structures. (conceptual introduction only)
Concept of green building and rating.

SECTION II

Unit: 4 **8hrs**

Plumbing system, Various Materials for system like A-PVC, C-PVC, GI, and HDPE.
Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan, introduction to rainwater harvesting. Concept of rain water Gutters. Rainwater outlet and Down Take Systems.
Electrification: - Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing.

Fire resistance in building: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

Unit: 5 **8hrs**

Ventilation: - Definition and necessity of Ventilation, functional requirement, various system and section criteria.
Air conditioning: - Purpose, Classification, Principles, Systems and Various Components of thesame.
Thermal Insulation: - General concept, Materials, Methods.
Introduction to Acoustics: Absorption of sound, various materials, conditions for good acoustics.
Sound Insulation and methods of noise control.

Unit: 6 **8hrs**

Paints: Different types and application methods.
Plastering, Pointing and various techniques.
Wall cladding, skirting, dado work with various materials.
Miscellaneous finishes such as POP, Gypsum plaster.

Term Work:

1. Imperial size sheet based on actual measurement of existing residential buildingconsisting of plan, elevation, section passing through staircase. Site plan. Area statement and brief specifications (G+1 building and minimum 5 rooms, Measurement drawing should be done in group of maximum 5 students).
Note: The centre line plan drawn expected to be transferred on ground as an exercise.

2. Planning and design of residential building (G+1).

3. Full set of drawings for the building planned in 2- (a) Municipal Submission drawing. (b) Working Drawings (Max. 2 student group):

- Foundation / Center Line Drawing.
- Furniture layout plan.
- Electrification plan
- Water supply and drainage plan.

4. Project report giving details of following systems

- Stair Case
- Drainage System
- Water Supply System
- Water Tank
- Septic Tank
- Design of terrace Drainage System

5. Site visit along with report.

References:

1. Building Construction – B.C.Punmia (Laxmi Publications)
2. Basic Civil Engineering – G. K. Hiraskar (DhanpatRai Publications)
3. A Text Book of Building Construction – S.P. Arora, S.P. Bindra (DhanpatRai Publications)
4. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
5. A to Z of Practical Building Construction and Its Management- Sandeep Mantri (SatyaPrakashan, New Delhi)
6. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
7. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
8. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
9. Civil Engineering Drawing – M. Chakraborty.
10. Engineering Materials – R.K.Rajput (S. Chand)
11. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P)
12. Ltd.)
13. Form follows feelings, the Architectural PramodBeri, Anjali Prakashan.
14. A to Z Construction Practices by Mantri.
15. High Strength Concrete, M.A. Cauldron.
16. Time Saver Standards.

COMPUTER AIDED DRAWING (CAD) (REVISED)

Teaching Scheme:
Lectures: -
Practical :- 2 hours

Examination Scheme:
Theory paper: -
Term work: 50 marks

Student Learning Outcomes:

After successfully completing the course, Student will able to:

1. Describe Auto-CAD commands.
2. Draw 2D Auto-CAD drawing of residential building.
3. Draw municipal and working drawings.

Assignment No. 1
Study of Auto CAD Commands

Assignment No. 2
Preparation of 2D AutoCAD drawing consisting of plan and elevation of 2 BHK house with minimum needs.

Assignment No. 3
Preparation of 2D AutoCAD municipal drawing.

Assignment No. 4
Preparation of ANY one of the working drawings of Project prepared in the term work of subject Building Design and Drawing.

References:

1. AutoCAD – David Frey (BPB Sybex Publications)
2. AutoCAD – George Omura

NUMERICAL METHODS (REVISED)

Teaching Scheme:
Lectures: - 2 hours
Practical: - 2 hours

Examination Scheme:
Theory paper: ---
Term work: 50 marks

Student Learning Outcomes:

After completing the course, the student should be able to: -

1. Apply the techniques, skills, Knowledge of mathematics, science and modern engineering tools necessary for engineering practice.

2. Develop programs in C and C++, where applications will be drawn from different fields of civil engineering so as to motivate individual interests of students and to equip them with basic computing tools for civil engineering applications

SECTION I

Unit: 1 Solution of Nonlinear and Transcendental equations : 3hrs

Basic concepts on polynomial equations, Roots of equations by Bisection method, Iterative method, Regula falsi method, Newton Raphson method, Secant method.

Unit: 2 Numerical Interpolation : 3hrs

Least square curve fit and trigonometric approximations, Finite differences and difference operators, Newtons interpolation formulae, Gauss forward and backward formulae, Sterling, Bessel's and Evertte's formulae, Interpolation with unevenly space data points-Lagrange's interpolation

Unit: 3 Numerical differentiation and integration : 4hrs

Numerical differentiation, errors in numerical differentiation, Numerical integration-Trapezoidal, Simpson's 1/3 and 3/8 rules, Romberg integration-recursive formulae, Evaluation of double integrals by Trapezoidal and Simpson's rules

SECTION II

Unit: 4 System of simultaneous algebraic equations 4hrs

Matrix inversion and solution of transcendental and system of algebraic equations-Gauss elimination method, Jacobi's method and Gauss-Seidal method, Eigen values and Eigen vectors, Jacobi's method.

Unit: 5 Ordinary differential equations : 4hrs

Euler's method, Modified Euler's method, Runge Kutta methods of 2nd and 4th order.

Unit: 6 Applications to Civil Engg. problems : 6hrs

Formulation of various problems of Civil Engineering

Calculation of slope & design of a beam, Seepage and development of flow nets, consolidation of soil layer, head loss due to friction, water supply pipe network etc. and development of computer programmes

TERM WORK

Programs on Applications to civil engineering problems using C & C++ Language

1. Roots of equations by bisection method
2. Newton rapson method
3. Least square curve fitting
4. Simpson's 1/3 and 3/8 rules
5. Gauss-Seidal method
6. Gauss elimination method
7. Runge- Kutta methods of 2nd and 4th order.
8. Modified Euler's method
9. Calculation of slope & design of a beam
10. Water supply pipe network
11. Interpolating rainfall data over a watershed
12. Consolidation of soil layer

Reference Books

1. Grewal, B.S., Numerical methods in engineering and science, Khanna Publishers, Delhi.
2. Rajasekaran , S. Numerical methods in science and engineering : a practical approach, Wheeler Publishing, New Delhi.
3. Lafore,Robert, Object Oriented programming in C++, Techmedia, Delhi.
4. Balagurusamy,E. Object oriented programming with C++, Tata McGraw□Hill, New Delhi.
5. Rao, S. S., Applied Numerical Methods for Engineers and Scientists, Prentice-Hall, 2002
6. Schafer,Michael, Computational engineering: introduction to numerical methods, Springer□Verlag, Berlin.
7. Chapra, S. C. and Canale, R. P., Numerical Methods for Engineers, McGraw-Hill, 6th Ed., 2009.

SHIVAJI UNIVERSITY, KOLHAPUR
S. E. Civil (Part I & II) Equivalence 2014-15

SEMESTER-III

Sr. No.	OLD	NEW
1	Engineering Mathematics -III	Engineering Mathematics -III
2	Surveying-I	Surveying-I
3	Structural Mechanics I	Strength of Materials
4	Fluid Mechanics -I	Fluid Mechanics -I
5	Building Construction	Building Construction and Materials

SEMESTER-IV

Sr. No.	OLD	NEW
1	Structural Mechanics II	Structural Mechanics
2	Surveying -II	Surveying -II
3	Concrete Technology (TE Civil Sem. V)	Concrete Technology
4	Fluid Mechanics -II	Fluid Mechanics -II
5	Building Design	Building Design and Drawing
6	Computer Aided Drawing	Computer Aided Drawing (CAD)

Dr Pandurang S. Patil

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