

Applied Mathematics - III

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

EVALUATION SYSTEM

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

SYLLABUS

1. Complex Variables

- Necessary and sufficient conditions for function $f(z)$ to be analytic (without proof), Harmonic functions. Orthogonal trajectories.
- Milne Thomson's method to find analytic function from its real or imaginary parts.
- Cauchy Riemann's equation in polar –coordinates
- Mapping, Conformal mapping.
- Linear, bilinear mapping with geometrical interpretations.
- Applications of Complex variables to Civil Engineering problems.

2. Fourier Series & Integrals

- Orthogonal & Orthonormal set of functions.
- Fourier series, Determination of Fourier constants, Dirichlet's conditions.
- Fourier series for $f(x)$, $x \in [c, c + 2\pi]$ and $x \in [c, c + 2L]$.
- Fourier series of Odd and Even functions.
- Half range Fourier Sine & Cosine series, Parseval's Identity.
- Complex form of Fourier series.
- Fourier Integral, Fourier integrals of even and odd functions.

3. Laplace Transforms

- Function of bounded variation (Statement only) Laplace Transforms of $1, e^{at}, \sin at, \cos at, \sinh at, \cosh at, t, \operatorname{erf}(\sqrt{t}), J_0(t)$.
- Shifting theorems, change of scale.

$$L\{t^n f(t)\} = L\left\{\frac{f(t)}{t}\right\} = L\left\{\frac{d^n f(t)}{dt^n}\right\} = L\left\{\int_0^t f(u) du\right\}$$

- Convolution theorem (with proof), Evaluation of real integrals using Laplace transforms
- Laplace transforms of special functions (Heaviside Unit step function, Dirac Delta function and periodic functions).
- Inverse Laplace Transforms.
- Evaluation of Inverse Laplace Transforms using partial fractions, convolution, theorems, shifting theorems and other properties.
- Application of Laplace Transform to solve initial & boundary value problems involving ordinary differential equation with one dependent variables.

4. Matrices

- Types of matrices (including orthogonal & unitary).
- Adjoint of a matrix, Partitioning of Matrices. Inverse of a matrix
- Elementary Transformation, rank of a matrix, normal form
- System of Homogeneous and Non Homogeneous linear equations, their consistency & Solution.
- Eigen values and Eigen vector
- Cayley Hamilton Theorem (without proof), problems based on Cayley Hamilton theorem.

Reference :

1. Complex Variables and Applications (*R.V. Churchill & J.W. Brown*) McGraw Hill.
2. Theory of Functions of a Complex Variable (*Shanti Narayan*) S. Chand.
3. Laplace Transforms (*Murray Spiegel*) Schaum Series.
4. Engineering Mathematics (*Bali & Iyengar*) Laxmi Publications.
5. Matrices (*Shanti Narayan*) S. Chand.



Surveying – I
S.E. Sem. III [CIVIL/CONE]

EVALUATION SYSTEM

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

SYLLABUS

1. Introduction

Various types of surveying – based on methods and instruments, classifications, uses and necessity of geodetic surveying, photographic, astronomy and hydrographic surveying.

Plain and diagonal scale, various types of verniers, micrometers on surveying instruments, principles of surveying.

Different types of ranging, tapes, chains, steel band

Linear measurements, approximate, direct, optical and electronic methods.

Chain surveying, minor instruments for setting out right angle.

2. Compass Survey

Bearings – different types, compass – prismatic, surveyor, whole circle and reduced bearings, declination, local attraction, plotting of compass survey by different methods.

3. Levelling and contouring :

Definitions, technical terms, different types of levels such as dumpy, quickset, precise, auto, temporary and permanent adjustments of dumpy and auto level, Auto levels, self compensating instrument, laser level. Difficulties in levelling work, reduction of levels, corrections and precautions in levelling work, problems.

Contour – definitions, contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring.

Running a level line, L section, cross section, methods of interpolation Grade contour – definition, use, setting out in field

Computation of volume by trapezoidal and prismoidal formula, volume from spot levels, volume from contour plan.

4. Areas

Area of a irregular figure by Trapezoidal rule, average ordinate rule, Simpson's 1/3 rule, various coordinate methods.

Planimeter : types of planimeter including digital planimeter, area of zero circle, use of planimeter.'

5. Theodolite Traverse

Various parts and axis of transit, technical terms, temporary and permanent adjustments of a transit, horizontal and vertical angles, methods of repetition and reiteration.

Different methods of running a theodolite traverse, Gales traverse table, balancing of traverse by Bow-Ditch's transit and modified transit rules Problems on one-plane and two-plane methods, omitted measurements Precautions in using theodolite, errors in theodolite survey.

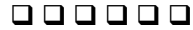
Use of theodolite for various works such as prolongation of a straight line, setting out an angle.

6. Plane Table Surveying

Definitions, uses and advantages, temporary adjustments, Different methods of plane table surveying,
Two point problem,
Errors in plane table survey, use of telescopic alidade

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.



Strength of Materials

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

EVALUATION SYSTEM

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

SYLLABUS

1. Shear force and bending moment

Axial force, shear force and bending moment diagrams for statically determine beams including beams with internal hinges for different types of loading, relationships between rate of loading, shear force and bending moment.

2. Stress and Strain

Stress, Strain, Modulus of elasticity (E), Modulus of Rigidity (G), Bulk Modulus (K), yield stress, ultimate stress, factor of safety, shear stress, Poisson's ratio. Relationship between E, G and K. Bars of varying sections, composite sections, temperature stresses.

3. Simple theory of bending :

Flexure formula for straight beams, moment of inertia, product of inertia and polar moment of inertia of plane areas, principal axes of inertia, moment of inertia about principal axes, transfer theorem, simple problems involving applications of flexure formula, section modulus, moment of resistance of section of flitched beams.

4. Shear stress in beams

Distribution of shear stress across plane sections used commonly for structural purposes, shear connectors. Shear stress and force in beams of thin walled open cross sections, shear centre of thin walled sections such as angle, tee, channel and I sections.

5. Simple theory of torsion

Torsion of circular shafts – solid and hollow, stresses in shaft when transmitting power, close coiled helical springs under axial load.

6. Bending moment combined with axial loads

Application to members subjected to eccentric loads, core of a section. Problems on chimneys, retaining walls etc. involving lateral loads,

7. Principal stresses

General equations for transformation of stress, principal planes and principal stresses, maximum shear stress, determination using Mohr's circle, principle stresses in shafts subjected to torsion, bending and axial thrust, concept of equivalent torsional and bending moments.

8. Rivets and welds

Axially and eccentrically loaded riveted and welded connections.

9. Thin cylindrical and spherical shells

Stresses and strains in thin cylindrical and spherical shells under internal pressure.

References :

1. Mechanics of Materials (*E.P. Popov*) – Prentice Hall of India Pvt. Ltd.
2. Mechanics of Materials (*Timosenko & Gere*) – Prentice Hall of India Pvt. Ltd.
3. Mechanics of Structures, Vol. I (*S.B. Junnarkar*) – Charotar Publishers
4. Mechanics of Materials (*James M. Gere*) – Brooks/Cole
5. Strength of Materials (*G.H. Ryder*), MacMillan.
6. Mechanics of Materials (*Pytel & Singer*) – McGraw Hill, New Delhi
7. Strength of Materials (*William A. Nash*), Schaum's Outline Series out line service, McGraw Hill Book Co.
8. Mechanics of Materials (*Beer & Johnson*) – Tata McGraw Hill, New Delhi
9. Strength of Materials (*Subramanian*), Oxford University Press
10. Strength of Materials (*R.K.Rajput*), S. Chand.



Building Materials and Construction

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

EVALUATION SYSTEM

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

SYLLABUS

1. Classification of materials, requirements of building materials and products: functional, aesthetical and economical.
Study of properties of materials–physical, mechanical, chemical, biological and other like durability, reliability, compatibility and economic characteristics.
Types of structures–framed, load bearing and composite structures. Suitability and economic aspects of each type.
2. Stone-types, its properties, quarrying, milling and surface finishing, preservative treatments.
Structural clay products–bricks, roofing tiles, ceramic tiles, raw materials and manufacturing process.
Concrete blocks, flooring tiles, paver blocks–raw materials and manufacturing process.
Binder material : lime, cement : physical properties and manufacturing process, plaster of paris.
Mortar and concrete – ingredients, preparation and uses.
Masonry construction – classification and bonding in stone, brick and concrete blocks.
3. **Glass** – types and uses.
4. **Timber** : varieties, defects in timber, preservative treatments and wood composites.
5. **Metal and alloys** : Ferrous and non-ferrous metals and alloys, aluminium, tin, zinc, nickel, types and uses anti-corrosive treatment.
6. Floors and roofs. Types of floors, floor finishes and suitability. Types of roofs, wooden and steel trusses, roof covering and drainage.
7. Paints and varnishes, types, constituents and uses.
8. **Staircase** : types, size and location, layout, design considerations.
9. **Formwork** : materials used, design considerations, slip form shuttering, centering and staging, scaffolding.
10. **Building services** : Air conditioning, systems of heating, air conditioning, ventilation, construction requirements
Fire Fighting : fire hazards, resisting materials, fire alarm system, fire extinguishers, fire loads, precautions.
Lifts : passenger handling capacity and accessories.
Acoustics and sound insulation : Characteristics of sound, reflection and absorption coefficient, acoustical defects, design and material.
Plumbing : requirement and basics in design, water supply system, waste water system, materials
Damp-proofing and water proofing : materials and methods.

References :

1. Building construction (*S. P. Bindra and S.P. Arora*) – Dhapat Rai & Sons, Delhi
2. Building drawing (*M.G.Shah, C.M. Kale, S.Y.Patki*) – Tata McGraw Hill, Delhi
3. Services in building complex (*V. K. Jain*) – Khanna Publishers
4. Material of construction (*D. N. Ghose*), Tata McGraw Hill, Delhi
5. Architectural materials science (*D. Anapetor*) – Mir Publishers
6. IS codes of different materials, BIS publications
7. Introduction to engineering materials (*B. K. Agrawal*), Tata McGraw Hill New Delhi.
8. Engineering materials (*Rangwala*) – Charotar Publications
9. Engineering materials (*P. Surendrasingh*) – Vani Education Books New Delhi
10. Building construction (*Rangwala*) – Charotar Publications



Engineering Geology

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

EVALUATION SYSTEM

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

SYLLABUS

1. Introduction

Branches of geology useful to civil engineering, Importance of geological studies in various civil engg. Projects.

Internal structure of the Earth and use of seismic waves in understanding the interior of the earth.

2. General and Physical Geology

Agents modifying the earth's surface, study of weathering and its significance in engineering properties of rocks like strength, water, tightness and durability etc.

Geological action of river, wind, glacier, ground water and the related land forms created by them.

Volcanism – Central type and fissure type, products of volcano, volcanic land forms.

Earthquakes – Earthquakes waves, construction and working of seismographs. Earthquakes zones of India.

Preventive measures of structures constructed in Earthquake prone area.

3. Mineralogy

Identification of minerals with the help of physical properties, rock forming minerals, megascopic identification of primary and secondary minerals, study of common ore minerals as prescribed under practical.

4. Petrology

Study of Igneous, sedimentary and metamorphic rocks, distinguishing properties between Igneous, sedimentary and metamorphic rocks to identify them in fields.

Igneous Petrology – Mode of formation, Texture and structure etc. Hatch's scheme of classification, study of common igneous rocks.

Sedimentary Petrology – Mode of formation, Textures, characteristics of shallow water deposits like lamination, bedding, current bedding etc. classification of secondary rock types, residual deposits, chemically formed and organically deposits, commonly occurring sedimentary rocks.

Metamorphic Petrology – Mode of formation, agents and types of metamorphism, metamorphic minerals, rock cleavage, structures and textures of metamorphic rocks, classification, commonly occurring metamorphic rocks.

5. Structural Geology

Structural elements of rocks, dip, strike, outcrop patterns, unconformities, outliers and inliers, study of joints, faults and folds, importance of structural elements in engineering operations.

Stratigraphy and Indian Geology

General principles of Stratigraphy and co-relation, geological timescale, Physiographic divisions of India and their characteristics, Geological history of peninsular India, Study of formations in the peninsula, Important economic minerals and building stones of India.

7. Geological Investigation

Preliminary geological investigation and their importance to achieve safety and economy of the projects supporting case studies of dams and tunnel projects in Maharashtra state.

Methods of surface and subsurface investigations – Excavations – Trial pits. Trenches etc.

Core Drilling – Geological logging, inclined drill holes.

Electrical Resistivity methods, Seismic methods and their applications. Use of aerial photographs, satellite imageries in civil engineering projects.

8. Geology of Dam and Reservoir Site

Strengths, stability and water tightness of foundation rocks and their physical characters and geological structures. Geological conditions and choice of type of dams. Favorable and unsuitable conditions for locating dams, structural and erosional valleys. Precautions to be taken to counteract unsuitable conditions. Significance of faults, dykes, crush zones, joints and unfavourable dips on the dam site and treatment giving to such structures.

9. Tunneling

Importance of geological considerations while choosing sites and alignments of the tunnel.

Ideal site conditions for tunneling, geological conditions to be avoided. Tunneling to various types of rocks under various geological and structural conditions. Difficulties during tunnelling and methods to overcome the difficulties.

10. Ground Water

Sources and zones, water table, Unconfined and Perched. Factors controlling water bearing capacity of rocks. Pervious and Impervious rocks. Cone of depression and its use in Civil engineering. Geological work of groundwater. Springs and seepage sites and geological structures. Artesian wells. Different types of rocks as source of ground water.

Methods of artificial recharge of ground water, geology of percolation tank.

11. Land Slides

Their types, causes and preventive measures for landslides.

12. Building Stones

Requirements of good stones, geological factors, controlling properties of good building stones, consideration of common rocks as building stones, study of different building stones from various formations in Indian Peninsula, geological factors controlling location of quarries, quarrying methods and quarrying operations.

References :

1. Text book of Engineering Geology (*Dr. R.B. Gupte*) – Vidyarthi Pune
2. Text book of Engineering Geology (*P. K. Mukerjee*) – Asia
3. Text book of Engineering and General Geology (*Parbin Singh*) – Catson Publication House.
4. Text book of Engineering Geology (*N Chenna Kesavulu*) – MacMillan.
5. Principles of Physical Geology (*Arthur Homes, Thomas Nelson*) – London.
6. Principles of Geomorphology (*William D. Thornbury, John Wiley*) – New York.
7. Principles of Engineering Geology (*K.M. Banger*)
8. Geology for Civil Engineering (*A.C. McLean, C.D. Gribble, George Allen*) – Unwin London
9. Geology for India (*D.N.Wadia*) – National Book Trust



Fluid Mechanics – I
S.E. Sem. III [CIVIL/CONE]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical	2 Hrs.	–
Oral	–	–
Term Work	–	25

SYLLABUS

1. Properties of Fluids

Mass density, weight density, specific gravity, specific volume, viscosity, compressibility, bulk surface tension, capillary action, vapour pressure, types of fluids, basic concept of applicable to fluid mechanics.

2. Fluid State

Pascal's law, Hydrostatic Law, pressure variation in fluids at rest, absolute, atmospheric, gauge pressure, measurement of pressures, Hydrostatic force on plane and curved surface.

Buoyancy and flotation : Archimede's principle Metacentre, metacentric height, equilibrium of floating and submerged bodies, oscillation of floating body.

3. Liquids in Relative Equilibrium

Uniform linear acceleration, liquid containers subjected to constant horizontal and vertical acceleration, constant rotation with vertical axis.

4. Fluid Kinematics

Description of fluid flow : Lagrangian method, Eulerian method. Streamline, Path lines and streak lines, Classification of Fluids flows, Differential equation of continuity, continuity equation in polar co-ordinates, Rotational flow, Rotation and vorticity, stream function, potential function, circulation, flow net.

5. Fluid Dynamics

Control volume and control surface, Euler's equation, Bernoulli's Theorem, Bernoulli's equation of real fluids, application to flow measuring devices : Venturimeter, nozzle meter, pitot tube, rotameter.

6. Flow Measurement

Orifice : Hydraulic coefficients, small and large orifice, time of emptying a tank through orifice.

Mouthpieces : External, convergent Borda's mouthpieces

Notches and weirs : rectangular, triangular, Cipolletti weirs, velocity of approach, end contractions.

7. Ideal Fluid Flow

Uniform flow, source flow, sink flow, free vortex flow, superimposed flow : source and sink flow, doublet, flow past half body, flow past a Rankine oval body, flow past a cylinder only.

110th over parallel line through the flow past of the body source and venturimeter, orifice, nozzlemeter, Bernoulli's theorem

References :

1. Hydraulics and fluid mechanics (*Dr. P. M. Modi & 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 International Edition.
9. Fluid mechanics (*Joseph Spurk*) – Springer
10. Mechanics of fluids (*Potler, Wiggert*) – Prentice-Hall International.

