

ENGINEERING MATHEMATICS – IV

CODE: 10 MAT 41
Hrs/Week: 04
Total Hrs: 52
Marks:100

IA Marks: 25
Exam Hrs: 03
Exam

PART-A

Unit-I: NUMERICAL METHODS - 1

Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Runge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

[6 hours]

Unit-II: NUMERICAL METHODS – 2

Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge-Kutta method of fourth-order.

Numerical solution of second order ordinary differential equations: Picard's method, Runge-Kutta method and Milne's method.

[6 hours]

Unit-III: Complex variables – 1

Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.

Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

[7 hours]

Unit-IV: Complex variables – 2

Conformal Transformations: Bilinear Transformations.
Discussion of Transformations:
 $w = z^2$, $w = e^z$, $w = z (a^2 / z)$. Complex line integrals-
Cauchy's theorem and Cauchy's integral formula.

[7 hours]

PART-B

Unit-V: SPECIAL FUNCTIONS

Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

[7 hours]

Unit-VI: PROBABILITY THEORY - 1

Probability of an event, empirical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

[6 hours]

Unit-VII: PROBABILITY THEORY- 2

Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson distributions; Exponential and normal distributions.

[7 hours]

Unit-VIII: SAMPLING THEORY

Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t-distribution. Chi -Square distribution as a test of goodness of fit

[6 hours]

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

CONCRETE TECHNOLOGY (COMMON TO CV/TR/CTM)

Sub Code	:	10 CV 42	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

Unit- 1

Cement, Chemical composition, hydration of cement, Types of cement, manufacture of OPC by wet and dry, process (flow charts only) Testing of cement - Field testing, Fineness by sieve test and Blaine's air permeability test, Normal consistency, testing time, soundness, Compression strength of cement and grades of cement, Quality of mixing water. -7 Hours

Unit-2

Fine aggregate - grading, analysis, Specific gravity, bulking, moisture content, deleterious materials. Coarse aggregate – Importance of size, shape and texture. Grading of aggregates - Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. - 6 Hours

Unit-3

Workability - factors affecting workability, Measurement of workability - slump, flow tests, Compaction factor and vee-bee consistometer tests, Segregation and bleeding, Process of manufacture of concrete : Batching, Mixing, Transporting, Placing, Compaction, Curing. -7 Hours

Unit-4

Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures - Fly ash, Silica fumes and rice husk ash.

-6 Hours

Part-B

Unit-5

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, Effect of aggregate properties, relation between compressive strength, and tensile strength, bond strength, modulus of rupture, Accelerated curing, aggregate - cement bond strength, Testing of hardened concrete - compressive strength, split tensile strength, Flexural strength, factors influencing strength test results.

- 6Hours

Unit-6

Elasticity - Relation between modulus of elasticity and Strength, factors affecting modulus of elasticity, Poisson , Ratio, Shrinkage - plastic shrinkage and drying shrinkage, Factors affecting shrinkage, Creep - Measurement of creep, factors affecting creep, effect of creep,

- 7 Hours

Unit-7

Durability - definition, significance, permeability, Sulphate attack, Chloride attack, carbonation, freezing and thawing, Factors contributing to cracks in concrete - plastic shrinkage, settlement cracks, construction joints, Thermal expansion, transition zone, structural design deficiencies, - 6 Hours

Unit-8

Concept of Concrete Mix design, variables in proportioning , exposure conditions, Procedure of mix design as per IS 10262-1982, Numerical examples of Mix Design

- 7 Hours

TEXT BOOKS:

1. "Concrete Technology" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi, 2002.

REFERENCES :

1. "Properties of Concrete" Neville, A.M. : , ELBS, London
2. "Concrete Technology" – A.R.Santakumar. Oxford University Press (2007)
3. "Concrete Manual" - Gambhir Dhanpat Rai & Sons, New Delhi.
4. "Concrete Mix Design" - N.Krishna Raju, Sehgal - publishers.
5. "Recommended guidelines for concrete mix design" - IS:10262,BIS Publication

**STRUCTURAL ANALYSIS –I
(COMMON TO CV/TR)**

Sub Code	:	10 CV 43	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

STRUCTURAL SYSTEMS AND ENERGY CONCEPT

1.1 Forms of structures, 1.2 Conditions of equilibrium, 1.3 Degree of freedom, 1.4 Linear and Non linear structures, 1.5 One, two, three dimensional structural systems, 1.6 Determinate and indeterminate structures [Static and Kinematics]. 1.7 Strain energy and complimentary strain energy, 1.8 Strain energy due to axial load, bending and shear, 1.9 Theorem of minimum potential energy, 1.10 Law of conservation of energy, 1.11 Principle of virtual work,

7 Hours

UNIT 2:

DEFLECTION OF BEAMS

2.1 Moment area method, 2.2 Conjugate beam method

6 Hours

UNIT 3:

DEFLECTION OF BEAMS AND FRAMES BY STRAIN ENERGY

3.1 The first and second theorem of Castigliano, problems on beams, frames and trusses, 3.2 Betti's law, 3.3 Clarke - Maxwell's theorem of reciprocal deflection.

7 Hours

UNIT 4:

ANALYSIS OF BEAMS AND PLANE TRUSSES BY STRAIN ENERGY

4.1 Analysis of beams (Propped cantilever and Fixed beams) and trusses using strain energy and unit load methods

7 Hours

PART – B

**UNIT 5:
ARCHES AND CABLES**

5.1 Three hinged circular and parabolic arches with supports at same levels and different levels, 5.2 Determination of thrust, shear and bending moment, 5.3 Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).

6 Hours

**UNIT 6:
ANALYSIS OF BEAMS**

6.1 Consistent deformation method – Propped cantilever and fixed beams

6 Hours

UNIT 7:

7.1 Clapeyron's theorem of three moments – continuous beams and fixed beams

6 Hours

**UNIT 8:
ANALYSIS OF ARCHES**

8.1 Two hinged parabolic arch, 8.2 Two hinged Circular Arch

7 Hours

TEXT BOOKS:

1. **Theory of Structures**, Pandit and Guptha, Vol. – I, Tata McGraw Hill, New Delhi.
2. **Basic Structural Analysis** Reddy C. S., Tata McGraw Hill, New Delhi.
3. **Strength of Materials and theory of structures** Vol I & II, B.C. Purnia , R.K., Jain Laxmi Publication New Delhi

REFERENCE BOOKS:

1. **Elementary Structural Analysis**, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
2. **Structural Analysis**, 4th SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.
3. **Analysis of Structures**, Thandava Murthy, Oxford University Press, Edition 2005.

SURVEYING – II
(COMMON TO CV/TR/EV/CTM)

Sub Code	:	10 CV 44	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
THEODOLITE SURVEY

1.1 Theodolite and types, 1.2 Fundamental axes and parts of a transit theodolite, 1.3 Uses of theodolite, 1.4 Temporary adjustments of a transit theodolite, 1.5 Measurement of horizontal angles – Method of repetitions and reiterations, 1.6 Measurements of vertical angles, 1.7 Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment

6 Hours

UNIT 2:
PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE

2.1 Interrelationship between fundamental axes for instrument to be in adjustment and step by step procedure of obtaining permanent adjustments

7 Hours

UNIT 3:
TRIGONOMETRIC LEVELING

3.1 Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, 3.2 Distance and difference in elevation between two inaccessible objects by double plane method. Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.

8 Hours

UNIT 4:
TACHEOMETRY

4.1 Basic principle, 4.2 Types of tacheometric survey, 4.3 Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, 4.4 Anallactic lens in external focusing telescopes, 4.5 Reducing the constants in internal focusing telescope, 4.6 Moving hair method and

tangential method, 4.7 Substance bar, 4.8 Beaman stadia arc.

7 Hours

PART – B

UNIT 5:

CURVE SETTING (Simple curves)

5.1 Curves – Necessity – Types, 5.2 Simple curves, 5.3 Elements, 5.4 Designation of curves, 5.5 Setting out simple curves by linear methods, 5.6 Setting out curves by Rankines deflection angle method.

6 Hours

UNIT 6:

CURVE SETTING (Compound and Reverse curves)

6.1 Compound curves 6.2 Elements 6.3 Design of compound curves 6.4 Setting out of compound curves 6.5 Reverse curve between two parallel straights (Equal radius and unequal radius).

6 Hours

UNIT 7:

CURVE SETTING (Transition and Vertical curves)

7.1 Transition curves 7.2 Characteristics 7.3 Length of Transition curve 7.4 Setting out cubic Parabola and Bernoulli's Lemniscates, 7.5 Vertical curves – Types – Simple numerical problems.

6 Hours

UNIT 8:

AREAS AND VOLUMES

8.1 Calculation of area from cross staff surveying, 8.2 Calculation of area of a closed traverse by coordinates method. 8.3 Planimeter – principle of working and use of planimeter to measure areas, digital planimeter, 8.4 Computations of volumes by trapezoidal and prismoidal rule, 8.5 Capacity contours

6 Hours

TEXT BOOKS:

1. 'Surveying' Vol 2 and Vol 3 - B. C. Punmia, Laxmi Publications
2. 'Plane Surveying' A. M. Chandra – New age international (P) Ltd
3. 'Higher Surveying' A.M. Chandra New age international (P) Ltd

REFERENCE BOOKS:

1. **Fundamentals of Surveying** - Milton O. Schmidt – Wong, Thomson Learning.

2. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India
3. **Surveying**, Arther Bannister et al., Pearson Education, India

**HYDRAULICS & HYDRAULIC MACHINES
(COMMON TO CV/TR/EV)**

Sub Code	:	10 CV 45	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART-A

UNIT-1: DIMENSIONAL ANALYSIS AND MODEL STUDIES

Introduction, Systems of units, Dimensions of quantities, Dimensional Homogeneity of an equation. Analysis- Raleigh's method, Buckingham's II theorem- problems.
Model Studies, Similitude, Non-dimensional numbers: Froude models-Undistorted and Distorted models. Reynold's models-Problems
07 hrs

UNIT-2: UNIFORM FLOW IN OPEN CHANNELS

Introduction, Geometric properties of Rectangular, Triangular, Trapezoidal and Circular channels. Chezy's equation, Manning's equation-problems.
Most economical open channels-Rectangular, Triangular, Trapezoidal and Circular channels- problems.
06 Hrs

UNIT-3: NON-UNIFORM FLOW IN OPEN CHANNELS

Introduction, Specific energy, Specific energy diagram, Critical depth, Conditions for Critical flow- Theory & problems.

Hydraulic jump in a Horizontal Rectangular Channel- Theory and problems.

Dynamic equation for Non-Uniform flow in an Open channel, Classification of Surface profiles- simple Problems.

07 Hrs

UNIT-4: IMPACT OF JET ON FLAT VANES

Introduction, Impulse- Momentum equation. Direct impact of a jet on a stationary flat plate, Oblique impact of a jet on a stationary flat plate, Direct impact on a moving plate, Direct impact of a jet on a series of flat vanes on a wheel. Conditions for maximum hydraulic efficiency. Impact of a jet on a hinged flat plate- problems.

06 Hrs

PART-B

UNIT-5: IMPACT OF JET ON CURVED VANES

Introduction, Force exerted by a jet on a fixed curved vane, moving curved vane.

Introduction to concept of velocity triangles, Impact of jet on a series of curved vanes-problems.

06 Hrs

UNIT-6: PELTON WHEEL

Introduction to Turbines, Classification of Turbines. Pelton wheel- components, working and velocity triangles. Maximum power, efficiency, working proportions- problems.

07 Hrs

UNIT-7: KAPLAN TURBINES

Introduction, Components, Working and Velocity triangles, Properties of the Turbine, Discharge of the Turbines, Number of Blades-Problems. Draft Tube: Types, efficiency of a Draft tube. Introduction to Cavitation in Turbines.

07 Hrs

UNIT-8: CENTRIFUGAL PUMPS

Introduction, Classification, Priming, methods of priming. Heads and Efficiencies. Equation for work done, minimum starting speed, velocity triangles. Multistage Centrifugal Pumps (Pumps in Series and Pumps in parallel). Characteristic Curves for a Single stage Centrifugal Pumps- problems.

06 Hrs

TEXT BOOKS:

4. 'A TextBook of Fluid mechanics & Hydraulic Machines'- R.K.Rajput, S.Chand & Co, New Delhi, 2006 Edition.
5. ' Text Book Of Fluid Mechanics& Hydralic Machines'- R.K.Bansal, Laxmi Publications, New Delhi, 2008 Edition.
3. ' Fluid Mechanics and Turbomachines'- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

REFERENCE BOOKS:

5. ' Introduction to Fluid Mechanics' – Robert w. Fox: Philip j. Pritchard: Alan t. McDonald, Wiley India, New Delhi, 2009 Edition.
6. 'Introduction To Fluid Mechanics' – Edward j. Shaughnessy,jr; Ira m. Katz.; James p Schaffer, Oxford University Press, New Delhi, 2005 Edition.

7. 'Hydraulics and Fluid Mechanics' – Dr. P.N. Modi & Dr S.M. Seth, Standard Book House- New Delhi. 2009 Edition..

**BUILDING PLANNING AND DRAWING
(COMMON TO CV/TR)**

Sub Code	: 10 CV 46	IA Marks	:	25
Hrs/ Week	: 06 (3 x 2 = 6) Practical	Exam Hours	:	04
	01 Theory	Exam Marks	:	100

1. To prepare geometrical drawing of component of buildings i) Stepped wall footing and isolated RCC column footing, ii) Fully paneled and flush doors, iii) Half paneled and half-glazed window, iv) RCC dog legged and open well stairs, v) Steel truss.

15 Hours

2. Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio.

9 Hours

3. Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Two bed room building, ii) Two storeyed building.

27 Hours

4. Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building i) Primary health centre, ii) Primary school building, iii) College canteen iv) Office building

12 Hours

5. For a given single line diagram, preparation of water supply, sanitary and electrical layouts

6 Hours

REFERENCE BOOKS:

1. "Building Drawing", Shah M.H and Kale C.M, Tata Mc Graw Hill Publishing co. Ltd., New Delhi.

- 2 “**Building Construction**”, Gurucharan Singh, Standard Publishers & distributors, New Delhi.
- 3 **National Building Code**, BIS, New Delhi.

IA MARKS

15 Marks for term work.
 10 Marks for a test conducted at the end of the semester of 4hrs duration on the Line of VTU examination.

TERM WORKS DETAILS:

- Sheet No: 1 to 4 from chapter No1**
Sheet No: 5 to 8 from chapter No3
Sheet No: 9 to 13 from chapter No4
Sheet No: 14 & 15 from chapter No5

SCHEME OF EXAMINATION

Section-I Compulsory question from chapter No 3 for 60 Marks
 Plan.....25 }
 Elevation.....15 } 60
 Section.....15 }
 Schedule of opening.....05 }

Section-II Four questions from chapters 1, 2, 4 and 5 should be set, out of which two have to be answered (20 x 2 = 40 Marks).

Note: No theory question shall be asked from any chapter.

**SURVEYING PRACTICE – II LABORATORY
 (COMMON TO CV/TR/CTM)**

Sub Code	:	10 CVL 47	IA Marks	:	25
Hrs/ Week	:	03	Exam Hours	:	03
Total Hrs.	:	42	Exam Marks	:	50

Exercise – 1
 Measurement of horizontal angles with method of repetition and reiteration using theodolite, Measurement of vertical angles using theodolite.

Exercise – 2
 To determine the elevation of an object using single plane method when base is accessible and inaccessible.

Exercise – 3

To determine the distance and difference in elevation between two inaccessible points using double plane method.

Exercise – 4

To determine the tachemetric constants using horizontal and inclined line of sight.

Exercise – 5

To set out simple curves using linear methods – perpendicular offsets from long chord and offsets from chords produced.

Exercise – 6

To set out simple curves using Rankine’s deflection angles method.

Exercise – 7

To set out compound curve with angular methods with using theodolite only.

Exercise – 8

To set out the center line of a simple rectangular room using offset from base line

Exercise – 9

To set out center lines of columns of a building using two base lines at right angles

Demonstration

Exposure to use of Total Station. Traversing, Longitudinal sections, Block levelling, Usage of relevant softwares for preparation of the contour drawings.

Scheme of Examination:

Any one of the above exercise is to be conducted in the examination by the student.

**APPLIED ENGINEERING GEOLOGY LABORATORY
(COMMON TO CV/TR)**

Sub Code	:	10 CVL 48	IA Marks	:	25
Hrs/ Week	:	03	Exam Hours	:	03

Total Hrs. : 42

Exam Marks : 50

1. Describe and identify the minerals based on their physical, special properties, chemical composition and uses. Study of important rock forming minerals, ores and other important industrial minerals. (As per the III semester theory syllabus) – 2 practicals

2. Describe and identify the rocks as per the theory syllabus by giving their physical properties and engineering uses. – 2 practicals

3. Study of Geological maps and their sections: interpreting them in terms of selecting the sites for various civil engineering structures. - 3 practicals

4. Dip and strike (surface method) problems: To find out the dip and strike of the geological formation to select suitable site for civil engineering structures. – 2 practicals

5. Borehole problems (sub surface dip and strike): three point level ground methods: - 2 practicals

6. Thickness of strata (out crops) problems: To determine the true thickness, vertical thickness and the width of the out crops on different topographical terrain. – 1 practical

7. Field visit to Civil engineering projects –Dams, Reservoirs, Harbours etc. – 3 days

Scheme of Examination

1. Identification of Minerals (5 Nos.): 5x2 : 10 marks

2. Identification of Rocks (5Nos.): 5x2 : 10 marks

3. Geological Map: 1x 15 : 15 marks

4. Borehole Problems: 1x 05 : 05 marks

5. Dip and Strike

Problems: 1x04 : 04 marks

6. Thickness of strata problems: 1x03 : 03 marks

7. Viva- Voce: 03 marks

I.A. Marks should be assessed by conducting a test for 10 Marks and 15 Marks for practical record. (Total Marks: 25)
