

SCHEME OF EXAMINATION FOR PART TIME DEGREE COURSE IN CIVIL ENGINEERING

Class: S.E. (Civil)

Semester : III

		No. of Periods of 45 Min.			Paper (Hours)	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Termwork/Assignments	Practical	Oral	Total
1	Applied Maths III	4	.....	.....	3	100	.....	.....	.....	100
2	Structural Analysis II	4	.....	2	3	100	25	.....	.....	125
3	Bldg design & Drg.	1	3	.....	4	100	25	.....	.....	125
4	Hydraulics & Hyd. Machinery	4	2	.....	3	100	25	.....	.....	125
	Total	13	5	2	4 Papers	400	75	.....	.....	475

Class: S.E. (Civil)

Semester : IV

S.N.	Subjects	No. of Periods of 45 Min.			Duration of Theory Paper (Hours)	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Termwork/Assignments	Practical	Oral	Total
1	Applied Maths IV	4	.....	.....	3	100	.....	.....	.....	100
2	Design of Steel Structures	4	.....	2	3	100	25	.....	25	150
3	Soil Mechanics	4	2	.....	3	100	25	.....	25	150
4	Advance Surveying	4	2	3	100	25	25*	150
	Total	16	4	2	4 Papers	400	75	75	550

* Oral & Practical

① S.E. CIVIL P.T.D.C.

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APPLIED MATHEMATICS - III

Class : S.E. (All Branches) Semester : III (P.T.D.C.)

Periods per week : Lectures : 4
Tutorials : -
Practicals : -

Evaluation system : Theory Examination : 3 Hours, 100 marks
Practical Examination : -
Oral Examination : -
Term Work : -

Detailed Syllabus :

- 1. Vector Analysis** : Scalar and vector fields, Directional derivative of a scalar field, Vector differential operator del , Gradient Divergence, Curl and their expressions in Cartesian Co-ordinates, Formulas involving del , Line Integral, Surface Integral, Volume Integral, properties of Line Integral, Statements of Green's theorem in plane, Gauss divergence theorem and Stoke's theorem (without proofs), Conservative, Irrotational and Solenoidal fields.
- 2. Fourier Series** : Definition in the interval $(-\pi, \pi)$ Dirichlet Conditions (only statement), Derivation of Euler's formulae, Fourier expansion of $f(x)$ in $(-\pi, \pi)$ and $(0, 2\pi)$ with discontinuity also, Expansion of even and odd functions, Half range series, Parseval's Identity.
- 3. Matrices** : Definition, types of matrices, Sum and product of matrices, Transpose, adjoint, Inverse of a matrix, orthogonal matrix, Elementary transformations, rank of a matrix, normal form of a matrix, Homogeneous & Nonhomogeneous systems of linear equations, their Solutions and Consistency, Eigen Value problem, Characteristic equation, Eigen-values and vectors, Cayley-Hamilton theorem (without proof) Diagonalisation (orthogonally also).

Note : Theory should be only limited to give insight into applications.

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Books recommended :

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|----|---------------------------------|----|-------------------------------|
| 1. | Elements of Applied Mathematics | by | P.N. Wartikar & J.N. Wartikar |
| 2. | Engineering Mathematics | by | M.L. Bhatia |
| 3. | Engineering Mathematics | by | R.M. Baphana |
| 4. | Engineering Mathematics | by | Kumbhojkar |
| 5. | Engineering Mathematics | by | B.S. Grewal |
| 6. | Vector calculations | by | Shanti Narayan |
| 7. | Matrices | by | A.R. Vashistha |
| 8. | Complex Analysis | by | M.R. Spiegel, Schaums series |
| 9. | Fourier Analysis | by | M.R. Spiegel, Schaums series |

STRUCTURAL ANALYSIS II



Class : S.E. (Civil) Semester : III (P.T.D.C.)

Periods per week : Lectures : 4
Tutorials : 2
Practicals : -

Evaluation system : Theory Examination : 3 Hours, 100 marks
Practical Examination : -
Oral Examination : -
Term Work : 25 Marks

Detailed Syllabus :

- 1. General
 - 1.1 Types of structures occurring in practice and their classification
 - 1.2 Stable & unstable structures : statical & kinematical determinacy and indeterminacy of structures
- 2. Deflection of statically determinate structures
 - 2.1 Review of general theorems based on virtual work and energy methods
 - 2.2 Deflections caused by temperature changes & settlement of supports
 - 2.3 Application to determinate beams, pin jointed frames & rigid jointed frames
- 3. Analysis of indeterminate structures by flexibility method:
 - 3.1 Flexibility coefficients and their use in formulation of compatibility equations
 - 3.2 Castigliano's theorem of least work.
 - 3.3 Application of above methods to propped cantilevers, fixed beams, continuous beams
 - 3.4 Theorem of three moments; application to continuous beams
 - 3.5 Simple pin jointed frames
 - 3.6 simple rigid jointed frames
- 4. Analysis of indeterminate structures by stiffness method:
 - 4.1 Stiffness coefficients for prismatic members and their use for formulation of equilibrium equations for indeterminate beams & simple rigid jointed frames.
 - 4.2 Slope deflection method
 - 4.3 Moment distribution method
 - 4.4 Applications of above methods to indeterminate beams & simple rigid jointed frames. (single bay & single storey)

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Term work :

The term work shall consist of at least 20 solved problems based on the above syllabus.

Text books :

1. Basic structural analysis by Reddy C. S., Tata McGraw Hill ✓
2. Matrix methods in structural analysis by Pandit & Gupta, Tata McGraw Hill ✓
3. Structural Mechanics Vol. II by Junnarkar S.B., Charotar Book Stall ✓

References :

1. Intermediate structural analysis by Wang C.K., McGraw Hill ✓
2. Elementary structural analysis by Norris, Wilbur, Utku, McGraw Hill
3. Modern methods in structural mechanics by Thadani B.N. & Desai J.P., Weinall Book Corporation
4. Matrix methods of frame analysis by Gare & Weaver ✓
5. Elementary theory of structures by S. Yuan-Yu Hsieh Prentice-Hall International
6. Structural Analysis by Alexander Chajes
7. Structural Analysis - A Unified Approach by Prakash Rao D.S. Universities Press

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BUILDING DESIGN AND DRAWING

Class : S. E. (Civil) Semester : III (P.T.D.C.)

Periods per week : Lectures : 1
Tutorials : -
Practicals : 3

Evaluation system : Theory Examination : 4 Hours, 100 marks
Practical Examination : -
Oral Examination : -
Term Work : 25 Marks

Detailed Syllabus :

- 1 Planning & design of public buildings such as :
 - i. buildings for education, schools, colleges, institutions, libraries
 - ii. buildings for health : hospitals, health centres, dispensaries, maternity homes, sanatoriums.
 - iii. industrial structures.
 - iv. buildings for entertainment : theatres, cinema halls, club houses, sports clubs
 - v. offices, hotels, boarding houses, rest houses
- 2 Architectural planning, massing & composition, concept of built environment & its application in planning.
- 3 Perspective drawing : one point and two point perspective
- 4 Principles of modular planning, planning as recommended by National Building
- 5 Town Planning : objectives and principles, master plan, road systems, zoning, green belt, slums
- 6 Use of computers in building planning and designing

Term work :

Term work shall consist of at least three A1 (Imperial) size drawing sheets giving details of minimum two different types of public buildings. One building planned shall be RCC framed structure and shall have ground plus at least one upper floor. Other building planned shall be on a load bearing structure situated in rural area and is to be constructed with locally available materials.

Buildings so planned shall be detailed out with following drawings:

- ground floor plan
- typical floor plan
- elevation
- typical section
- roof plan, foundation plan and basement (if proposed) plan
- site plan
- layout plan with drainage lines
- any other typical details, if necessary.

Recommended text books :

1. Building drawing & design by Shah, Kale & Patki, Tata McGraw Hill ✓
2. Planning & designing by Sane Y. S. ✓
3. Building Drawing by M. Chakraborti ✓

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HYDRAULICS AND HYDRAULIC MACHINERY



Class : S. E. (Civil) Semester : III (P.T.D.C.)

Periods per week : Lectures : 4
 Tutorials : -
 Practicals : 2

Evaluation system : Theory Examination : 3 Hours, 100 marks
 Practical Examination : -
 Oral Examination : -
 Term Work : 25 Marks

Detailed Syllabus :

1 Dynamics of fluid flow:

Momentum principle, applications : force on plates, pipe bends, jet propulsion, moment of momentum equation

2 Dimensional analysis:

Dimensional homogeneity, Buckingham's Π theorem, Rayleigh's method & other methods, dimensionless groups, similitude, model studies, distorted & undistorted models

3 Laminar flow through pipes:

Reynold experiment, critical velocity, steady laminar flow through parallel plates, moving plates, flow through circular pipes and annulus

4 Flow through pipes :

Loss of head through pipes, Darcy - Weisbach equation, minor losses, total energy equation, hydraulic gradient line, pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flow in dead end pipes, syphon, power transmission through pipes, nozzles

5 Impact of jets:

Jet striking stationary, moving, inclined & perpendicular flat, impact on stationary, moving, curved vane - series of curved vanes

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6 Turbines :

Classification, details of construction, performance characteristics, model studies, unit quantities of Pelton wheel, Francis & Kaplan turbines, examples illustrating fixing size of different components, calculation of efficiencies, output etc.

7 Centrifugal pumps :

Classification, velocity diagram, series & parallel operation, characteristics curves, efficiencies, model studies, simple examples

8 Miscellaneous hydraulic machinery :

Hydraulic ram, press, intensifier, crane & lift, examples

Practicals :

List of experiments : (At least six to be performed)

1. Reynold's experiment
2. Friction loss through pipes
3. Laminar flow through pipes
4. Minor losses
5. Impact of jet
6. Performance of centrifugal pump
7. Performance of Pelton wheel
8. Performance of Francis turbine
9. Hydraulic ram

Term work :

Report on experiments performed as detailed above shall be submitted as term work.

Recommended text books :

1. Hydraulics & fluid mechanics	by	Modi P.M. & Seth S.M.	
			Standard Book House ✓
2. Theory & applications of fluid mechanics	by	Subramanya K.	
			Tata McGraw Hill ✓
3. Fluid mechanics	by	Dr. Jain A.K.	
			Khanna Publishers ✓
4. Fluid mechanics	by	Nagarathnam	
			Khanna Publishers

APPLIED MATHEMATICS - IV

Class : S.E. (All Branches) Semester : IV (P.T.D.C.)

Periods per week : Lectures : 4
 Tutorials : -
 Practicals : -

Evaluation system : Theory Examination : 3 Hours, 100 marks
 Practical Examination : -
 Oral Examination : -
 Term Work : -

Detailed Syllabus :

1. **Statistics** : Frequency distributions, Measures of central tendency: Mean Median, Mode, Quartiles, Percentiles, Dispersion : quartile deviation, mean deviation, standard deviation, combined standard deviation, coefficients of quartile deviation & variation, coefficients of skewness (Karl Pearson's and Bowley's)
Probability : Definition, addition and multiplication theorems (without proofs), conditional probability, random variable, probability distributions: Binomial, Poisson & Normal distributions.
2. **Partial differential equations** : Equation governing transverse vibrations of an elastic string (with derivation). Its solution using Fourier Series. Heat equation (No derivation), one dimension at heat flow with solution, steady state configuration of heat in two dimensions.
3. **Complex Variables** : Definition & Properties of a complex number Differentiability of functions, Analytic functions, Cauchy-Riemann theorem (No proof), Derivation of a polar form of Cauchy-Riemann equations, Harmonic Conjugate functions, orthogonal property, Concept of fixed and critical points of a transformation Conformal mappings, its properties without proof, some standard transformations (i) Translation (ii) Rotation & Magnification (iii) Inversion & Reflection, Bilinear transformation & its cross-ratio, preservation property & it maps a circle onto a circle (with proofs).
4. **Laplace Transform** : Definition, statement of conditions for existence of Laplace transform, Transforms of elementary functions, periodic functions, derivatives, Integrals, Multiplication by t^n , division by t . Inverse Laplace transforms, Statement of Convolution theorem, use of Laplace transform to solve n th order linear differential equations with constant coefficients.

Books recommended :

1.	Elements of Applied Mathematics	by	P.N. Wartikar & J.N. Wartikar
2.	Engineering Mathematics	by	M.L. Bhatia
3.	Engineering Mathematics	by	R.M. Baphana
4.	Engineering Mathematics	by	Kumbhojkar
5.	Engineering Mathematics	by	B.S. Grewal
6.	Statistics	by	S.V. Kelkar Reliable Prakashan
7.	Practical Statistics	by	S.V. Kelkar Manisha Prakashan
8.	Complex Analysis & Laplace transform	by	M.R. Spiegel, Schaums series

DESIGN OF STEEL STRUCTURES

Class : S.E. (Civil) Semester : IV (P.T.D.C.)

Periods per week : Lectures : 4
 Tutorials : 2
 Practicals : -

Evaluation system : Theory Examination : 3 Hours, 100 marks
 Practical Examination : -
 Oral Examination : 25 Marks
 Term Work : 25 Marks

Detailed Syllabus :

- 1.0 Rivetted and welded connections;
 - 1.1 Axially and eccentrically loaded joints
 - 1.2 Simple connection of bracket plates to columns
 - 1.3 Beam to beam and beam to column connections, design of framed, unstiffened and stiffened seat connections.

- 2.0 IS code provisions:
 - 2.1 Permissible stresses in members due to axial tension, axial compression, bending compression and shear; permissible stress in rivets/bolts/welds etc., deflection criteria for flexural members
 - 2.2 Imposed loads on flat and sloping roofs and floors, wind loads on sloping roofs and vertical cladding including effect of degree of permeability and wind drag.

- 3.0 Roofing system:
 - 3.1 Analysis of pin-jointed trusses under various loading cases, computation of design forces in members
 - 3.2 Design of purlins, design of tension and compression members
 - 3.3 Design and detailing of connections and supports

- 4.0 Flooring system
 - 4.1 Concept of floor system with secondary beams, main beams and columns.
 - 4.2 Design of simply supported beams using rolled steel sections
 - 4.3 Design of built-up sections

- 5.0 Welded plate girder
 - 5.1 Proportioning and design of section and connections
 - 5.2 Curtailment of flange plates
 - 5.3 Design of web splices
 - 5.4 Design of stiffeners

6.0 Columns and bases:

- 6.1 Design of columns under axial loads using single or multiple rolled steel sections.
- 6.2 Design of lacings and battens
- 6.3 Design of slab base and gusseted base

Term work :

The term work shall consist of at least 20 solved problems based on the above syllabus.

Text books :

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|----|---|----|--------------------------------------|------------------------|---|
| 1. | Design of steel structures | by | Negi L.S. | Tata McGraw Hill | ✓ |
| 2. | Design of steel structures | by | Kazimi S.M.A. & Jindal R.S. | Prentice Hall of India | |
| 3. | Design of steel structures | by | Krishnamachar B.S. & Ajitha Sinha D. | | |
| 4. | Design of steel structures | by | Arya and Ajmani | New Chand & Bros. | ✓ |
| 5. | Design of steel structures
Vol. I & II | by | Ramachandran | | |
| 6. | Design of steel structures | by | Dayaratnam | | |
| 7. | Design of steel structures | by | M. Raghupathi | | |

References :

- | | | | |
|----|----------------------------|----|---------------------------------------|
| 1. | Design of steel structures | by | Breslar, Lin and Scalzi |
| 2. | Design of steel structures | by | Mac. Ginely T. |
| 3. | Structural steel work | by | Reynolds T.J., Kent L.E. Lazenby D.W. |
| 4. | Relevant IS Codes | | |

SOIL MECHANICS

Class : S.E. (Civil) Semester : IV (P.T.D.C.)

Periods per week : Lectures : 4
Tutorials : -
Practicals : 2

Evaluation system : Theory Examination : 3 Hours, 100 marks
Practical Examination : -
Oral Examination :
Term Work : 25 Marks

Detailed Syllabus :

- 1.0 Basic definition & relationships
- 1.1 Soil as three phase system in terms of weight; volume; void ratio; porosity
- 1.2 Definitions : moisture content; unit weights; degree of saturation; void ratio; porosity; specific gravity; mass specific gravity; etc.
- 1.3 Relationships between : volume-weight; void ratio-moisture content; unit weight-moisture content; unit weight-percent air voids; saturation-moisture content; moisture content-specific gravity; etc.
- 1.4 Determination of various parameters such as :
 - 1.4.1 Moisture content by : oven dry method, Pycnometer, sand bath method, torsional balance method, radio activity method, alcohol method.
 - 1.4.2 Specific gravity by : density bottle method, Pycnometer method, measuring flask method
 - 1.4.3 Unit weight by : water displacement method, submerged weight method, core cutter method, sand replacement method, water balloon method, radiation method
- 2.0 Plasticity characteristics of soil
 - 2.1 Introduction to & definitions of : plasticity of soils, consistency limits, liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indexes, flow & toughness indexes
 - 2.2 Determination of : liquid limit, plastic limit, shrinkage limit
 - 2.3 Use of consistency limit
- 3.0 Classification of soils
 - 3.1 Introduction of soil classification : particle size, classification; textural soil classification, unified soil classification; Indian standard soil classification system.
 - 3.2 Identification : field identification of soils, general characteristics of soil in different groups.

4.0 Permeability of soils

4.1 Introduction : hydraulic head; Darcy's law, validity of Darcys;law

4.2 Determination of coefficient of permeability;

4.3 Laboratory method : constant head method; falling head method

4.4 Field method: pumping in test; pumping out fest

4.5 Permeability aspects : permeability of stratified soils; factors affecting permeability of soils.

5.0 Seepage analysis

Introduction; stream and potential functions; characteristics of flow nets; graphical methods to determine flow nets; use of flow nets.

6.0 Effective stress principle

Introduction; effective stress principle; nature of effective stress; effect of water table fluctuation of effective stress; effective stress in soils saturated by capillary action; seepage pressure; quick sand condition; seepage pressure approach to quick sand condition.

7.0 Compaction of soils

Introduction; comparison between compaction and consolidation; initial, primary & secondary consolidation; spring analogy for primary consolidation; consolidation test, consolidation test results; time settlement curves, basic definitions, Terzaghi's theory of consolidation, final settlement of soil deposits, secondary consolidation.

8.0 Consolidation soils

Introduction, comparison between compaction & consolidation; initial, primary & secondary consolidation; spring analogy for primary consolidation; consolidation test, consolidation test results; time settlement curves, basic definitions, Terzaghi's theory of consolidation, final settlement of soil deposits, secondary consolidation.

9.0 Shear strength

Principal planes parallel to the coordinate axes; Mohr's circle; important characteristics of Mohrs' circle; Mohr coulomb theory; direct shear test; merits and demerits of direct shear test; Triaxial comparession test; types of shear tests; relation between major and monor principal stresses; unconfined compression test, vane shear test.

10.0 Stability of slopes

Introduction; different factors of safety; types of slope failures; wedge failure; Sweedish circle method; friction circle method; stability

10.0 Stability of slopes

Introduction; different factors of safety; types of slope failures; wedge failure; Swedish circle method; friction circle method; stability numbers and charts.

11 Soil Exploration :

Necessity, Methods and Modern techniques; Standard Penetration test; correlation of results.

Practicals :

List of tests (At least ten to be performed)

1. Field density using core cutter method
2. Field density using sand replacement method
3. Natural moisture content using oven drying method
4. Natural moisture content using Pycnometer
5. Natural moisture content using sand bath method
6. Grain size distribution by sieve analysis
7. Grain size distribution by hydrometer analysis
8. Consistency limits by liquid limit
9. Consistency limits by plastic limit
10. Consistency limits by shrinkage limit
11. Permeability tests using constant test method
12. Permeability tests using falling head method
13. Compaction test : standard proctor test
14. Compaction test : modified proctor test

Term Work :

Report on experiments performed as detailed above shall be submitted as term work.

Text books :

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|----|---|---------------------|---|---|
| 1. | Soil mechanics and foundation engineering | by B.C. Punmia, | Laxmi Book Depot, Delhi | ✓ |
| 2. | Soil mechanics and foundation engineering | by K.R. Arora | Standard Publishers and Distributors, New Delhi | ✓ |
| 3. | Soil mechanics and foundation engineering Vol. I and II (3 rd Edn) | by V.N.S. Murthy, | Saitech Publication | ✓ |
| 4. | Geotechnical engineering | by Venkatramaiah C. | Wiley Eastern Ltd. | |
| 5. | Soil engineering in theory and practice | Alam Singh | Standard Book House | ✓ |

References :

1. Fundamentals of soil engineering by D.W. Taylor John Wiley & Sons ✓
2. Soil engineering by R.L. Handy & Spangler M.G. International Textbook Company, Scranton, USA
3. An introduction to Geotechnical engineering by R.B. Holtz
4. Soil mechanics by R.F. Craig Chapman & Hall
5. Soil mechanics by Lambe T.W. & Whitman R.V. John Wiley & Sons
6. Theoretical soil mechanics by K. Terzaghi
7. Relevant Indian Standard Specifications & Codes

7 Use of computer for surveying ; Introduction to laser beam theory

8 Study of Remote Sensing Techniques

Practicals :

Practicals based on the above syllabus and the syllabus of surveying I at F. E. Civil Sem. I (P.T.D.C.) with modern survey instruments such as Electronic distance meter, Electronic theodolite, Auto level, etc.

Term work :

A detailed report of practicals as specified above and recorded in journal and allotted maximum marks upto 25.

Recommended text books :

- 1. Advance Surveying by Agor ✓
- 2. Advance Surveying by Duggal
- 3. Surveying by Arora (Vol. I and II) ✓

ADVANCED SURVEYING

Class : S. E. (Civil) Semester : IV (P.T.D.C.)

Periods per week : Lectures : 4
 Tutorials : -
 Practicals : 2

Evaluation system : Theory Examination : 3 Hours, 100 marks
 Practical Examination : -
 Oral Examination : 25 Marks*
 Term Work : 25 Marks

(* - Oral & Practical)

Detailed Syllabus :

1 Measurement of Volumes:

Definition of common terms, preparation of two and three level sections, volume of earthwork with trapezoidal and prismoidal formulae, corrections. Volume from spot levels and contour maps, mass diagram.

2 Photographic Surveying :

Introduction, various types and methods of photographic surveying, different technical terms used , planning terrestrial survey and aerial survey, detail study of aerial survey with vertical photographs, overlaps and mosaics, relief displacement and finding elevations of the objects, simple problems.

3 Astronomical Surveying :

Use for civil engineers, different terms used in astronomic surveying, study of co-ordinate system, use of formula in spherical trigonometry. Astronomical triangle and its various cases, study of time consideration, Indian standard time, various methods of establishing true meridian at a place.

4 Hydrographic Surveying :

Shore line surveys, soundings, tidal current surveys. Capacity of reservoirs, stream gauging techniques, two and three point problems.

5 Setting out tunnel curved in plan and on gradient and major bridges with modern survey instruments:

6 Route Survey for canal and roads in mountainous terrain with steep grades

