

PT EN09 301: Engineering Mathematics III

(Common for all branches)

Teaching scheme

2 hours lecture and 1 hour tutorial per week

Credits: 4

Objective

This course provides a quick overview of the concepts and results in complex analysis that may be useful in engineering. Also it gives an introduction to linear algebra and Fourier transform which are wealth of ideas and results with wide area of application.

Module I: Functions of a Complex Variable (13 hours)

Functions of a Complex Variable – Limit – Continuity – Derivative of a Complex function – Analytic functions – Cauchy-Riemann Equations – Laplace equation – Harmonic Functions – Conformal Mapping – Examples: Z^n , $\sin z$, $\cos z$, $\sinh z$, $\cosh z$, $(z+1/z)$ – Mobius Transformation.

Module II: Functions of a Complex Variable (14 hours)

Definition of Line integral in the complex plane – Cauchy's integral theorem (Proof of existence of indefinite integral to be omitted) – Independence of path – Cauchy's integral formula – Derivatives of analytic functions (Proof not required) – Taylor series – Laurent series – Singularities and Zeros – Residues – Residue Integration method – Residues and Residue theorem – Evaluation of real integrals.

Module III: Linear Algebra (13 hours) - Proofs not required

Vector spaces – Definition, Examples – Subspaces – Linear Span – Linear Independence – Linear Dependence – Basis – Dimension – Ordered Basis – Coordinate Vectors – Transition Matrix – Orthogonal and Orthonormal Sets – Orthogonal and Orthonormal Basis – Gram-Schmidt orthogonalisation process – Inner product spaces – Examples.

Module IV: Fourier Transforms (14 hours)

Fourier Integral theorem (Proof not required) – Fourier Sine and Cosine integral representations – Fourier Transforms – Fourier Sine and Cosine Transforms – Properties of Fourier Transforms.

Text Books

Module I:

Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.

Sections: 12.3, 12.4, 12.5, 12.6, 12.7, 12.9

Module II:

Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.

Sections: 13.1, 13.2, 13.3, 13.4, 14.4, 15.1, 15.2, 15.3, 15.4

Module III:

Bernaed Kolman, David R Hill, *Introductory Linear Algebra, An Applied First Course*, Pearson Education.

Sections: 6.1, 6.2, 6.3, 6.4, 6.7, 6.8, Appendix.B.1

Module IV:

Wylie C.R and L.C. Barrett, *Advanced Engineering Mathematics*, McGraw Hill.

Sections: 9.1, 9.3, 9.5

Reference books

1. H S Kasana, *Complex Variables, Theory and Applications*, 2e, Prentice Hall of India.
2. John M Howie, *Complex Analysis*, Springer International Edition.
3. Shahnaz bathul, *Text book of Engineering Mathematics, Special functions and Complex Variables*, Prentice Hall of India.
4. Gerald Dennis Mahan, *Applied mathematics*, Springer International Edition.
5. David Towers, *Guide to Linear Algebra*, MacMillan Mathematical Guides.
6. Howard Anton, Chris Rorres, *Elementary Linear Algebra, Applications Version, 9e*, John Wiley and Sons.
7. Anthony Croft, Robert Davison, Martin Hargreaves, *Engineering Mathematics*, 3e, Pearson Education.
8. H Parthasarathy, *Engineering Mathematics, A Project & Problem based approach*, Ane Books India.
9. B V Ramana, *Higher Engineering Mathematics*, McGrawHill.
10. Sarveswara Rao Koneru, *Engineering Mathematics*, Universities Press.
11. J K Sharma, *Business Mathematics, Theory and Applications*, Ane Books India.
12. John bird, *Higher Engineering Mathematics*, Elsevier, Newnes.
13. M Chandra Mohan, Vargheese Philip, *Engineering Mathematics-Vol. I, II, III & IV.*, Sanguine Technical Publishers.
14. N Bali, M Goyal, C Watkins, *Advanced Engineering Mathematics, A Computer Approach, 7e*, Infinity Science Press, Fire Wall Media.
15. V R Lakshmy Gorty, *Advanced Engineering Mathematics-Vol. I, II.*, Ane Books India.
16. Sastry S.S., *Advanced Engineering Mathematics-Vol. I and II.*, Prentice Hall of India.
17. Lary C Andrews, Bhimsen K Shivamoggi, *Integral Transforms for Engineers*, Prentice Hall of India.

Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.

10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences) 5 x 2 marks=10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical/Problem solving questions 4 x 5 marks=20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

PTCE09 302: MECHANICS OF SOLIDS

Teaching scheme

3 hours lecture and 1 hour tutorial per week

Credits: 5

Objectives

- *To study the internal effects produced and deformations of bodies caused by externally applied forces.*
- *To understand the strength characteristics of different materials and structural members subjected to shear, torsion and bending.*

Module I (18 Hours)

Tension, compression & shear : Types of external loads - internal stresses - normal and shear stresses - strain - Hooke's law - Poisson's ratio - relationship between elastic constants – working stress - stress strain diagrams - elongation of bars of constant and varying sections – statically indeterminate problems in tension and compression –Temperature and Prestrain effects – strain energy and complementary energy-strain energy due to tension, compression and shear.

Analysis of stress and strain on oblique sections:

Stress on inclined planes for axial and biaxial stress fields - principal stresses - Mohr's circle of stress - principal strains - strain rosette

Module II (20 Hours)

Bending Moment & Shear force: Different types of beams- various types of loading –

Relationship connecting intensity of loading , shearing force and bending moment- shear force and bending moment diagrams for cantilever beams, Simply supported and overhanging beams for different types of loading.

Stresses in beams of symmetrical cross sections:

Theory of simple bending –assumptions and limitations – Normal stresses in beams – Stresses in nonprismatic beams-moment of resistance - beams of uniform strength - beams of two materials – strain energy due to bending - shearing stresses in beams.

Unsymmetrical bending and shear centre .

Doubly symmetric beams with skew loads- pure bending of unsymmetrical beams-Generalized theory of pure bending-Deflections in unsymmetrical bending-shear centre of thin walled open cross sections.

Module III (16 hours)

Deflection of beams: Differential equation of the elastic curve - Method of successive integration, Macaulay's method, Method of superposition, moment area method ,conjugate beam method, strain energy method, Castigliano's method, and unit load method.

Module IV (18 hours)

Theory of columns: Direct and bending stresses in short columns- Kern of a section. Buckling and stability-Euler's buckling/crippling load for columns with different end conditions- Rankine's formula - Eccentric loads and the Secant formula-Imperfections in columns.

Torsion: Torsion of solid and hollow circular shafts.-Pure shear- strain energy in pure shear and torsion.

Springs: Close coiled and open coiled helical springs.

Thin and Thick Cylinders: Stresses in thin cylinders – thick cylinders - Lamé's equation – stresses in thick cylinders due to internal and external pressures - Wire wound pipes and cylinders -compound cylinders - shrink fit.

Text Books

1. Timoshenko , *Strength of Materials Vol. I & Vol. II* , CBS Publishers & Distributers, New Delhi
2. James M Gere & Stephen P Timoshenko , *Mechanics of Materials* , CBS Publishers & Distributers, New Delhi
3. Egor P Popov , *Mechanics of solids*, Prentice Hall of India, New Delhi.
4. S.S Bhavikatti , *Structural analysis Vol I* , Vikas Publications (P) Ltd.
5. S.B Junnarkar & H.J Shah, *Mechanics of Structures Vol II* ,Charotar publishing House.

Reference books

1. Hearn E.J., *Mechanics of Materials*, Pergamon Press, Oxford
2. Warnock F.V., *Strength of Materials*, Isaac Pitman
3. Nash W.A., *Strength of Materials*, Schaum's Outline Series, McGraw Hill
4. Wang C.K., *Statically Intermediate Structures*, McGraw Hill
5. D.K. Singh, *Strength of Materials*, Ane Books.

Internal work assessment (Maximum Marks – 30)

60%- Tests(minimum 2)

30%- Assignments (minimum2) such as home work, quiz, literature survey, seminar, term-project..

10%- Regularity in the class.

University Examination patternPART A: *Short answer questions**5×2 marks=10 Marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical / Problem solving questions**4×5 marks=20 Marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical / Problem solving questions.**4×10 marks= 40 Marks*

Two questions from each module with choice to answer one question.

*Maximum Total marks: 70***PTCE09 303: BUILDING TECHNOLOGY I****Credits:4****Teaching scheme**

2 hours lecture and 1 hour tutorial per week

Objectives:

To study (i) Details regarding properties and testing of building materials, (ii) Details regarding the construction of building components (iii) Properties of concrete and concrete mix design. (iv) Basic concepts in planning of buildings

Module I (14 hours)

General Requirements of Construction Materials – factors considered during selection. **Building stones** – Classification of rocks – Quarrying of stones. Dressing – Properties and uses of common stones – Tests conducted on stones. **Timber** – Classification – seasoning - defects in Timber — decay – preservation – Manufacture, properties and uses of plywood, fibre board, particle board. **Clay** products – Bricks and tiles – manufacture – BIS specifications properties and testing.

Lime – BIS Classification – manufacture – properties and uses. **Cement** – Manufacture – types of cement – uses – Properties and testing. **Mortar** – Types – Sand – properties – uses. **Iron and Steel** – Reinforcing steel – types – specifications. **Structural steel** – specifications – **Miscellaneous materials** (only properties, classifications and their use in construction industry): Glass, Plastics, A.C.Sheets, Bitumen, Adhesives, Aluminium

Module II (15 hours)

Concrete – Aggregates – Mechanical & Physical properties and tests – Grading requirements – Water quality for concrete –Admixtures – types and uses – plasticizers – accelerators – retarders – water reducing agents – batching – mixing – types of mixers – transportation – placing – compacting – curing.

Properties of concrete – fresh concrete – workability – segregation and bleeding - factors affecting workability & strength – tests on workability – tests for strength of concrete in compression, tension & flexure – stress –strain characteristics and elastic properties – shrinkage and creep.

Durability of concrete – permeability – sulphate attack - alkali aggregate reaction – exposure to marine environment. Concrete quality control – statistical analysis of results – standard deviation – acceptance criteria – mix proportioning (B.I.S method) – nominal mixes.

Module III (16hours)

Building construction - Preliminary considerations – site clearing and drainage – Excavation – Timbering – Function and requirements of foundations Bearing capacity of soils-methods of improving bearing capacity – Settlement of foundations and precautions – shallow and deep foundations – description of spread, grillage, raft and pile foundation.

Masonry – Types of stone masonry – Bonds in brickwork – advantages and limitations of masonry construction - corbels, cornice and copings – composite walls - cavity walls and partition walls – construction details and features – scaffoldings.

Lintels and arches – types and construction details. Floors and flooring – different types of floors and floor coverings. Roofs and roof coverings – different types of roofs – suitability – types and uses of roofing materials. Doors, windows and ventilators – Types and construction details.

Stairs – types - layout and planning. Finishing works – Plastering, pointing, white washing, colour washing, distempering, painting. Methods of providing DPC. Termite proofing.

Module IV (9 hours)

Functional planning of buildings - occupancy classification of buildings - building codes and rules - functional requirements of residential and public buildings as per the relevant building rules and NBC- Planning principles - checking for circulation, ventilation, structural requirements and other constraints - sketch plans, working drawings and site plan.

Text books

- 1.Rangwala S C., Engineering Materials, Charotar Publishers
- 2.Shetty M.S., Concrete Technology, S. Chand & company.
- 3.Arora and Bindra, Building construction, Dhanpath Rai and Sons.

Reference Books

1. Punmia B.C. Building Construction, Laxmi Publications.
2. Gambhir M L, Concrete Technology, Tata McGrawHill.
3. Krishna Raju N, Design of Concrete Mixes, CBS publishers.
4. Neville A.M.and Brooks.J.J, Concrete Technology, Pearson Education.
5. Akroyd T.N.W, Concrete: Properties & Manufacture, Pergamon Press.
6. Huntington W.C., Building Construction, John Wiley
7. National Building Code.
8. Kerala Building Rules

Internal work assessment (Maximum Marks – 30)

60%- Tests(minimum 2)

30%- Assignments (minimum2) such as home work, quiz, literature survey, seminar, term-project..

10%- Regularity in the class.

University Examination patternPART A: *Short answer questions**5×2 marks=10 Marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical / Problem solving questions**4×5 marks=20 Marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical / Problem solving questions.**4×10 marks= 40 Marks*

Two questions from each module with choice to answer one question.

*Maximum Total marks: 70***PTCE09 304: SURVEYING – I****Teaching Scheme**

2 hours lecture and 1 hour tutorial per week

Credit : 4

Objective: To acquaint with basic principles & basic instruments related with surveying & leveling.

Module I (13 hours)

Introduction - classification of surveys - reconnaissance - principle of working from whole to part - provision of control - conventional signs - chain survey - instruments - principles of chain survey - field book - plotting - tie line and check line - chaining and ranging - obstacles - chaining on sloping ground - errors in chain survey - uses of cross staff and optical square

Module II (12 hours)

Compass survey - prismatic compass - surveyor's compass - whole circle and reduced bearing - true and magnetic bearing - dip and declination - local attraction - traversing - plotting - error of closure - graphical and analytical adjustments - plane table survey - instruments and accessories - different methods - orientation - advantages and disadvantages of plane tabling - two point problem - three point problem - errors in plane tabling

Module III (14 hours)

Levelling - definition of level surfaces - mean sea level - reduced level - bench marks - levelling instruments - temporary and permanent adjustments - fly leveling - booking - reduction of levels - corrections for refraction and curvature - reciprocal leveling - longitudinal levelling and cross sectioning - contour survey - definition - characteristics of contour - uses of contour - methods of contouring - direct and indirect interpolation - plotting - areas and volumes - trapezoidal rule - simpson's rule - area from latitude and departure - uses of planimeter - volumes - trapezoidal and prismoidal formula

Module IV (15 hours)

Minor instruments - hand levels - clinometer - ceylon ghat tracer - hypsometer - pantagraph - edigraph - box sextant - telescopic alidade. Theodolite surveying - study of theodolite - temporary and permanent adjustments - measurement of horizontal angles - method of repetition and reiteration - measurement of vertical angles - theodolite traverse - calculation of co ordinates - corrections - traverse table - omitted measurements.

Curves – Types of curves – elements of a curve – simple curves – diff: methods of setting out compound curve – reverse curves – transition curves – vertical curves

Text Book

Kanetkar T.P. & Kulkarni S.V., Surveying Vol. I &II, Vidarthigriha Prakasan

Reference books

1. Punmia B.C., Surveying Vol. I &II, Laxmi Publishers
2. Arora K.R., Surveying Vol. I & II, Standard Book House

Internal work assessment (Maximum Marks – 30)

60%- Tests(minimum 2)

30%- Assignments (minimum 2) such as home work, quiz, literature survey, seminar, term-project..

10%- Regularity in the class.

University Examination pattern

PART A: *Short answer questions*

5 × 2 marks = 10 Marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical / Problem solving questions*

4 × 5 marks = 20 Marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical / Problem solving questions.*

4 × 10 marks = 40 Marks

Two questions from each module with choice to answer one question.

Maximum Total marks: 70

PTCE09 305: ENGINEERING GEOLOGY

Teaching scheme

2 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives: To make the students familiar with physical and structural geology as well as the basics of mineralogy and petrology.

Module I (18 hrs)

Physical Geology and Environmental Geology

The Earth Science and its sub divisions- scope of Engineering Geology

Geological works of rivers, oceans and wind

Weathering of rocks: products of weathering - influence of climate and lithology on weathering.

Volcanoes: types and causes of volcanism - volcanic products - types of volcanic eruptions and their distribution.

Elements of Engineering Seismology:

Causes of earthquakes - plate tectonics - earthquake mechanism

Earthquake phenomenon – focus, epicentre, seismic waves, magnitude, intensity, intensity scale, and its correlation with ground acceleration - characteristics of strong ground motions and attenuation

Earthquake recording instruments

Secondary effects – land and rock slides, liquefaction, fires, tsunamis, floods, release of poisonous gases and radiation.

Earthquake occurrence - seismic zoning map of India and its use – case studies of important Indian earthquakes - major world earthquakes - earthquake catalogue - assessment of damage - measures for protection of life and property – earthquake resistant structures

Landslides : terminology - classification - causes and controls of landslides

Geology and environment - Geology and health-geological factors in environmental health hazards

Module II (12 hrs)

Mineralogy and Petrology

Megascopic characters of the important rock forming mineral groups - quartz, feldspar, pyroxene, amphibole, mica and carbonates only

Classification and distinguishing features of igneous, sedimentary and metamorphic rocks- brief description of granite, basalt, dolerite, gabbro, sandstone, shale, limestone, slate, phyllite, schist, gneiss, quartzite and marbles only

Engineering properties of rocks - rocks as construction materials – qualities required for building, dimensional and decorative/ ornamental stones.

Module III (12 hrs)

Structural Geology, Hydrogeology and Exploration Geology

Geological structures and their significance in Civil Engineering projects - folds, faults, joints and unconformities

Origin and occurrence of groundwater – geological formations as aquifer, aquicludes, aquitards and aquifuges - artificial recharge of ground water - quality of ground water – saline water intrusion in coastal aquifers

Importance of ground water investigation in civil engineering projects – ground water exploration – electrical, electromagnetic, gravimetric, radioactive and seismic exploration techniques.

Module IV (12 hrs)

Geoinformatics and Engineering Geology

Remote sensing: Basic principles - role of remote sensing in Civil Engineering - various interpretation techniques in remote sensing

Geographical Information Systems.

Applications of geological knowledge in Civil Engineering projects - dams, bridges, roads, tunnels and multi-storied buildings - geological factors in the design of buildings.

Text books:

1. Kueffer and Lillesand : Remote sensing and Image interpretation
2. Read H.H. : Rutleys Elements of Mineralogy, CBS Publishers
3. Singh. P : Engineering and General Geology. S.K. Kataria
4. Todd, D.K : Ground water Hydrology. John Wiley
5. Tyrrel .G.W. : Petrology
6. Understanding GIS : ISRI Publications.

Reference books:

1. Billings.M.P. : Structural Geology. Asia Publishing House.
2. Holmes, A :Principles of Physical Geology. Thomas Nelson
3. Judds, W.R : Principles of Engineering Geology and Geotechniques. Mc Graw Hill
4. Keshavalu, C.N. :Text book of Engineering Geology. Mc Millan India Ltd.
5. Pandey,S.N. :Principles and Applications of Photogeology Wiley Eastern
6. Reddy. V :Engineering Geology for Civil Engineers. Oxford &IBH
7. Sabins F.F. :Remote Sensing – Principles and Interpretation. W Freeman & Co., SanFrancisco
8. Sathya Narayanaswami.B.S : Engineering Geology, Dhanpat Rai & Co (P) Ltd
9. Strahler :Environmental Geology
10. Valdiya K.S :Environmental Geology in Indian Context –Tata Mc Graw Hill

Internal work assessment (*Maximum Marks – 30*)

60%- Tests(minimum 2)

30%- Assignments (minimum2) such as home work, group discussions, quiz, literature survey, seminar, term-project..

10%- Regularity in the class.

University Examination pattern

PART A: *Short answer questions*

5 × 2 marks = 10 Marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical / Problem solving questions*

4 × 5 marks = 20 Marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical / Problem solving questions.* *4 × 10 marks = 40 Marks*

Two questions from each module with choice to answer one question.

Maximum Total marks: 70

PTCE09 306(P) SURVEYING LAB – I

Teaching Scheme

2 hours practical per week

Credits : 2

Objective: To impart training in Chain, Compass, Plane table surveying & Leveling.

List of exercises

- | | |
|--|---|
| 1. Chain Survey | Traversing and plotting of details |
| 2. Compass Survey | Traversing with compass and plotting |
| 3. Plane table Survey | Method of Radiation and intersection |
| 4. Plane table Survey | Solving Two Point Problem |
| 5. Plane table Survey | Solving Three Point Problem |
| 6. Plane table Survey | Traverse |
| 7. Leveling | Fly leveling- plane of collimation method |
| 8. Leveling | Fly leveling- rise and fall method |
| 9. Leveling | Longitudinal and cross sectioning |
| 10. Leveling | Contour surveying |
| 11. Setting out of building plans | |
| 12. Study of Minor instruments: Planimeter, pantagraph, clinometer, hand levels, Quick setting level, Cylon Ghat Tracer, sextent | |
| 13. Theodolite : study of instrument, temporary adjustments, measurement of horizontal and vertical angles. | |

Internal Continuous Assessment (*Maximum Marks-50*)

60%-Laboratory practical and record

30%- Test/s

10%- Regularity in the class

Semester End Examination (*Maximum Marks-50*)

70% - Procedure, conducting experiment, results, tabulation, and inference

20% - Viva voce

10% - Fair record

PTCE09 307(P): MATERIALS TESTING LAB I

Teaching scheme

2 hours practical per week

Credits: 2

Objective:

To study various properties of building materials

List of experiments

1. Tests on cement

a) Fineness b) Normal consistency and Setting time c) Soundness d) Compressive strength

2. Test on bricks -

a) Water absorption b) Efflorescence c) Compressive strength

3. Tests on aggregate for concrete

a) Physical Properties

i) Grain size distribution ii) Specific gravity iii) Density iv) Void ratio

v) Bulking of sand

b) Aggregate crushing value

4. Properties of fresh concrete – workability tests

a) Flow & vee- bee tests

b) Slump & Compaction factor test

5. Tests on Timber

a) Compressive strength –parallel to grain & perpendicular to grain

b) Bending tests

4. Test on tiles

(i) Transverse strength, (ii) Water Absorption of

a) Flooring tiles

b) Roofing tiles.

Internal Continuous Assessment (*Maximum Marks-50*)

60%-Laboratory practical and record

30%- Test/s

10%- Regularity in the class

Semester End Examination (*Maximum Marks-50*)

70% - Procedure, conducting experiment, results, tabulation, and inference

20% - Viva voce

10% - Fair record