

**Applied Mathematics – IV**  
S.E. Sem. IV [CIVIL/CONE]

---

---

**EVALUATION SYSTEM**

	<b>Time</b>	<b>Marks</b>
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	–	–
<b>Oral Exam</b>	–	–
<b>Term Work</b>	–	–

**SYLLABUS**

**1. Vector Calculus & Analysis**

- Recall Gradient, Curl and Divergence (with properties), Conservative, Irrotational and Solenoidal fields.
- Line integrals, properties of line integral, Green's theorem in plane.
- Stoke's theorem and Gauss divergence theorem (without proof). Related identities and deductions.

**2. Statistics & Probability**

- Measures of central tendency (mean, median, mode, quartiles, deciles, percentiles, only introduction no questions to be asked).
- Measures of dispersions (mean deviation, quartile, deviation, standard deviation), coefficient of variation.
- Covariance & Correlation, Karl Pearson's coefficient & spearman's rank coefficient (with proofs) (repeated and non-repeated ranks).
- Regression analysis (Linear and multiple).
- Introduction to probability and conditional probability, Baye's theorem.
- Discrete and continuous random variable, Probability mass function & Probability density function. Probability distribution for random variables.
- Expected value, Variance, Moments and Moment generating function.
- Binomial, Poisson and Normal distribution for detailed study.
- Central limit theorem (only statement) and problems based on it.

**3. Sampling Theory & Resting of Hypothesis**

- Population and sample, Sampling with and without replacement, Random samples, Population parameters, Sample statistics.
- Sampling distributions, Sample mean sampling distribution of means, Sampling distribution of proportions. The sample variance, Sampling distribution of variances.
- Cases where population variance is unknown, Sampling distribution of ratios of variances, Other statistics.
- Statistical decisions, Statistical hypothesis, Null hypothesis and alternate hypothesis.
- Test of hypothesis and significance, Type I and Type II errors, Level of significance, One-tailed and two tailed tests.
- Test of significance for large samples (between sample and population mean, difference between the means of two samples).
- Tests of significance for small samples (t-test, paired t-test, F-test). The  $\chi^2$  test for goodness of fit and contingency tables.

**4. Estimation Theory**

- Unbiased estimates and efficient estimates, Point and interval estimates.
- Confidence interval estimates of population parameters. Confidence interval for means, proportions, variance ratios. Maximum likelihood estimates.

## 5. Complex Variable

- Line integral for a complex valued function, Cauchy's integral theorem and Cauchy's integral formula (with proofs).
- Singularities and poles, Taylor's and Laurent's series (without proof), Cauchy's residue theorem.
- Evaluation of real integrals of the form  $\int_0^{2\pi} f(\cos\theta\sin\theta)d\theta$  and  $\int_{-\infty}^{\infty} f(x) dx$  using residue theory.

### References :

1. Vector calculus (*Shanti Narayan & J. N. Kapur*), S. Chand & company Limited.
2. Probability & statistics for engineers (*Richard Johnson & Gupta*), Pearson Education.
3. Probability & statistics (*Murray Spiegel*), Schaum series.
4. Complex variables (*Churchill & Brown*), Tata McGraw Hill



**Surveying – II**  
S.E. Sem. IV [CIVIL/CONE]

**EVALUATION SYSTEM**

	<b>Time</b>	<b>Marks</b>
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical &amp; Oral Exam</b>	–	25
<b>Term Work</b>	–	25

**SYLLABUS**

**1. Curves**

Definitions of different terms, necessity of curves and types of curves

- (i) Simple circular curves and compound curves, office and field work, linear methods of setting out of curves. Angular methods for setting out of curves, two theodolite and Rankine deflection angle methods.
- (ii) Reverse and transition curves, their properties and their advantages design of transition curves, shift, spiral angle.  
Composite curves – office and field work, setting out of curve by angular method, composite curve problems.
- (iii) Vertical curves – definitions, geometry and types, tangent correction and chord gradient methods, sight distance on a vertical curve, difficulties in setting out curves and solutions for the same.

**2. Tachometric Surveying**

Principles and uses, advantages, stadia formula, different methods of tachometer, subtense bar method, location details by tachometer, stadia diagram and tables, error and accuracy in tachometric survey work. Application in plane table and curve setting.

**3. Setting Out Works**

General horizontal and vertical control, setting out of foundation plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite.

setting out of sewer line, culvert, Setting out centre line for tunnel, transfer of levels of underground work.

Project / route survey for bridge, dam and canal.

Checking vertically of high rise structures

**4. Modern Surveying Instruments**

Electronic in surveying, general principles used in the instruments, Electronic distance measurements – types, principles, applications in surveying, correction for field observations.

Electronic digital theodolite – types, uses and application, concept of total station-uses and application.

Use of computer in survey work for level computation and plotting contour plan using software.

Introduction of GPS

**5. Precision Leveling**

Precise level and leveling staff, field procedure for precise leveling, field notes.

**References :**

1. Surveying and levelling, Vol-I & II, (*Kanetkar and Kulkarni*), Pune Vidyarthi Griha, Pune.
2. Surveying and levelling (*N. N. Basak*), Tata McGraw Hill, New Delhi.
3. Surveying (*R. Agor*), Khanna Publishers.
4. Surveying. Vol – I, (*Dr. K. R. Arora*), Standard book house.



**Structural Analysis – I**  
S.E. Sem. IV [CIVIL/CONE]

**EVALUATION SYSTEM**

	<b>Time</b>	<b>Marks</b>
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	–	–
<b>Oral Exam</b>	–	25
<b>Term Work</b>	–	25

**SYLLABUS**

**1. Axial Force, Shear Force and Bending Moment**

Axial force, shear force and bending moment diagrams for statically determinate frames with and without internal hinges.

**2. General Theorems**

Theorems relating to elastic structures, principle of virtual work, strain energy in elastic structures, stresses due to axial load and impact load, complementary energy, Castigliano's theorem, Betti's and Maxwell's reciprocal theorems, principle of superposition.

**3. Unsymmetrical bending**

Flexural stresses due to bending in two planes for symmetrical sections, bending of unsymmetrical sections.

**4. Deflection of Statically Determinate Structures**

Deflection of cantilevers, simply supported and overhanging beams for different types of loadings using following methods –

Double integration, Macaulay's method, Moment area, Conjugate beam, Principle of virtual work (unit load method) and Castigliano's theorem.

Deflection of determinate pin jointed and rigid jointed frames by principle of virtual work (unit load method) and Castigliano's theorem.

**5. Influence Lines for Statically Determinate Structures**

Influence lines for cantilevers. Simply supported, overhanging beams and pin jointed warren truss, criteria for maximum shear force and bending moment, absolute maximum shear force and bending moment under moving loads (udl and series of point loads) for simply supported beam.

**6. Elastic Arches**

Determination of normal thrust, shear force and bending moment for parabolic, braced and segmental three hinged arches, influence lines for normal thrust, shear force and bending moment for three hinged parabolic arch.

**7. Suspension Bridges**

Simple suspension cable, different geometries of cables, minimum and maximum tensions in the cable supported at same/different levels, anchor cable, suspension cable with three hinged stiffening girder, influence line diagram for horizontal tension in the cable, shear force and bending moment at any section of the stiffening girder.

**8. Struts**

Struts subjected to axial loads, concept of buckling, Euler's and Rankine's design formulae for strut with different support conditions. Struts subjected to eccentric and lateral loads, struts with initial curvature.

**References :**

1. Basic structural analysis (*C. S. Reddy*), Tata McGraw Hill, New Delhi.
2. Theory of structures (*Timoshenko & Young*), Tata McGraw Hill, New Delhi
3. Structural mechanics, Vol. I & II, (*Junnarkar S. B.*), Charotar Publisher.
4. Elementary structural analysis (*Norries & Wilbur*), McGraw Hill.
5. Structural analysis (*Laursen H. I.*), McGraw Hill Publishing Co.
6. Structural analysis (*Bhavikatti*), Vikas Publishers.
7. Structural theorems and their application (*B. G. Neal*), Pergaman Press.
8. Structural analysis (*Hibbler*), Prentice Hall International.
9. Structural analysis (*Chajes*), ELBS London.
10. Structural analysis (*Kassimalli*), TWS Publications.
11. Comprehensive structural analysis. Vol-I&II, (*Vaidyanathan R. and Perumal R.*), Laxmi Pub.
12. Fundamentals of structural analysis (*K. M. Leet, C. M. Uang and A. M. Gilbert*), Tata McGraw Hill, New Delhi.
13. Structural analysis (*Devdas Menon*), Narosa Publishing House.
14. Elementary theory of structures (*Hseih*), Prentice Hall.



**Building Design and Drawing – I**  
S.E. Sem. IV [CIVIL/CONE]

---

---

**EVALUATION SYSTEM**

	<b>Time</b>	<b>Marks</b>
<b>Theory Exam</b>	4 Hrs.	100
<b>Practical Exam</b>	–	–
<b>Oral &amp; Sketching Exam</b>	–	25
<b>Term Work</b>	–	25

**SYLLABUS**

1. Planning and preparing of working drawings of residential structures of all types such as bungalows, row houses, duplex, apartment houses etc., and principles of planning, relevant knowledge of building bylaws, code of practice for architectural drawings as per IS 962 and related causes of local D.C. rules.
2. Constructional details and drawings of foundations floors, roofs–flat and pitched, doors and windows, staircases, plumbing items, columns, beams and slabs as per current practice.

**References :**

1. Building drawing (*M. G. Shah, C. M. Kale, S. Y. Patil*), Tata McGraw Hill, Delhi.
2. Civil engineering drawing (*M. Chakraborty, Monojit Chakraborty*), Publication Kolkata.
3. Building drawing and detailing (*BTS Prabhu, K. V. Paul and C. Vijayan*), SPADES Publication Calicut.
4. Planning and designing buildings (*Y. S. Sane*), Modern Publication House, Pune.



# Concrete Technology

S.E. Sem. IV [CIVIL/CONE]

## EVALUATION SYSTEM

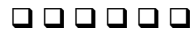
	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

## SYLLABUS

- 1. Aggregates**  
Properties of coarse and fine aggregates and their influence on properties of concrete
- 2. Cement**  
Physical properties of cement as per IS codes, types of cements and their uses and uses.
- 3. Concrete**  
Grades of concrete, Manufacturing of concrete, importance of w/c ratio. Properties of fresh concrete- workability and factors affecting it, consistency, cohesiveness, bleeding, segregation. Properties of hardened concrete- Compressive, Tensile and Flexural strength, Modulus of Elasticity, Shrinkage and Creep. Durability – Factors affecting durability, laboratory tests on durability such as Permeability test, Rapid chloride penetration test. Concreting in extreme weather conditions, under-water concreting.
- 4. Concrete Mix Design**  
Mix design for compressive strength by I.S. method and DoE method. Mix design for flexural strength.
- 5. Admixtures**  
Plasticizers, Superplasticizers, Retarders, Accelerators, Mineral admixtures and other admixtures, test on admixtures, chemistry and compatibility with concrete.
- 6. Ready Mix Concrete**  
Advantages of ready mix concrete, components of RMC plant, distribution and transport, handling and placing, mix design of RMC.
- 7. High Performance and High Strength Concrete**  
Constituents of high performance and high strength concrete, various tests and their applications.
- 8. Special Concretes:**  
Light weight concrete, High density concrete, No fines concrete, Fiber reinforced concrete, Polymer concrete-types. Ferrocement, Shotcrete, Self compacting concrete, Reactive powder concrete, Bendable concrete.
- 9. Repairs and Rehabilitation of Concrete Structures**  
Distress in concrete structures, causes and prevention, damage assessment procedure, crack repair techniques.
- 10. Non-Destructive Testing of Concrete**  
Hammer test, ultrasonic pulse velocity test, load test, carbonation test,  $\frac{1}{2}$  cell potentiometer test, core test and relevant provisions of I.S. codes.

**References :**

1. Concrete Technology, (*A. R. Shanthakumar*), Oxford University Press.
2. Concrete technology theory and practice, (*Shetty MS.*), S. Chand.
3. Properties of concrete, (*Neville*), Isaac Pitman, London.
4. Relevant I. S. codes, Bureau of Indian standard.
5. Special Publication of ACI on Polymer concrete and FRC.
6. Proceedings of International Conferences on Polymer Concrete and FRC.
7. Concrete Technology, (*Gambhir M. L.*), Tata McGraw Hill, New Delhi.
8. Concrete Technology, (*Neville A. M. & Brooks. J. J.*), ELBS – Longman.
9. Tentative Guidelines for cement concrete mix design for pavements (IRC:44–1976), Indian Road Congress, New Delhi.
10. Repairs and rehabilitation, (*Compilation from Indian congress Journal*), ACC Pub.



**Fluid Mechanics – II**  
S.E. Sem. IV [CIVIL/CONE]

**EVALUATION SYSTEM**

	<b>Time</b>	<b>Marks</b>
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	2 Hrs.	–
<b>Oral Exam</b>	–	25
<b>Term Work</b>	–	25

**SYLLABUS**

**1. Flow Through Pipes**

Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy line, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles.

**2. Analysis of Pipes Network**

Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.

**3. Compressible Flow**

Back equation of flow (elementary study), Velocity of sound or pressure wave in a fluid. Mach number, Mach cone, area-velocity relationship, stagnation properties, flow of compressible flow through discharge measuring devices.

**4. Laminar Flow**

Reynolds experiment, Critical velocity, Steady laminar flow through circular pipes, annulus, parallel plates : stationary and moving, kinetic energy correction factor, momentum correction factor, Dash pot.

**5. Turbulent Flow Through Pipes**

Causes of turbulence, instability, mechanism of turbulence, Reynolds stresses. Semi-empirical theories of turbulence, Prandtl's mixing length theory, Universal velocity distribution equation, resistance equation, applications, Moody diagram.

**References :**

1. Hydraulics and fluid mechanics (*Dr. P. M. Modi and Dr. S. M. Seth*), Standard Book House.
2. Theory and applications of fluid mechanics (*K. Subramanya*), Tata McGraw Hill, New Delhi.
3. Fluid mechanics (*Dr. A. K. Jain*), Khanna Publishers.
4. Fluid mechanics and fluid pressure engineering", (*D. S. Kumar*), F. K. Kataria & sons.
5. Fluid mechanics (*R. K. Bansal*), Laxmi Publications (P) Ltd.
6. Fluid mechanics (*Frank M. White*), Tata McGraw – Hill.
7. Fluid mechanics (*Streeter, Wylie Bedford,*), McGraw–Hill International Edition.
8. Fluid mechanics with engineering applications (*R. L. Daugherty, J. B. Franzini, E. J. Finnemore*), Tata McGraw–Hill, New Delhi.
9. Fluid mechanics (*Joseph Spark*), Springer
10. Mechanics of fluids (*Potter, Wiggers*), Prentice – Hall international.

