SCHEME AND SYLLABI

FOR

THIRD TO EIGHTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING
(PART TIME)

FROM 2009 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

SCHEME OF STUDIES AND SYLLABUS FOR B. TECH DEGREE (PART - TIME)
III to VIII SEMESTERS 2009 SCHEME

Third Semester

Sl. No	Code	Subject	Hours / week			Marks		Sem-end Duration Hours	Credits
			L	T	P/D	Inte-rnal	Sem-end		
1	PTEN09 301	Engineering Mathematics III	2	1	-	30	70	3	4
2	PTCE09 302	Mechanics of Solids	3	1	-	30	70	3	5
3	PTCE09 303	Building Technology I	2	1	-	30	70	3	4
4	PTCE09 304	Surveying I	2	1	-	30	70	3	4
5	PTCE09 305	Engineering Geology	2	1	-	30	70	3	4
6	*PTCE09 306(P)*	Surveying Lab I	-	-	2	50	50	3	2
7	*PTCE09 307(P)*	Materials Testing Lab I	-	-	2	50	50	3	2
		Total	**11**	**5**	**4**				**25**

Fourth Semester

Sl. No	Code	Subject	Hours / week			Marks		Sem-end Duration Hours	Credits
			L	T	P/D	Inte-rnal	Sem -end		
1	PTEN09 401 A	Engineering Mathematics IV	2	1	-	30	70	3	4
2	PTCE09 402	Fluid Mechanics	3	1	-	30	70	3	5
3	PTCE09 403	Structural Analysis I	2	1	-	30	70	3	4
4	PTCE09 404	Engineering Economics & Principles of Management	2	1	-	30	70	3	4
5	PTCE09 405	Surveying II	2	1	-	30	70	3	4
6	*PTCE09 406(P)*	Surveying Lab II	-	-	2	50	50	3	2
7	*PTCE09 407(P)*	Civil Engineering Drawing I	-	-	2	50	50	3	2
		Total	**11**	**5**	**4**				**25**

Fifth Semester

Sl. No	Code	Subject	Hours / week			Marks		Sem-end Duration Hours	Credits
			L	T	P/D	Inte-rnal	Sem-end		
1	PTCE09 501	Transportation Engineering I	2	1	-	30	70	3	5
2	PTCE09 502	Structural Design I	2	1	-	30	70	3	4
3	PTCE09 503	Open Channel Hydraulics & Hydraulic Machinery	2	-	-	30	70	3	4
4	PTCE09 504	Geotechnical Engineering I	2	1	-	30	70	3	4
5	PTCE09 505	Structural Analysis II	2	1	-	30	70	3	4
6	PTCE09 506	Building Technology II	1	1	-	30	70	3	3
7	*PTCE09 507(P)*	Civil Engineering Drawing II	-	-	2	50	50	3	2
8	*PTCE09 508(P)*	Fluid Mechanics Lab	-	-	2	50	50	3	2
		Total	**11**	**5**	**4**				**28**

Sixth Semester

Sl. No	Code	Subject	Hours / week			Marks		Sem-end Duration Hours	Credits
			L	T	P/ D	Inte-rnal	Sem-end		
1	PTCE09 601	Hydrology & Irrigation Engineering	2	1	-	30	70	3	5
2	PTCE09 602	Structural Design II	2	1	-	30	70	3	4
3	PTCE09 603	Structural Analysis III	2	1	-	30	70	3	4
4	PTCE09 604	Geotechnical Engineering II	2	1	-	30	70	3	4
5	PTCE09 605	Transportation Engineering II	2	-	-	30	70	3	3
6	PTCE09 Lxx	Elective I	2	1	-	30	70	3	4
7	*PTCE09 607(P)*	Geotechnical Engineering Lab	-	-	2	50	50	3	2
8	*PTCE09 608(P)*	Materials Testing Lab II	-	-	2	50	50	3	2
		Total	**12**	**4**	**4**				**28**

Electives I

PTCE09 L01 Advanced Mechanics of Materials
PTCE09 L02 Traffic Engineering
PTCE09 L03 Maintenance and Repair of Buildings
PTCE09 L04 Computer Applications and Operations Research
PTCE09 L05 Functional Design of Buildings

Seventh Semester

Sl. No	Code	Subject	Hours / week			Marks		Sem-end Duration Hours	Credits
			L	T	P/D	Inte-rnal	Sem-end		
1	PTCE09 701	Structural Design III	2	1	-	30	70	3	5
2	PTCE09 702	Design of Hydraulic Structures	2	1	-	30	70	3	4
3	PTCE09 703	Environmental Engineering I	2	-	-	30	70	3	3
4	PTCE09 704	Construction Engineering & Management	2	-	-	30	70	3	3
5	PTCE09 Lxx	Elective II	2	1	-	30	70	3	4
6	PTCE09 Lxx	Elective III	2	-	-	30	70	3	4
7	*PTCE09 707(P)*	Computer Applications Lab	-	-	2	50	50	3	2
8	*PTCE09 708(P)*	Environmental Engineering Lab	-	-	2	50	50	3	2
9	*PTCE09 709(P)*	Project	-	-	1	100	-	3	1
		Total	**12**	**3**	**5**				**28**

Eighth Semester

Sl. No	Code	Subject	Hours / week			Marks		Sem-end Duration Hours	Credits
			L	T	P/D	Inte-rnal	Sem-end		
1	PTCE09 801	Environmental Engineering II	2	1	-	30	70	3	5
2	PTCE09 802	Quantity Survey & Valuation	2	1	-	30	70	3	3
3	PTCE09 803	Elective IV	2	1	-	30	70	3	4
4	PTCE09 804	Elective V	2	1	-	30	70	3	4
5	*PTCE09 805(P)*	Seminar	-	-	2	100	-	3	2
6	*PTCE09 806(P)*	Project	-	-	6	100	-	3	7
7	*PTCE09 807(P)*	Viva Voce	-	-	-	-	100	3	3
		Total	**8**	**4**	**8**				**28**

Electives for 7th and 8th Semesters

PTCE09 L06 Advanced Structural Design I
PTCE09 L07 Advanced Structural Design II
PTCE09 L08 Advanced Geotechnical Engineering I
PTCE09 L09 Advanced Geotechnical Engineering II
PTCE09 L10 Highway Pavement Design
PTCE09 L11 Ecology and Environmental Chemistry
PTCE09 L12 Industrial Structures
PTCE09 L13 Structural Dynamics & Seismic Design
PTCE09 L14 Soil Exploration, Testing and Evaluation
PTCE09 L15 Surface Hydrology and Water Power
PTCE09 L16 Urban Transportation Planning
PTCE09 L17 Architecture and Town Planning
PTCE09 L18 Advanced Construction Engineering and Management
PTCE09 L19 Coastal Engineering & Marine Structures
PTCE09 L20 Ground Water Hydrology
PTCE09 L21 Ground Improvement Techniques
PTCE09 L22 Environmental Pollution Control Engineering*
PTCE09 L23 Experimental Stress Analysis*
PTCE09 L24 Remote Sensing and GIS*
PTCE09 L25 Finite Element Methods*

Global Electives

CS09 L24	Computer Based Numerical Methods
PE09 L24	Industrial Psychology
PE09 L25	Entrepreneurship
ME09 L22	QUALITY ENGINEERING AND MANAGEMENT
ME09 L25	Energy Engineering and Management
ME09 L23	Industrial Safety Engineering
AN09 L24	Project Management
CH09 L24	Industrial Pollution Control
EC09 L23	Data Structures and Algorithms
EE09 L22	Soft Computing Techniques

PT EN09 301: Engineering Mathematics III

(Common for all branches)

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

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, sinz, cosz, sinhz, coshz, $(z+{}^1/_Z)$– 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 orthogonolisation 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)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* 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.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

PTCE09 302: MECHANICS OF SOLIDS

Teaching scheme **Credits: 5**
3 hours lecture and 1 hour tutorial per week

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 - Lame'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 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 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 – **Miscallaneous 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 Materialals, 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 Technolgy, 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 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 304: SURVEYING – I

Teaching Scheme **Credit : 4**
2 hours lecture and 1 hour tutorial per weak

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 -ediograph - 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, Vidyarthigriha 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 (minimum2) 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 **Credits:** 4
2 hours lecture and 1 hour tutorial per week

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., SanFranscisco
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 **Credits : 2**
2 hours practical per weak

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 **Credits: 2**
2 hours practical per week

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

PTEN09 401A: Engineering Mathematics IV

(Common for ME, CE, PE, CH, BT, PT, AM, and AN)

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objective

The use of probability models and statistical methods for analyzing data has become common practice in virtually all scientific disciplines. Two modules of this course attempt to provide a comprehensive introduction to those models and methods most likely to be encountered and used by students in their careers in engineering. A broad introduction to some important partial differential equations is also included to make the student get acquainted with the basics of PDE.

Module I: Probability Distributions (13 hours)

Random variables – Mean and Variance of probability distributions – Binomial Distribution – Poisson Distribution – Poisson approximation to Binomial distribution – Hyper Geometric Distribution – Geometric Distribution – Probability densities – Normal Distribution – Uniform Distribution – Gamma Distribution.

Module II: Theory of Inference (14 hours)

Population and Samples – Sampling Distribution – Sampling distribution of Mean (σ known) – Sampling distribution of Mean (σ unknown) – Sampling distribution of Variance – Interval Estimation – Confidence interval for Mean – Null Hypothesis and Tests of Hypotheses – Hypotheses concerning one mean – Hypotheses concerning two means – Estimation of Variances – Hypotheses concerning one variance – Hypotheses concerning two variances – Test of Goodness of fit.

Module III: Series Solutions of Differential Equations (14 hours)

Power series method for solving ordinary differential equations – Legendre's equation – Legendre polynomials – Rodrigue's formula – Generating functions – Relation between Legendre polynomials – Orthogonality property of Legendre polynomials (Proof not required) – Frobenius method for solving ordinary differential equations – Bessel's equation – Bessel functions – Generating functions – Relation between Bessel functions – Orthogonality property of Bessel functions (Proof not required).

Module IV: Partial Differential Equations (13 hours)

Introduction – Formation of PDE – Complete Solution – Equations solvable by direct integration – Linear PDE of First order, Legrange's Equation: $Pp + Qq = R$ – Non-Linear PDE of First Order, $F(p,q) = 0$, Clairaut's Form: $z = px + qv + F(p,q)$, $F(z,p,q) = 0$, $F_1(x,q) = F_2(y,q)$ – Classification of Linear PDE's – Derivation of one dimensional wave equation and one dimensional heat equation – Solution of these equation by the method of separation of variables – D'Alembert's solution of one dimensional wave equation.

Text Books

Module I:
Richard A Johnson, CB Gupta, *Miller and Freund's Probability and statistics for Engineers, 7e*, Pearson Education- Sections: 4.1, 4.2, 4.3, 4.4, 4.6, 4.8, 5.1, 5.2, 5.5, 5.7

Module II:
Richard A Johnson, CB Gupta, *Miller and Freund's Probability and statistics for Engineers, 7e*, Pearson Education- Sections: 6.1, 6.2, 6.3, 6.4, 7.2, 7.4, 7.5, 7.8, 8.1, 8.2, 8.3, 9.5

Module III:
Erwin Kreysig, *Advanced Engineering Mathematics, 8e,* John Wiley and Sons, Inc.-
Sections: 4.1, 4.3, 4.4, 4.5

Module IV:
N Bali, M Goyal, C Watkins, *Advanced Engineering Mathematics, A Computer Approach, 7e,* Infinity Science Press, Fire Wall Media- Sections: 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9
Erwin Kreysig, *Advanced Engineering Mathematics, 8e,* John Wiley and Sons, Inc.
Sections: 11.2, 11.3, 11.4, 9.8 Ex.3, 11.5

Reference books

18. William Hines, Douglas Montgomery, avid Goldman, Connie Borror, *Probability and Statistics in Engineering,* 4e*,* John Wiley and Sons, Inc.
19. Sheldon M Ross, *Introduction to Probability and Statistics for Engineers and Scientists,* 3e, Elsevier, Academic Press.
20. Anthony Croft, Robert Davison, Martin Hargreaves, *Engineering Mathematics*, 3e, Pearson Education.
21. H Parthasarathy, *Engineering Mathematics, A Project & Problem based approach,* Ane Books India.
22. B V Ramana, *Higher Engineering Mathematics,* McGrawHill.
23. Sarveswara Rao Koneru, *Engineering Mathematics*, Universities Press.
24. J K Sharma, *Business Mathematics, Theory and Applications,* Ane Books India.
25. John bird, *Higher Engineering Mathematics*, Elsevier, Newnes.
26. M Chandra Mohan, Vargheese Philip, *Engineering Mathematics-Vol. I, II, III & IV.*, Sanguine Technical Publishers.
27. Wylie C.R and L.C. Barret, *Advanced Engineering Mathematics*, McGraw Hill.
28. V R Lakshmy Gorty, *Advanced Engineering Mathematics-Vol. I, II.*, Ane Books India.
29. Sastry S.S., *Advanced Engineering Mathematics-Vol. I and II*., Prentice Hall of India.
30. Michael D Greenberg, *Advanced Engineering Mathematics*, Pearson Education.

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)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* 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.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

PTCE09 402: FLUID MECHANICS

Teaching scheme **Credits:** 5

3 hours lecture and 1 hour tutorial per week

Objective:

- *This course gives an introduction to the fundamentals of fluid flow and its behavior so as to equip the students to learn related subjects and their applications in the higher semesters.*

Module I (19hours)

Fluid - definition - types of fluids - fluids as a continuum - fluid properties - density – specific gravity - surface tension and capillarity - vapour pressure - viscosity and compressibility - classification of fluids - fluid statics - fluid pressure - absolute and gauge pressure – measurement of pressure - fluid static force on immersed surfaces - buoyant forces - stability of floating and submerged bodies - hydraulic press, cranes, lifts - fluid kinetics - methods of describing fluid flow - Lagrangian and Eulerian approaches - types of fluid flow - rotational and irrotational flows - vorticity and circulation - velocity and acceleration - local and convective acceleration - potential flows - velocity potential and stream function - laplace equation - flownets - uses and limitations - methods of analysis of flow net

Module II (18 hours)

Fluid dynamics - forces influencing fluid motion - types of forces - body and surface forces - energy and head - equations of fluid dynamics - Euler equation and application - integration of Euler equation to get Bernoullis' equation - momentum equation - vortex motion - free and forced vortex - application of Bernoullis' equation in measurement of flows - stagnation pressure - pitot tube, prandtl tube, venturi meter, orifice plate - flow nozzles, orifices, mouthpieces, notches and weirs.

Module III (18 hours)

Pipe flow - transition from laminar flow to turbulent flow - problems in pipe flow - losses in pipe flow - major and minor losses - losses in transition - losses in fittings and valves - friction loss in pipe - coefficient of friction - commercial pipes in use - different arrangements of pipes – pipes open to atmosphere - pipe connecting reservoirs - branching pipes - pipes in parallel and series - equivalent lengths – power transmission in pipes - waterhammer - cavitation - syphons – laminar flow in pipes - Hagen Poisuille's equation.

Module IV (17 hours)

Forces around submerged bodies – Introduction to boundary layer- Dimensional analysis – scope of dimensional analysis - dimensions - dimensional homogeneity - dimensional groups - dimensional analysis using Buckingham's π theorem method - examples of drag on immersed bodies - pipe flow - flow over weirs and orifices - model testing - similitude - special model laws - Froude, Reynold, Weber, Cauchy and Mach.laws - problem solution using Froude and Reynold laws.

Text books:

1. Modi P.N. & Seth S.M., *Hydraulics & Fluid Mechanics*, Standard Book House
2. Bensal R K A Text Book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications

Reference books:

1. Streeter V.L., Fluid Mechanics, McGraw Hill
2. Garde R.J., Fluid Mechanics Through Problems, Wiley eastern
3. Subramanya K., Theory and Applications of Fluid Mechanics, Tata McGraw Hill
4. Duncan, Tom & Young, Fluid Mechanics, ELBS

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

Note: Students shall be encouraged to solve problems using software like spreadsheet, MATLAB etc.)

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.
The weightage for numerical questions may be modified

Maximum Total marks: 70

PTCE09 403: STRUCTURAL ANALYSIS - I

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objectives

- *To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary structures.*

Module 1 (14 hours)

Elastic theorems and energy principles. Strain energy due to axial load, bending moment, shear and torsion- principle of superposition

Principle of virtual work-Castigliano's theorem for deflection-theorem of complementary energy-Betti's theorem-Maxwell's law of reciprocal deflections-principle of least work-application of unit load method and strain energy method for determination of deflection of statically determinate frames -pin jointed trusses -temperature effects, lack of fit.

Statically indeterminate structures-degree of static and kinematic indeterminacies. Analysis of fixed beams by strain energy method.

Module II (14 hours)

Fixed and continuous beams.

Brief introduction to force and displacement methods-analysis of beams and rigid frames of different geometry by consistent deformation method-settlement effects- -analysis of pin jointed trusses by consistent deformation method-external and internal redundant trusses-effect of settlement and prestrain.

Beams curved in plan-Analysis of cantilever beam curved in plan - analysis of circular beams over simple supports.

Module III (13 hours)

Moving loads and influence lines .

Introduction to moving loads-concept of influence lines-influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams-Muller Breslau principle-Application to propped cantilevers -influence lines for forces in beams and trusses analysis for different types of moving loads-single concentrated load-several concentrated loads uniformly distributed load shorter and longer than the span.

Module IV (13 hours)

Cables, suspension bridges and arches.

Analysis of forces in cables-temperature effects-suspension bridges with three hinged and two hinged stiffening girders-theory of arches-Eddy's theorem-analysis of three hinged and two hinged arches - settlement and temperature effects.

Text books:

1. Gere and Timoshenko, Mechanics of materials, CBS. Publishers
2. Wilbur J.B. and Norris C.H., Elementary structural Analysis, McGraw Hill
3. Wang C.K., Intermediate Structural Analysis, McGraw Hill
4. Hibbeler., Structural Analysis, Pearson Education
5. Daniel L Schodak, Structures, Pearson Education/Prentice Hall India

References:

1. Kinney S., Indeterminate Structural Analysis, Oxford & IBH
2. Coates, Coutie and Kong , Structural Analysis, ELBS Publishers
3. Reddy C.S., Indeterminate Structural Analysis, Tata McGraw Hill
4. Timoshenko S.P.& Young D.H., Theory of Structures, McGraw Hill

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* *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: *Analytical / Problem solving questions* *.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
Maximum Total marks: 70

CE09 404 ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT

Credits: 4

Section 1 ENGINEERING ECONOMICS

Teaching scheme: 2 hours lecture per week

Objective:

- Impart fundamental economic principles that can assist engineers to make more efficient and economical decisions.

Pre-requisite: NIL

Module1 (14 Hrs.)

Economic reasoning, Circular Flow in an economy, Law of supply and demand, Economic efficiency. Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Private and Social cost, Opportunity cost. Functions of Money and commercial Banking. Inflation and deflation: concepts and regulatory measures. Economic Policy Reforms in India since 1991: Industrial policy, Foreign Trade policy, Monetary and fiscal policy, Impact on industry.

Module II. (13 Hrs).

Value Analysis – Function, aims, procedure.–Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor. Methods of project analysis (pay back, ARR, NPV, IRR and Benefit -Cost ratio) Break-even analysis-, Process planning.

Text books

1 Panneer Selvam, R, Engineering economics, Prentice Hall of India, New Delhi, 2002.

2. Wheeler R(Ed) Engineering economic analysis, Oxford University Press, 2004.

Internal Continuous assessment

Maximum marks15

One Series test (9marks),

One assignment (4 marks)

Regularity in attendance (2marks).

University question pattern (35marks)

Part A: 3 Analytical questions of five marks from the two modules with not less than one from each (3 x 5 = 15)

Part B: 2 questions of ten marks from the two modules with equal number of choices (2 x 10 = 20)

Section 1I PRINCIPLES OF MANAGEMENT

Teaching scheme: 1 hour per week

Objective:

- *To provide knowledge on principles of management, decision making techniques, accounting principles and basic management streams*

Module III (18 hours)

Principles of management – Evolution of management theory and functions of management Organizational structure – Principle and types

Decision making – Strategic, tactical & operational decisions, decision making under certainty, risk & uncertainty and multistage decisions & decision tree

Human resource management – Basic concepts of job analysis, job evaluation, merit rating, wages, incentives, recruitment, training and industrial relations

Module IV (18 hours)

Financial management – Time value of money and comparison of alternative methods

Costing – Elements & components of cost, allocation of overheads, preparation of cost sheet, break even analysis

Basics of accounting – Principles of accounting, basic concepts of journal, ledger, trade, profit &loss account and balance sheet

Marketing management – Basic concepts of marketing environment, marketing mix, advertising and sales promotion

Project management – Phases, organisation, planning, estimating, planning using PERT & CPM

References

1. F. Mazda, *Engineering management*, Addison Wesley, Longman Ltd., 1998
2. Lucy C Morse and Daniel L Babcock, *Managing engineering and technology*, Pearson Prentice Hall
3. O. P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai and Sons, Delhi, 2003.
4. P. Kotler, *Marketing Management: Analysis, Planning, Implementation and Control*, Prentice Hall, New Jersey, 2001
5. Venkata Ratnam C.S & Srivastva B.K, *Personnel Management and Human Resources*, Tata McGraw Hill.
6. Prasanna Chandra, *Financial Management: Theory and Practice*, Tata McGraw Hill.
7. Bhattacharya A.K., *Principles and Practice of Cost Accounting*, Wheeler Publishing
8. Weist and Levy, *A Management guide to PERT and CPM*, Prantice Hall of India
9. Koontz H, O'Donnel C & Weihrich H, *Essentials of Management*, McGraw Hill.
10. Ramaswamy V.S & Namakumari S, *Marketing Management : Planning, Implementation and Control*, MacMillan

Internal Continuous assessment
Maximum marks15
One Series test (9marks),
One assignment (4 marks)
Regularity in attendance (2marks).

University question pattern (35marks)

Part A: 3 Analytical questions of five marks from the two modules with not less than one from each (3 x 5 = 15)

Part B: 2 questions of ten marks from the two modules with equal number of choices (2 x 10 = 20)

Note: University question paper shall have separate sections I and II for Engineering Economics and Principles of Management respectively and students shall answer in two separate answer books.

PTCE09 405: SURVEYING II

Teaching Scheme **Credits: 4**
2 hours lecture and 1 hour tutorial per weak

Objective:
- To understand advanced concepts of surveying by using basic instruments to study modern trends in surveying.

Module I (13 hours)
Tacheometric surveying – stadia system – fixed and movable hair methods – staff held vertical & normal –
instrument constants – analytic lens – tangential system – subtense bar
Hydrographic survey – scope – shoreline survey - soundings - sounding equipment - methods - ranges – locating sounding - plotting - three point problem

Module II (14 hours)
Triangulation - principle - reconnaissance - selection of site for base line - selection of stations - orders of
triangulation - triangulation figures - scaffolds and signals - marking of stations - intervisibility and heights of stations - satellite stations - base line measurement - equipment and corrections. Adjustment of observations - laws of weight - probable error - most probable value - station adjustment – figure adjustment - adjustment of geodetic quadrilateral - adjustments of a level network - adjustment of a closed traverse

Module III (14 hours)
Field astronomy - definitions - solution of an astronomical triangle - co-ordinate systems - time - solar, siderial and standard equation of time - sundial - determination of time, azimuth, latitude and longitude

Module IV (13 hours)
Trigonometric levelling - various methods - photogrammetry - fundamental principles of ground and aerial photogrammetry - analytical and graphical methods - field work - phototheodolite and its use - methods of aerial surveying - interpretation of air photographs - introduction of modern instruments - electronic distance measuring – total station – types, working principles, measurement techniques and error corrections - automatic levels

Reference books:
1. Kanetkar T.P. & Kulkarni S.V., *Surveying Vol. I &II*, Vidyarthigriha Prakasan
2. Punmia B.C., *Surveying Vol. I &II,* Laxmi Pub
3. Arora K.R., *Surveying Vol. I & II*, Standard Book House

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, term-project, software exercises, etc.
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 406(P): SURVEYING LAB II

Teaching Scheme **Credits: 2**

2 hours practical per week

Objective

• *To give a practical knowledge in different aspects of Theodolite Surveying & Tacheometry*

List of exercises

1. Theodolite surveying - horizontal angle by repetition & reiteration methods.
2. Determination of tacheometric constants
3. Heights and distances by stadia tacheometry
4. Heights and distances by tangential tacheometry
5. Heights and distances by solution of triangles
6. Setting out of simple curves - linear methods
7. Setting out of simple curves - angular method
8. Setting out of transition curve
9. Theodolite traversing
10. Study of modern instruments - Automatic levels, Total station and Electronic theodolite
11. Total station – Horizontal and vertical angles, Horizontal distance, Level difference, traversing & Area calculation.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Note: A term project, like an application oriented field survey, is to be completed as part of this practical subject.

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

PTCE09 407(P): CIVIL ENGINEERING DRAWING I

Teaching scheme **Credits: 2**
2hours per week

Objectives
- *To make the students aware about the basic principles of Building Drawing*
- *To make the students to know Basic commands of a popular drafting package*
- *Make the students to draw plan, elevation and section of buildings*

Module 0: Introduction of a Popular Drafting Package (6 Hours)
- Basic Commands and simple drawings

Module 1: Detailed drawing of Components (21 Hours)
- Panelled doors, glazed windows and ventilators in wood (2 Sheets)
- Steel windows (1 Sheet)
- Roof truss in structural steel sections (2 sheets)
- Reinforced Concrete staircase (2 sheets)

Module –II: From given line sketch and specification, develop Working drawings (plan, elevation and section) of the following buildings (27 Hours)
- Single storied residential building with flat and tiled roof (4 Sheets)
- Public buildings like office, dispensary, post office, bank etc. (3 sheets)
- Factory building with trusses supported on Brick walls and pillars (2 sheets)

Assignment: preparing drawings in any popular drafting package.

Reference Books:
Balagopal T.S. Prabhu, Building drawing and detailing, Spades Publishers
Shah & Kale ,Building Drawing, Tata McGraw Hill
B.P. Verma, Civil Engineering Drawing and housing Planning, Khanna Publishers

Internal Continuous Assessment *(Maximum Marks-50)*

Any 5 sheets in Module 1- 5 x 2 = 10 marks
Any 6 sheets in Module II –6 x 2 = 12 Marks
Assignment - 8 marks
Test - 20 marks
Total - 50 marks

University Examination pattern:
1) No Questions from Module 0
2) 3 Questions of 10 marks each from Module I with Choice to answer any two
(2 x 10 = 20 marks)
3) One compulsory question of 30 marks from Module II (1 x 30=30 marks)
Total - 50 marks

PTCE09 501: TRANSPORTATION ENGINEERING I

Teaching Scheme **Credits: 5**
2 hours lecture and 1 hour tutorial per weak

Objective:
To equip the students to plan, and design various structures and traffic control devices coming under two modes of transportation viz: Highways and Airports.

Module I (16 hours)
Introduction – Role of transportation in society- Different modes of transport- Importance of roads in India- classification of roads - road patterns -typical cross sections of roads in urban and rural areas - requirements and factors controlling alignment of roads - engineering surveys for highway location.
Highway geometric design - pavement surface characteristics - camber and width requirements – sight distances - stopping and overtaking sight distances - overtaking zone requirements - design of horizontal alignment – speed – radius - super elevation - methods of providing super elevation - extra widening of pavements - transition curves - design of vertical alignment - gradient - grade compensation – summit curves and valley curves - worked out problems

Module II (22 hours)
Transportation Planning
Classification of transport technologies-inter modal co-ordination - ITS and automated highways – salient features of first, second and third and forth road development plans in India - planning surveys and master plan preparations - Expressways - case studies-
Traffic Engineering:
Introduction - road user, vehicle and traffic characteristics - traffic engineering studies – speed – speed and delay - volume - origin and destination - parking and accident studies - worked out problems –
Road intersections- principles of design of at grade intersection - simple layouts
Traffic operation-Traffic control devices- classifications and uses of traffic signs and markings – traffic signals – signal co-ordination- design of isolated signals by Webster's method

Module III (20 hours)
Highway materials-Desirable properties and testing of highway materials –subgrade soil, road aggregates and bituminous materials
Highway Economics- Principles of economic evaluation – road user benefits - highway cost – economic evaluation by annual cost, benefit cost ratio and net present value method - worked out problems
Design of flexible and rigid pavements - IRC methods - worked out problems
Construction -- bituminous and cement concrete pavements
Failures in pavements - flexible and rigid pavements

Module IV (14 hours)
Airport planning and design:-
Introduction - aircraft characteristics and their influence on planning of airports - airport obstructions and zoning - component parts of airports and site selection - runway design - orientation - basic runway length - corrections and geometric design; design of taxiways and aprons – Controlling of air traffic-Operation of instrument landing system-terminal area planning concepts and its facilities - aircraft parking configurations - surface and subsurface drainage systems - worked out problems

Text books:
1. Khanna.S.K and Justo.C.E.G., Highway Engineering, Nemchand and Bros.
2. Khanna.S.K and Arora.M.G., Airport Planning and Design, Nemchand&Bros.

References:
1. Kadiyali.L.R., Traffic Engineering and Transportation planning, Khanna Publishers, New Delhi
2. Kadiyali.L.R., Principles of Highway Engineering, Khanna Publishers, New Delhi
3. Yoder and Witenzak, Principles of Pavement design, John Wiley and sons, New York
4. IRC 37-2001-Guide lines for flexible pavement design
5. National Transport Policy Committe Report, Planning Commission, New Delhi.
6. Vision 2021, Road Development Plan, IRC, New Delhi,
7. IRC 58-2002 Guide lines for rigid pavement design
8. O'Flaherty.C.A, Highway - Traffic Planning and Engineering, Edward Arnold London
9. Horonjoff.R, Planning and Design of Airports, Mcgraw Hill book

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 502: STRUCTURAL DESIGN I

Teaching Scheme **Credits: 4**
2 hours lecture and 1 hour tutorial per week

Objective
• *To provide the students with the knowledge of the behaviour of reinforced concrete structural elements in flexure, shear, compression, tension and torsion, and to enable them to design such elements under various loads.*

Module I (16 Hours)
Material strength and properties - grades of concrete and steel - characteristic strength and working strength - types of loads, characteristic loads, load combinations, - Working Stress Method of design of RC sections - principles, assumptions - durability and fire resistance - moment of resistance of singly and doubly reinforced rectangular and flanged sections - deflection criterion for flexural

members - bond, flexural and anchorage bonds, development length - design of sections subjected to flexure, shear and torsion using Working Stress Method.

Module II (12 Hours)
Limit State Method of design of RC sections - principles and assumptions - partial safety factors - comparison with Working Stress Method, advantages - moment of resistance of singly and doubly reinforced rectangular and flanged sections - bond, flexural and anchorage bonds, development length, - design of sections subjected to flexure, shear and torsion using Limit State Method.

Module III (14 Hours)
Design and detailing of simply supported, cantilever and continuous RC beams - design and detailing of one way simply supported and continuous RC slabs - IS Code coefficients for continuous beams and slabs - design and detailing of two way RC slabs with various support conditions using IS Code coefficients. All designs shall be done by both Limit State and Working Stress Methods with greater importance attached to the former.

Module IV (12 Hours)
Design of stairs - general principles - design and detailing of various types of stairs - stairs with waist slab, stringer beam stairs, and stairs with cantilever steps - dog legged and folded plate stairs. Design and detailing of RC columns by Working Stress Method - general principles - axially loaded short and long columns – helically reinforced columns – short and long columns with eccentric loads – design and detailing of RC tension members by Working Stress Method.

Text Books
1. Pillai S. U. and Menon D., Reinforced Concrete Design, Tata McGraw Hill
2. Sinha S. N., Reinforced Concrete Design, Tata McGraw Hill
3. Varghese P. C., Limit State Design of Reinforced Concrete, Prentice Hall of India
4. Punmia B. C., Jain A. K. and Jain A. K., Limit State Design of Reinforced Concrete, Laxmi Publications (P) Ltd., 1st Edition, 2007.

Reference Books
1. Park and Paulay, Reinforced Concrete
2. Mallick S. K. and Gupta A. K., Reinforced Concrete, Oxford and IBH.
3. Jain A. K., Reinforced Concrete- Limit State Design, Standard Book House.
4. Jain and Jaikrishna, Plain and Reinforced Concrete Vol I, Nemchand
5. Sinha N. C. and Roy S. K., Fundamentals of Reinforced Concrete, S. Chand and Company Ltd.
6. Purushothaman, Behaviour, Analysis and Design of Reinforced Concrete Elements, Tata McGraw Hill.
7. Gambhir M. L., Design of Reinforced Concrete Structures, , Prentice Hall of India

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, seminar, term-project, software exercises, etc.
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.
The weightage for numerical questions may be modified
IS:456 and IS:875 are allowed to be used during examination
Maximum Total marks: 70

PTCE09 503: OPEN CHANNEL HYDRAULICS AND HYDRAULIC MACHINERY

Teaching scheme **Credits:** 4
2 hours lecture per week

Objective:
• *To learn, understand and develop concepts regarding the types of free surface flow and their applications in order to have adequate background for the design of various hydraulic structures*.

Module I (14 hours)
Introduction: Difference between open channel flow and pipe flow. Types of channels- types of flow .Velocity distribution in open channels. Geometrical parameters of a channel. Qualification for uniform flow –Computation of uniform flow – Chezy's and Manning's equations . Determination of normal depth - Algebraic & Graphical method. Most efficient cross section- Rectangular – trapezoidal –triangular, circular cross section not flowing full. Conveyance – Hydraulic exponent N for uniform flow computation
Energy and Momentum Principles: Concept of specific energy, specific force, critical flow, critical depth critical velocity- hydraulic exponents M for critical flow. Application of specific energy principle - transitions in rectangular channel – problems. Metering flumes- venturi - standing wave - par shall.

Module II (13 hours)
Non uniform flow: gradually varied flow - basic assumptions - dynamic equation for gradually varied flow - different forms of the dynamic equation - characteristics of flow profiles in prismatic channels.
Back water curve: computation of length of back water curve - numerical integration – Standard step method- direct step method – computation of backwater profile using spreadsheet.
Stream flow measurement - gauges and recorders - determination of velocity of flow - measurement of discharge in rivers - area-velocity method - stage - discharge relation

Module III (13 hours)
Rapidly varied flow: characteristics of the flow - hydraulic jump - initial and sequent depths – nondimensional equation - practical application of hydraulic jump - types of jump in horizontal floor –

basic characteristics of the jump - energy loss - efficiency - height of jump - jump as energy dissipater – stilling basins - jump position - tail water conditions - jump types - stilling basins of generalized design – rapidly varied unsteady flow – introduction to surges and types of shallow water waves (Numerical examples not expected)

Module IV (14 hours)
Hydraulic machines
Turbines: hydrodynamic force on plates - impact of jets - fixed and moving - flat and curved – velocity triangles - equation for power and work done - classification of turbines - components of Pelton wheel, Francis turbine, Kaplan turbine (Design is not expected) - specific speed - selection of turbines – penstock and surge tanks
Pumps: classification- NPSH – Selection of pumps
Rotodynamic pumps: types - volute and whirl pool chambers - velocity triangle for pumps – least starting speed - efficiency - specific speed - multistage pumps - operating characteristics of centrifugal pumps
Positive displacement pumps: reciprocating pump - types - work done - effect of acceleration and frictional resistance - slip and coefficient of discharge - separation in suction and delivery pipes – air vessel - gear pump
Deep well pumps: submersible, jet and airlift pumps - general principle of working - selection and installation of pumps

Text book:
Modi P.N. & Seth S.M., Hydraulics & Fluid Mechanics, Standard Book House

Reference books:
1. Subramanya K., Flow in Open Channels, Tata McGraw Hill
2. Hanif Choudhary M., Open Chanel Flow, Prentice Hall of India
3. Chow V.T., Open Channel Hydraulics, McGraw Hill
4. Richard French H., Open Channel Hydraulics, McGraw Hill
5. Addison H., A Treatise on Applied Hydraulics, Asia Publishing House
6. Michael, Wells and Pumping Machinery

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 (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. (20% to 30% numerical questions)
PART C: Descriptive/Analytical/Problem solving questions *4 x 10 marks=40 marks*
Two questions from each module with choice to answer one question. (50% to 70% numerical questions)
Maximum Total Marks: 70

PTCE09 504: GEOTECHNICAL ENGINEERING I

Teaching Scheme **Credits: 4**
2 hours lecture and 1 hour tutorial per week

Objectives
To equip the students to understand the properties and behavior of soil for the design of foundations, earth and earth retaining structures.

Module I (13hours)
Nature of soil and functional relationships: Formation of soils - Soil type - 3 phase system - void ratio - specific gravity - dry density - porosity - water content - saturated unit weight - submerged unit weight - degree of saturation – Soil Structure: single grained, honey combed, flocculated and dispersed structure and their effects on the basic soil properties.
Laboratory and field identification of soils: Determination of water content by oven drying – Specific gravity using pycnometer and specific gravity bottle - Grain size analysis by sieve analysis, hydrometer analysis and pipette analysis - Atterberg limits and indices – Visual identification by simple field tests – Field density by core cutter, sand replacement and wax coating methods
Classification of soils: Necessity - Principles of classification - I.S. classification – Plasticity charts – Group index

Module II (15 hours)
Soil water: Modes of occurrence – adsorbed and capillary water types - Total stress - Effective stress – Pore pressure - Pressure diagrams
Permeability: Definition - Darcy's law - Factors affecting permeability – Laboratory determination - Stratified soils : average permeability.
Shear Strength: Definition - Mohr's strength and stress circles - origin of planes - Mohr's envelope - Mohr- Coulomb strength theory –Direct shear test – triaxial shear test - drainage conditions – UU, CU and CD tests - Measurement of pore pressure -Total and effective stress strength parameters - UCC test - Vane shear tests - Choice of test conditions for field problems.

Module III (14 hours)
Consolidation: Definition –Spring analogy for primary consolidation - Terzaghi's theory of one dimensional consolidation – Concepts of coefficient of compressibility - Coefficient of volume change and compression index – Laboratory consolidation test - e-log p curves - pre-consolidation pressure - Time rate of consolidation - difference between consolidation and compaction
Compaction: Definition and objectives of compaction – Standard and Modified Proctor tests - Concept of OMC and maximum dry density - Zero air voids line - Factors influencing compaction - Effect of compaction on soil properties - Field compaction methods - Proctor needle for field control.

Module IV (12 hours)
Earth pressure: Earth pressure at rest - Active and passive earth pressure for cohesionless and cohesive soils - Rankine's and Coulomb's theories - Point of application of earth pressure for cases of with and without surcharge in cohesionless and cohesive soils - Culmann's and Rebhan's graphical construction for active earth pressure-
Stability of slopes: Slope failure, base failure and toe failure - Swedish circle method – $\Phi = 0$ analysis and $c = 0$ analysis - Friction circle method - Taylor's stability number -Stability charts.

Text Books
1. Arora K. R., *Soil Mechanics & Foundation Engineering*, Standard Publications, 1987.
2. Punmia B. C., *Soil Mechanics & Foundations*, Laxmi Publications, 1988
3. Murthy V. N. S., *Soil Mechanics & Foundation Engineering*, Dhanpat Rai, 1996

Reference Books

1. Terzaghi K. & Peck R.B., *Soil Mechanics in Engineering Practice*, John Wiley & Sons, US, 1967.
2. Venkatramiah C., *Geotechnical Engineering*, New Age International Publishers, 2006
3. Gopal Ranjan & Rao A. S. R., *Basic & Applied Soil Mechanics*, New Age International Publishers, 2000
4. Khan I.H., *Text Book of Geotechnical Engineering*, Prentice Hall of India
5. Cudoto, *Geotechnical Engineering Principles and Practices*, Pearson Education, 2007

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 505 STRUCTURAL ANALYSIS II

Teaching scheme **Credits:** 2
2 hours lecture and 1 hour tutorial per week

Objectives

- *To equip the students with the force and displacement methods of structural analysis with emphasis on analysis of rigid frames and trusses*

Module I (17 Hours)

Slope Deflection Method and Moment Distribution Method

Review of force method and displacement methods of analysis
Slope Deflection method - analysis of continuous beams- beams with overhang- analysis of rigid frames - frames without sway and with sway - different types of loads -settlement effects
Moment Distribution method – analysis of beams and frames – non sway and sway analysis – frames with sloping legs – gabled frames

Module II (13 Hours)

Clapeyrons Theorem (Three Moment Equation) and Kani's Method

Derivation of three moment equation - application of three moment equation for analysis of continuous beams under the effect of applied loads and uneven support settlement. Kani's Method of analysis applied to continuous beams and rigid frames of different geometry - frames without sway and with sway.

Module III (13 Hours)

Approximate Methods of Analysis of Multistoried Frames

Analysis for vertical loads-substitute frames-loading condition for maximum hogging and sagging moments in beams and maximum bending moment in columns- wind load analysis of multistoried frames – portal method and cantilever method for lateral load analysis.

Module IV (11 Hours)

Plastic Theory

Introduction – plastic hinge concept – plastic modulus – shape factor – redistribution of moments – collapse mechanisms – plastic analysis of beams and portal frames by equilibrium and mechanism methods.

Text Books:

1. R.Vaidyanathan and P.Perumal, Comprehensive Structural Analysis Volume I & II, Laxmi Publications (P) Ltd.
2. Hibbeler, RC, Structural analysis, Pearson Education
3. Daniel L Schodak, Structures, Pearson Education
4. Reddy . C.S., Basic Structural Analysis, Tata McGraw Hill
5. S.S. Bhavikatti, Structural Analysis, Vikas Publication Houses (P) Ltd

Reference Books:

1. Wang C. K., Intermediate Structural Analysis, Tata McGraw Hill
2. Wilbur J. B. & Norris C. H., Theory of Structures, McGraw Hill
3. Timoshenko S. P. and Young D. H., Theory of Structures, McGraw Hill
4. Kinney J. S., Indeterminate Structural Analysis, Oxford & IBH
5. Negi L. S. and Jangid R. S, Structural Analysis, Tata McGraw Hill
6. Rajasekaran S. and Sankarasubramanian G., Computational Structural Mechanics, PHI
7. SP:6 (6): Application of Plastic Theory in Design of Steel Structures
8. Ghali A. and Neville A. M, Structural Analysis – A Unified and Matrix Approach, Chapmen and Hall, 3rd edition 1989
9. Prakash Rao D. S., Structural Analysis – A Unified Approach, Universities Press

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* *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: *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 506: BUILDING TECHNOLOGY –II

Teaching Scheme **Credits: 3**
1 hour lecture and 1 hour tutorial per week

Objective:
• *To impart the basic concepts in functional requirements of building and building services.*
• *To develop understanding about framed construction, building failures and earth quake resistant construction.*

Module I (9 hours)
Multi-storeyed Buildings – Framed building – steel and concrete frame – structural systems – erection of steel work – bolting, riveting, welding –concrete framed construction – reinforcement – concreting of columns, beams, slabs and stairs – formwork – contraction and expansion joints – introduction to prefabricated construction – slip form construction.
Vertical transportation – Elevators – types – terminology – passenger, service and goods elevators – design considerations for passenger elevators – handling capacity – arrangement and positioning of lifts – escalators – features –use of ramps.

Module II (7 hours)
Fire safety – Fire resistant construction – fire load – fire resisting properties of materials – precautionary measures against origin and spread of fire – Alarm systems – hydrants – sprinklers- fire escape – requirements of high rise construction
Plumbing services – Typical details of water supply and sewage disposal for single and multistoreyed buildings – systems of plumbing - standard requirements.

Module III (10 hours)
Thermal control – Thermal comfort of human beings –human body's thermal balance and heat loss; Thermal control of buildings- insulation – principles - materials – methods of thermal insulation – insulation by orientation and shading – Features of tropical climate.
Ventilation – functions – provisions for ventilation – orientation – external features – cross ventilation – openings - mechanical ventilation systems – summer and winter air conditioning – introduction to different types of air-conditioning systems.
Lighting – photometric quantities – types of visual tasks -lighting requirements of various buildings- day lighting -day light factor – need for artificial lighting .
Acoustics – Introduction – criteria for acoustic environment – sound – control, insulation, and isolation – Acoustic materials and methods of fixing – acoustic requirement of auditorium.

Module IV (10 hours)

Introduction to Cost-effective construction - principles of filler slab and rat-trap bond masonry

Building failures – General reasons – classification – Causes of failures in RCC and Steel structures – Foundation failure – failures by alteration, improper maintenance, overloading – Fire, Wind and Earthquake.

Earthquake resistant construction (Reference no. 7 and 8) – (only construction aspects are to be covered and detailed designs not contemplated) – principles – lightness – continuity – suspended parts. Building configuration – strength in various directions – foundations – ductility. Seismic strengthening of masonry and earthen structures – band reinforcing-buttressing.

Text books:

1. Koenigsberger. Manual of tropical housing and building Part I – Climate Design. Orient Longman.
2. Punmia B.C,Building construction. Laxmi Publications
3. Arora and Bindra, Building construction, Dhanpath Rai and Sons.
4. Rangwala, S C Building Construction, Charotar Publishing House

References:

1. Smith P & Julian W. Building services, Applied Science Pub.
2. Mcking T.M, Building Failures, Applied Science Pub.
3. Huntington W.C., Building construction, John Wiley.
4. Narasimhan V, Introduction to Building Physics.
5. Adler R, Vertical Transportation for Building, American Elsevier Pub.
6. Bureau of Indian Standards , National Building Code of India, 2005
7. Code of practice for earthquake resistant design and construction of buildings, IS:4326-1993
8. Hand book on building construction practices – BIS, SP 62 (S&T) – 1997
9. Tall building systems & concepts, Monograph on planning and design of Tall building, council on Tall buildings and Urban Habitat.
10 Patil, S.M., Building Services, Sachin Printers, Mumbai

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, seminar, term-project, software exercises, etc.
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 507(P): CIVIL ENGINEERING DRAWING II

Teaching scheme **Credits : 2**
2hours / week

Objective
• To make the students to be able to plan and draw different views of Building according to State Building rules.
• To make the students to draw different views of Building in drafting packages.
• (The student is expected to know the local building rules and National Building Code provisions. After the course, the student should be in a position to prepare building sketches for the clients and submission drawings for approval. Each student shall complete a term project in tracing paper)**.**

Module 0: (8 Hours).
• Prepare Building Drawings with specification in any popular drafting software

Module I: (34 hours) Planning from given requirements of areas and specifications and preparation of Sketch & working drawings for :
• Different types of residential buildings- Single and two storied with RCC (flat & sloped) roof, Two storied Flats. (4 sheets)
• Planning of simple tile roof building. (2 sheets)
• Variety of Public Buildings- Small public utility shelters, dispensaries, libraries, schools, banks, hostels, offices, factories etc. (5 sheets)

Module II (12 hours)
1. Preparation of site plan and service plans as per building rules. (2 sheets)
2. Building Services (for single and two storied buildings only). (1 sheet)
3. Septic tanks and soak pit detailed drawing. (1 sheet)

Assignment : Plan and draw all the views of a Single Storied Building with all details in any popular drafting package as per prevailing building rules on any fictitious plot.

Reference Books:
1. National Building Code of INDIA
2. Kerala Building rules
3. Balagopal T.S. Prabhu, Building drawing and detailing, Spades Publishers
4. Shah and Kale ,Building Drawing, Tata McGraw Hill

Internal assessment
Any 10 Sheets – 20 marks
Assignment - 15 marks
Test - 10 marks
Regularity - 5 marks
Total - 50 marks

PTCE09 508(P): FLUID MECHANICS LABORATORY

Teaching scheme **Credits:** 2
2 hours practical per week

Group A

1. Study of instruments: pressure gauge - piezometer - manometer-pressure transducers - pilot tubes - current meter.
2. Demonstration: Bernoulli's theorem - phreatic lines - fluming horizontally and vertically
3. Steady flow through pipes: determination of friction factor for various types of pipes
4. Orifices and mouthpieces: various types-steady case
5. Notches and weirs: various types-steady case
6. Time of emptying: unsteady flow
7. Discharge measurements: venturimeter - venturi flume - orifice meter - water meter

Group B

8. Open channel flow: determination of Manning's coefficient
9. Plotting the specific energy curve
10. Tracing back water profiles / draw down profiles
11. Hydraulic jump parameters

Group C

12. Study of pelton wheel - Francis-Kapalan turbines
13. Study of centrifugal - reciprocating - jet and deep well pumps
14. Calibration of pressure gauge.
15. Air flow measurement using air blowers.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

End Semester Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

PTCE09: 601 HYDROLOGY AND IRRIGATION ENGINEERING

Teaching scheme **Credits:** 5
2 hours lecture and 1 hour tutorial per week

Objective:
Students are expected to realize the importance of water resources and its application in irrigation engineering

Module I (18 hours)
Introduction: hydrologic cycle - application of hydrology in engineering - water balance equation - water resources of India.
Precipitation: Types, forms and measurement of precipitation –network design- presentation of data - average precipitation over an area - mass curve and hyetograph – double mass curve - depth-area-duration and intensity - duration-frequency analysis - probable maximum precipitation.
Runoff - Characteristics of runoff - factors affecting runoff - yield from a catchment.
Hydrograph analysis - components of hydrograph - base flow separation - rainfall- run off relations - unit hydrograph theory - derivation of unit hydrograph - applications and limitations of unit hydrograph - S hydrograph.

Module II (19 hours)
Irrigation - necessity - advantages - disadvantages – types- flow and lift irrigation - perennial and inundation irrigation –methods of irrigation-flooding, furrow, sprinkler and drip- important crops and crop seasons - duty and delta - water requirement - irrigation efficiency - direct and storage irrigation - multipurpose projects
Reservoir-types -investigation and planning - selection of site - fixation of storage capacity - flow duration curves - flow mass curve - reservoir sedimentation
Head works:- storage and diversion works-selection of site – Component and layout of Diversion head works – Head regulator and cross regulator (no design) - silt excluder and silt extractor - weirs - types of weirs- seepage theories – Biligh's and Khosla's theory –method of independent variables.

Module III (19 hours)
Distribution works: classification of canals - alignment of canals - considerations for fixing longitudinal slopes of canals - cross section of canals - burrow pits - spoil banks - service roads - back berm - counter berm – off take alignment - maintenance of irrigation canals - design of canals - erodible canals - canals in alluvial soils - regime theory - Kennedy's theory and Lacey's theory - silting in canal and prevention - scour - protection against scour - losses in irrigation canals - water logging - causes of water logging - measures for prevention of water logging - drainage - benefits of drainage - types of drains - design and maintenance of open drains - tile drains - layout of tile drain system -lining of irrigation canals - necessity and advantages of lining - disadvantage of lining - types of lining.
canal structures – Canal falls, canal outlets, canal escapes, cross drainage works.

Module IV (16 hours)

Floods - estimation of peak discharge - rational method - unit hydrograph method – frequency analysis.

River training and flood control works- river behaviour - control and training of rivers- objectives of river training- types of training works – guide banks – groynes - levees - flood banks - Flood control by regulating reservoirs - flood storage basin - flood warning –flood plain zoning.

Text books

1. Subramanya K., Engineering Hydrology, Tata McGraw Hill
2. *Punmia B.C. & Lal P.B., Irrigation and Water Power, Lexmi Publications*
3. Dr. Modi P.N., Irrigation Water Resources & Water Power, Standard publishers
4. Asawa, Irrigation Engineering, Wiley Eastern

Reference books

1. Regunath H.M., Hydrology, Prentice Hall
2. Chow V.T et. al., Applied Hydrology, McGraw Hill
3. Priyani V.B., The Fundamentals Principles of Irrigation Engineering, Charotar
4. Sahasrabudhe S.R., Irrigation Engineering & Hydraulic Structures
5. Varshney R.S., Theory & Design of Irrigation structures Vol. I & II, Nem Chand
6. Michael A.M., Irrigation - Theory & Practice, Vikas Publishing House
7. S.K Garg, Irrigation Engineering and Hydraulic structures, Khanna publishers
8. IS: 5968 (1987) – Guide for the planning and layout of canal system for irrigation

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* *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: *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 602: STRUCTURAL DESIGN II

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives

- To familiarize the fundamental aspects of structural behaviour and design of steel structures satisfying the requirements such as safety, feasibility and economy of steel structures
- To introduce concepts on design of timber structures

Module I (12 hours)
Review of concepts of plastic analysis of beams and frames. Introduction to structural steel sections, material property, stresses, loads, types of design-rigid, semi rigid – Analysis and design of riveted, bolted and welded connections to resist direct force and moment-design of single and double angle ties-design of struts.

Module II (20 hours)
Solid and built-up columns for axial loads - design of battens and lacings. Design of eccentrically loaded solid & built-up columns
Analysis and Design of laterally restrained & unrestrained simple & compound beams- Design for flexure, shear, deflection, and bearing.

Module III (12 hours)
Column bases, column –beam connections-moment resistant connections (in plane, out of plane)
Design of roof trusses: types of roof trusses-selection-design loads and load combinations-assessment of forces due to wind-design principles-design of purlins, design of joints-design of members.

Module IV (10 hours)
Design of timber structures: types of timber - classification - allowable stresses-design of beams-flexure, shear, bearing and deflection considerations-Design of columns. Design of composite beam sections with timber and steel.

Note:
All designs shall be done as per current I.S. specifications
Special importance shall be given to detailing in designs
S.I. units shall be followed
IS 800, IS 883, IS 875 and SP 6 shall be permitted in the examination hall.

Text Book:
1. Subramanian N, Design of steel Structures, Oxford University Press
2. IS 800 – 2007, Code of practice for Structural steel design, BIS
3. Punmia B. C., Jain A. K. and Jain A. K., Design of Steel Structures, Laxmi Publications (P) Ltd.

Reference Books:
1. Ram Chandra., Design of steel Structures. Vol I & II Standard Book House
2. Arya and Ajmani., Design of Steel Structures., Nemchand

3. S.K.Duggal., Design of steel Structures, Tata McGraw-Hill
4. P.Dayaratnam., Design of Steel Structures ,Wheeler Publishing
5. Lin & Bresler, Design in Structural Steel, John Wiley
6. M.A. Kazimi and R.S. Jindal, Design of Steel Structures, Prentice-Hall of India
7. Krishnaraju N., Structural Design and Drawing-Reinforced Concrete and Steel, University Press
8. Raghupathi, Steel Structures, Tata McGraw Hill

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* *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: *Analytical / Problem solving questions.* *4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
IS: 800, IS: 883, IS: 875 and SP 6 are allowed in the exam hall
Maximum Total marks: 70

PTCE09 603: STRUCTURAL ANALYSIS III

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives

- To enable the students to have a comprehensive idea of matrix structural analysis with emphasis on the relative advantages of the flexibility method and the stiffness method
- To enable the students to visualize structural dynamics problems with a proper blend of structural analysis and vibration theory

Module I (17 hours)
Matrix analysis of structures: static and kinematic indeterminacy-force and displacement method of analysis-definition of flexibility and stiffness influence coefficients-development of flexibility matrices by physical approach
Flexibility method: flexibility matrices for truss and frame elements-load transformation matrix-development of total flexibility matrix of the structure-analysis of simple structures-plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects

Module II (11 hours)
Stiffness method: Development of stiffness matrices by physical approach-stiffness matrices for truss and frame elements-displacement transformation matrix-analysis of simple structures-plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects

Module III (11 hours)
Introduction to direct stiffness method-Rotation of axes in two dimensions, stiffness matrix of elements in global co- ordinates from element co-ordinates- assembly of load vector and stiffness matrix, solution of two span continuous beam-single bay single storey portal frame.

Module IV (15 hours)
Structural dynamics-introduction-degrees of freedom-single degree of freedom-linear systems-equation of motion, D'Alembert's principle-damping-free response of damped and undamped systems-logarithmic decrement-transient response – Vibration isolation – Introduction to two degree of freedom systems

Text books:

1. Gere, J.M. and William Weaver, Matrix Analysis of framed structures, CBS Publishers
2. Clough R.W. and Penzein, J., Dynamics of structures, Tata McGraw Hill
3. Anil. K. Chopra, Dynamics of structures, Pearson Education/ Prentice Hall India
4. Beaufait. F.W., Basic concepts of structural analysis,
5. Denhartog, Mechanical Vibration
6. Rajasekharan.S. and Sankarasubramanian G., Computational structural Mechanics, PHI
7. Reddy C.S., Basic structural analysis, Tata McGraw Hill

Reference books:

1. Wang C.K., Matrix method of structural analysis, International Text book company
2. Przemeineicki J.S., Theory of Matrix structural analysis, Tata McGraw Hill
3. Meivovitch L., Elements of vibration analysis
4. Thimoshenko.,Vibration problems in Engineering
5. Biggs, Structural Dynamics
6. Coates.R.C, and Coutie M.G., Structural Analysis
7. Madhujith Mukhopadhyay and Abdul Hamid Sheikh, Matrix and Finite Element Analysis of Structures, Ane Books 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* *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: *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 604: GEOTECHNICAL ENGINEERING II

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective

- To impart knowledge in behaviour and design aspects of various types of foundations

Module I (13 hours)
1. Stresses due to applied loads: Introduction- Boussinesque's equations for vertical pressure due to point loads, uniformly distributed loads and strip load - assumptions and limitations - pressure bulb – Newmark's charts and their use – Westergaard's formula for point loads-Approximate methods for vertical stress-distribution of contact pressure beneath footings.
2. Site investigation and soil exploration: objectives - planning - reconnaissance - depth and lateral extent of explorations -methods of subsurface exploration - test pits - Auger borings - rotary drilling – Types of soil samples-split spoon samplers- Standard penetration test- hand cut samples- boring log - soil profile- geophysical methods (in brief).

Module II (13 hours)
3. Foundation - general consideration: functions of foundations - definition of shallow and deep foundation - different types of shallow and deep foundations- selection of type of foundation - advantages and limitations of various types of foundations.
4. Bearing capacity of shallow foundations: Ultimate and allowable bearing capacity- net bearing pressure- Allowable soil pressure –Types of shear failure. Terzaghi's equation for bearing capacity for continuous, circular, rectangular and square footings -- bearing capacity factors and charts - - effect of water table on bearing capacity- Skemption's formulae, Meyerhof's formulae and IS code formula – bearing capacity based on SPT.

Module III (15 hours)
5. Settlement analysis: Introduction- causes of settlement – immediate, consolidation and total settlement – loads for settlement analysis-estimation of immediate and consolidation settlement - Allowable settlement-Maximum and differential settlements as per Indian standard- net safe settlement pressure based on SPT- cracks due to settlements- plate load test.
6. Footings: types of footings - depth of footing- foundation loading- principles of design of footings – strip/continuous, individual and combined (Rectangular, trapezoidal and strap only) footings - footings subjected to eccentric loading - conventional procedure for proportioning footings for equal settlements.

7. Open excavation: Open foundation excavations with unsupported slopes-supports for shallow and deep excavations-stress distribution in sheeting and bracing of shallow excavations.

Module IV (13 hours)

8. Raft foundations: Types –Principles of design of raft foundation- bearing capacity equations- for raft on sand based on SPT results (Teng's equation, Bowle's equation and IS 6403 formula) – raft on clay (Skempton's formula) - design methods - floating foundations - conventional design procedure for rigid mat.

9. Pile foundations: uses of piles - classification of piles - determination of type and length of piles - determination of bearing capacity of axially loaded single vertical pile – static (Meyerhof's formula) and dynamic (Engineering News Record formula and Hiley's formula) - pile load tests (IS methods) - negative skin friction – pile group - group action, pile spacing and efficiency of pile groups.

Note: Structural designs of foundations are not contemplated in this course.

Text Books

1. Arora K.R., *Soil Mechanics & Foundation Engineering.* Standard Publications
2. Joseph E. and Bowles, *Foundation Analysis & Design*, McGraw Hill
3. Punmia B. C., *Soil Mechanics & Foundations*, Laxmi Publications

Reference books

1. Gopal Ranjan and Rao A.S.R.*, Basic and applied soil mechanics,* New Age International Publishers
2. Venkatramiah, *Geotechnical Engineering*, New Age International Publishers
3. Shashi K. Gulhati and Manoj Dutta, Geotechnical Engineering, Tata McGraw-Hill Publishing Compay Limited, New Delhi.
4. Leonards G.A., *Foundation Engineering*, McGraw Hill
5. Teng W.C., *Foundation Design*, PHI
6. Tomlinson M.J., *Foundation Design & Construction*, Pitman
7. Murthy V.N.S., *Soil Mechanics & Foundations*
8. Coduto, *Geotechnical Engineering Principles and Practices*, Pearson Education

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* *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: *Analytical / Problem solving questions.* *4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question by the question paper setter.
Maximum Total marks: 70

PTCE 09 605: TRANSPORTATION ENGINEERING II

Teaching scheme **Credits:** 3
2 hours lecture per week

Objective*:*

- To build a strong, stable and deep concept in different means of transportation, to have a clear picture in the details of design, construction and maintenance of structures coming under this field.

Module I (14 hours)
Permanent way: functions and requirements of permanent way - components - typical cross sections - gauges - functions and requirements of components of permanent way - sleeper density - coning of wheels creep and wear in rails - rail fasteners - defects, failures and joints in rails - material assessment for unit length of track – Geometric design of railway track - horizontal curves - super elevation - cant deficiency - negative super elevation - safe speed on curves - gradients and grade compensation - worked out problems

Module II (7 hours)
Signalling and interlocking - signal control systems - points and crossings - track junctions - track circuiting - track alignment - construction of railway track - railway stations and yards.
Railway construction and maintenance
Construction of railway track- earth work plate laying and packing-maintenance of track - alignment - gauge-renewal of component parts-drainage - modern methods of track maintenance.

Module III (9 hours)
Elements of harbour - ports - various design considerations of a harbour - classifications - site selection factors - wet and dry docks - lock and lock gates - site selection, configuration and types of breakwaters - details of quays, piers, fenders, dolphins, slipways - transit shed and warehouse - navigational aids

Module IV (6 hours)
Tunneling: - Location survey and factors to be considered - different sections - shafts - transferring of centre line - methods of tunneling in hard rocks and soft soils - different methods for lining, ventilation, lighting and drainage

Text books:
1. Antia K.F., Railway Track, New Book Company Pvt. Ltd.
2. Subhash C Saxena and Satyapal Arora, A Text Book of Railway Engineering, Dhanapat Rai and Sons, NewDelhi
3 Quinn A.D., Design and Construction of Ports and Marine Structures, McGraw Hill.

References:

1. Agarwal. M.M., Railway Engineering, Prabha & Co. New Delhi, 1998
2. J.F Mundrey Railway track Engg. Tata Mc Graw Hill, New Delhi
3. P. Sreenivasan, Dock and Harbour Engineering,

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* *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: *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 606 Lxx ELECTIVE I

PTCE09 607(P): GEOTECHNICAL ENGINEERING LAB

Teaching scheme **Credits:** 2
2 hours practical per week

List of Experiments

1. Specific gravity of coarse and fine grained soils
2. Grain size analysis (a) Sieve analysis
3. Atterberg limits and indices
4. Determination of field density (a) sand replacement method (b) core cutter method
5. Determination of coefficient of permeability by
   (a) Constant head method (b) variable head method
6. Consolidation test
7. Compaction test (a) IS light compaction test (b) IS heavy compaction test
8. California bearing ratio test
9. Direct shear test
10. Unconfined compressive strength test

11. Triaxial shear test
12. Tests on aggregates: Los Angeles abrasion test, Shape test, Aggregate Impact value.
13. Tests on bitumen: Penetration test, Softening test, Ductility test & Specific Gravity.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

End Semester Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

PTCE09 608(P): MATERIAL TESTING LAB -II

Teaching scheme **Credits:** 2
2 hours practical per week

OBJECTIVE:
TO STUDY STRENGTH ASPECTS OF CONCRETE & METALS

List of Experiments

1. Tension test on mild steel specimens using universal testing machine (utm) and suitable extensometer
2. Shear test on mild steel rod
3. Torsion test on metal rods
4. Torsion test on metal wires – torsion pendulum
5. Spring test
    A) Open coiled spring
    B) Close coiled springs
6. Impact test
    A) Izod test
    B) Charpy test
7. Hardness test
    A) Brinell hardness test
    B) Rockwell hardness test
    C) Vickers hardness test
8. Casting of concrete cubes & cylinders with specified proportions/mix
9. Split tensile strength of concrete cylinders
10. Compression test on concrete cubes & cylinders – determination of modulii of elasticity
11. Flexural test on concrete beams
12. Study/demonstration on electrical resistance strain gauges, load cell

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

End Semester Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

PTCE09 L01: ADVANCED MECHANICS OF MATERIALS

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:

- To review and make more useful the methods and results presented in the first course on Mechanics of Materials.
- To show the limitations of the ordinary formulas of Strength of Materials, to consider the conditions under which these limitations are significant and to extend the subject to include a variety of important topics more complex than those usually involved in a first course.

Module 1 (16 hrs)

Stress, Principal stresses, Strain energy:

Stress at a point – stress on an arbitrarily oriented plane-stress transformations- strain theory-principal stresses & strains (2d & 3d)- Generalized Hooke's law-Equations of thermo-elasticity for isotropic materials-strain energy density- stress concentration.

Failure & Failure criteria:

Modes of failure –yield failure criteria-introduction to fracture mechanics-cracks & brittle fracture-fatigue-elastic and inelastic buckling.

Module II (14 hrs)

Beams on elastic foundation:

Basic equations-Winkler foundations- semi-infinite beams with concentrated loads-infinite beams with concentrated loads-uniformly distributed load-beams of finite length.

Curved Beams:

Circumferential stresses-radial stress and shear stress in curved beams-sections having thin flanges-closed sections with thin walls-deflections of sharply curved beams.

Module III (12 hrs)

Elements of theory of elasticity

Displacements-strains and compatibility-equilibrium equations and boundary conditions-stress field solutions for plane stress problems-polynomial solutions in Cartesian coordinates-displacements calculated from stresses-plane stress problems in polar coordinates.

Module IV (12 hrs)

Torsion

Torsion of a cylindrical bar of circular cross section- St. Venant's semi inverse method-stress function approach-elliptical, equilateral triangle & narrow rectangular cross sections-Prandtl's membrane analogy-Hollow thin wall torsion members-multiply connected cross sections- thin wall torsion members with restrained ends.

Text books:

1. R.D.Cook and W.C.Young, Advanced Mechanics of Materials, 2nd edition, Prentice Hall Intl,Inc.1999.
2. A.P.Boresi and O.M.Sidebottom, Advanced Mechanics of Materials, 4th edition, John Wiley & Sons,Inc.1985

References:

1. Timoshenko S.P and Goodier J.N, Theory of elasticity, McGraw Hill.
2. Srinath L.S, Advanced Mechanics of Solids, Tata McGraw Hill.
3. S P Timoschenko, Strength of Materials Vol II ,CBS Publishers
4. Shames, E.H., Mechanics of Deformable solids.

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* *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: *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 L02: TRAFFIC ENGINEERING

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Scope of traffic engineering & study of its elements - introduction - objectives and scope of traffic engineering - components of road traffic - vehicle, driver and road – road user and vehicle characteristics and their effect on road traffic - traffic maneuvers – traffic stream characteristics - relationship between speed, flow and density - sampling in traffic studies - adequacy of sample size

Module II (14 hours)

Traffic engineering studies and analysis - objectives - methods of study - equipment -data collection - analysis and interpretation (including case studies) of speed, speed and delay, volume, origin and destination, parking, accident & other studies .

Module III (14 hours)

Design, regulation and management of traffic engineering facilities - control of traffic movements through time sharing and space sharing concepts - design of canalizing islands, T, Y, skewed, staggered, round about, Mini-round about and other forms of at grade intersection - crossings including provision for safe crossing of pedestrians and cyclists - grade separated intersections - their warrants and design features - bus stop location and bus bay design - road lighting - regulations on vehicles, drivers and traffic - planning and design of one-way-streets - reversible lanes and roadways - turn regulation - transit and carpool lanes - pedestrian facilities.

Module IV (14 hours)

Traffic control devices and environmental control - traffic signs - markings and signals - different methods of signal design - redesign of existing signals including case studies - signal system and co-ordination - air and noise pollution of different transport modes - visual impacts - impacts on land development - technological approaches to improving environment.

Text Books

1. Pignatyaro L., Traffic Engineering – Theory & Practice , John Wiley
2. Kadiyali L.R., Traffic and Transport planning, Khanna Publishers

Reference Books

1. The Institute of Transportation Engineers, Transportation and Traffic Engineering Hand Book, Prentice Hall, Chapters 8, 17, 23, and 24
2. O' Flaherty C.A., Highways – Traffic planning & Engineering, Edward Arnold
3. MC Shane W.R.and Roess R.P., Traffic Engineering, Prentice Hall
4. IRC – SP41, Guide lines for the Design of At-Grade Intersections in Rural & Urban Areas
5. Salter R.J., Highway Traffic Analysis and Design, ELBS
6. Matson, Smith and Hurd, Traffic Engineering, McGraw Hill Book Co.

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* *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: *Problem solving questions.* *4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
Maximum Total marks: 70

PTCE09 L03: MAINTENANCE AND REPAIR OF BUILDINGS

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:

To study the durability aspects of buildings, causes and process of failure and repair and rehabilitation methods.

Module I (13 Hours)
Durability of buildings: Life expectancy of different types of buildings –effect of environmental elements such as heat, dampness, frost and precipitation on buildings-effect of chemical agents on building materials-effect of pollution on buildings-effect of fire on building-damage by biological agents like plants, trees, algae, fungus, moss, insects, etc.

Module II (15 hours)
Failure and repair of buildings: Definition of building failure-types of failures-methodology for investigation of failures-diagnostic testing methods and equipments-repair of cracks in concrete and masonry-methods of repair-repair and strengthening of concrete buildings-foundation repair and strengthening-underpinning-leakage of roofs and repair methods

Module III (13 hours)
Maintenance of buildings: Reliability principles and its applications in selection of systems for building- routine maintenance of building-maintenance cost-specifications for maintenance works-dampness-damp proof courses-construction details for prevention of dampness-termite proofing-fire protection-corrosion protection.

Module IV (13 hours)
Conservation and recycling: Performance of construction materials and components in service-rehabilitation of constructed facilities-conservation movement-materials and methods for conservation work-recycling of old buildings and its advantages- examples

Text Books:

1. Smith P & Julian W, Building services, Applied science publications
2. S Champion-Failure and repair of concrete structurers

References:

1. Peter H. Emmons, Concrete Repair and Maintenance, Galgotia Publishers
2. Jacob Feld –construction failure
3. Mckaig T.M, Building failures, Applied science publications
4. SP:25 BIS, Causes and Prevention of Cracks in buildings
5. Shetty M. S., Concrete Technology, S Chand and company
6. SP:62 (S&T)-1997, BIS, Hand Book on Building Construction Practice, pp. 457-765
7. Philip.H.Perkins , Concrete Structures – Repair water proofing & Protection
8. Raikar, Durable Structures – Through Planning for Preventive Maintenance, R & D Centre, Structural Designers and Consultants Pvt. Ltd., Vashi, New Bombay
9. Raikar, Diagnosis and Treatment of Structures in Distress, R & D Centre, Structural Designers and Consultants Pvt. Ltd., Vashi, New Bombay
10. Repair and Strengthening of Reinforced Concrete, Stone and Brick Masonry Buildings, United Nations Industrial Development Organisation, Vienna.

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* *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: *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 L04: COMPUTER APPLICATIONS AND OPERATIONS RESEARCH

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives:

- To enable the students to familiarize with mathematical models and numerical tools for solving and optimizing engineering problems.

A. Numerical methods in civil engineering

Module I (16 hours)

Introduction to numerical methods in civil engineering: importance of numerical methods in civil engineering - sources of errors in numerical methods - number representations - fixed and floating point numbers - significant digits - round off errors - development of computer algorithms - pseudo code

Solution of algebraic and transcendental equations in one variable: bisection method - method of false position - Newton-Raphson method - successive approximation method - development of computer algorithms for each of the above methods

System of linear algebraic equations: solution of linear algebraic equations using Gauss elimination method and LU decomposition method - solution by iterative method - conditions of convergence-III conditioned system of equations - applications in civil engineering problems – matrix structural analysis

Module II (13 hours)

Eigen value problems: examples of formulation of structural stability and structural dynamics problems as Eigen value problems in civil engineering - principal stresses and strains - free vibration of multi degree of freedom systems - determination of Eigen values and Eigen vectors by power method and Jacobi's method

Interpolation: Newton's formulae - Gauss' formulae - lagrangian interpolation - cubic spline interpolation

Module III (12 hours)

Numerical differentiation and integration: numerical differentiation using Newton's and Gauss' formulae - maximum and minimum values of tabulated functions - Newton Cote's integration formulae - numerical integration using trapezoidal formula - Simpson's formulae and Gauss quadrature - development of computer algorithms for numerical integration

Numerical solution of ordinary differential equations: Taylor's series method - Euler's method - Runge-Kutta method - finite difference method for the solution of boundary value problems

B. Optimisation methods in civil engineering

Module IV (13 hours)

Linear programming problems: statement of an optimisation problem - linear and nonlinear programming problems - standard form of linear programming problems - simplex algorithm - degeneracy, duality, transportation problem, assignment problem- applications of linear programming problems in civil engineering - limit design of steel portal frames

Introduction to Genetic Algorithms- basic concept - problem formulation - operations-convergence criteria.

Text Book

1. Sastry S.S., Introductory Methods of Numerical Analysis, Prentice Hall of India
2. Scarborough J.B., Numerical Mathematical Analysis, Oxford and IBH
3. Rao S.S., Engineering Optimization-Theory and Applications, New Age International Publishers

Reference books:

1. Krishnamoorthy E.V. and Sen S.K., *Numerical Algorithms,* Affiliated East West Press
2. Kirsch U., *Optimum Structural Design*, McGraw Hill
3. Fox R.L., *Optimization Methods for Engineering Design,* Addison Wesley
4. Singiresu S. Rao, Engineering Optimization (Theory and Practice) 3rd Edition, New Age International (P) Ltd.
5. Press W.H., et al. Numerical Recipes in C – The art of Computation, Cambridge Press
6. Goldberg D.E., Genetic Algorithms in Search, Optimisation and Machine Learning, Addison Wesley Publishing Company.

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* *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: *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 L05: FUNCTIONAL DESIGN OF BUILDINGS

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objectives:

- To study the design concepts for acoustical and lighting services
- To study principles of climatic design of buildings for tropical climates.

Module I (13 Hours)

Introduction to functional design – principles.

Acoustics : Physics of sound – frequency, intensity, variation with time, dB scale – measurement – airborne and structure borne propagation – effect of noise on man – behavior of sound in free field and enclosures – Sabine's formula – design criteria for spaces – acoustical defects – sound reduction, sound insulation and reverberation control – typical situation like offices, flats, auditorium and factories – acoustic materials – properties – types and fixtures.

Module II (13 Hours)

Lighting and Illumination Engineering: Types of visual tasks – principles of day lighting – day light factor – sky component – internal reflected component – external reflected component – design of windows for lighting – effect of orientation – evaluation of lighting by windows, skylights – artificial lighting – illumination requirements for various buildings – measurement – lux meter – lamps and luminaries – polar distribution curves – design of artificial lighting – lumen method – point by point method – coefficient of utilisation – room index – maintenance factor – room reflectance – glare – flood lighting of building exteriors – street lighting of building neighbourhood.

Module III (16 Hours)

Climatic elements: Climate on a global scale – solar radiation – radiation at earth's surface – measurement of solar radiation - earth's thermal balance – winds – trade winds – Westerlies – polar winds – wind data measurement at site – air pressure – atmospheric humidity – measurement – psychometric chart – condensation and precipitation – climatic graph – temperature inversion – influence of topography – urban climates – comparison and classification of climates.

Thermal comfort: Human body's heat production – body's heat loss – thermal balance of a body – heat loss in various environments – effect of prolonged thermal exposure –subjective variables – thermal comfort indices – effective temperature – psychometric chart – ET and its use – effect of radiation – mean radiant temperature – ET nomograms – finding CET – comfort zone

Thermo physical properties of building materials: Thermal quantities – heat flow – thermal conductivity – resistance and transmittance and surface coefficient – cavities – Solar radiation – absorbed, reflected and transmitted sol- air temperature concept- solar gain factor.

Heat flow through buildings – thermal transmittance of structural elements – thermal gradients – heat gain calculation - periodic heat flow – time lag and decrement factor.

Sun's movement and building – apparent movement of sun – solar charts and its use.

Module IV (12 Hours)

Design criteria for control of climate – passive and active building design – passive approach by orientation, glazing, shading, choice of building materials etc. Thermal insulation – insulating materials – properties – insulation of roofs, walls and openings.

Shading devices – shadow angles – internal blinds and curtains – heat absorbing glasses – effect of orientation on incident solar radiation and internal temperature – active systems – low energy cooling. Introduction to Intelligent buildings.

Text Book:

1. Koenigseberger, Manual of tropical Housing and Building Part I – Climatic design, Orient Longman

Reference Books:

1. Ajitha Simha, D. Building Environment, Tata McGraw Hill Publishing Co., New Delhi
2. Givoni B. Man, Climate and Architecture, Applied Science Publication.
3. Knudsen V.O. and Harris C.M., Acoustical Design in Architecture, John Wiley
4. Bureau of Indian Standards, National Building Code of India 1983
5. Bureau of Indian standards, Handbook on Functional Requirement of Buildings – SP:41(S and T) – 1987
6. Narasimham V., An Introduction to Building Physics
7. Krishnan, Climate responsive architecture, Tata McGraw Hill.

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* *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: *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 701: STRUCTURAL DESIGN III

Teaching scheme **Credits:** 5
2 hours lecture and 1 hour tutorial per week

Objectives

- To provide knowledge in the structural Design of selected advanced structures of concrete and steel

Part A: Reinforced Concrete

Module I (20 hours)
Design of columns subjected to axial load, uni-axial and bi-axial eccentrically loaded short and slender columns using SP 16 of BIS by limit state method.
Different types of foundations-Design of isolated footing for axially loaded & eccentrically loaded columns, combined footing, design principles of strap/cantilever footings- design of pile foundation-pile cap.

Module II (17 hours)
Design of cantilever and counter fort retaining walls
Design of R.C.C. Slab Bridge for IRC loading –Detailing
Design of rectangular water tanks using IS code coefficients (IS 3370) -Design of circular water tanks-staging
Design of spherical and conical domes-detailing

Module III (17 hours)
Prestressed Concrete fundamentals -Materials, principles – methods of prestressing- pre and post tensioning -losses of prestress. Analysis of stresses in pre and post tensioned beams (rectangular and I sections) at stages of transfer and service-cable profiles (principles only), concept of Type I, II and III PSC structures as per IS. Stresses in anchorage zone in post-tensioned beams (description only; no design expected)

Part B Steel

Module IV (18 hours)

Design of plate girders-design of section for flexure, shear and deflection-connections-horizontal and vertical stiffeners-curtailment of flange plates - design of bearing stiffener, web splices. Plate girder Railway Bridges- Types, structural configurations, Assessment of loads and stresses, design of critical sections of deck type and through type bridges, design principles of bridge bearings.

Note:
All designs shall be done as per current I.S. specifications
Special importance shall be given to detailing in designs
S.I. units shall be followed

Limit state design shall be practiced wherever possible as per codes
Use of IS 3370 (1 to 4), IRC 21(1, 2, 3, 7, 9), IS 13743, IS 800, IS 875 and SP 6 and SP16 shall be permitted in the examination hall.

Text Books:

1. Pillai S.U. & Menon D., Reinforced Concrete Design. Tata McGraw Hill
2. Punmia .B.C., Jain A. K., Reinforced Concrete Structures, Lexmi Publications
3. Johnson D. Victor, Essentials of Bridge Engineering, Oxford & IBH
4. Krishnaraju, Prestressed Concrete, Tata McGraw Hill
5. Subramanian N, Design of steel Structures, Oxford University Press
6. Ram Chandra., Design of steel Structures, Standard Book House
7. Punmia .B.C., Jain A. K., Design of Steel Structures, Lexmi Publications

Reference Books:

1. Park & Paulay, Reinforced Concrete, McGraw Hill
2. Varghese P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India
3. Varghese P.C., Advanced Reinforced Concrete Design, Prentice Hall of India
4. Mallick S.K, and Gupta A.K., Reinforced Concrete. Oxford & IBH
5. Jain. A.K., Reinforced Concrete-Limit state Design, Standard Book House
6. Jain and Jaikrishna, Plain and Reinforced Concrete Vol I & II, Nemchand
7. Winter and Nelson, Design of concrete Structures.. Tata McGraw Hill
8. Lin. T.Y. and Burns, Design of Prestressed Concrete Structures., John Wiley
9. Arya and Ajmani, Design of Steel Structures., Nemchand
10. Lin and Bresler, Design in Structural Steel, John Wiley
11. T.R.Jagadeesh and M.A.Jayaram., Design of Bridge Structures., Prentice-Hall
12. Libby J., Prestressed concrete structures, CBS Publishers
13. Krishnaraju N., Sructural Design and Detailing, Reinforced concrete and steel, University Press
14. Gaylord and Stallmeyer, Steel structures, McGraw Hill

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* *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: *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 702: DESIGN OF HYDRAULIC STRUCTURES

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour drawing per week

Objective:

- Students are expected to know the details of major and minor irrigation structures and their design. A student, who successfully completes the course, should be able to carry out design of various hydraulic structures in the given field conditions. Also to make the students familiarize with the relevant I.S codes and to enhance the capability of reading the working drawings.

Module I (18 hours*)
Storage Head Works;
Types of dams - gravity dam - selection of site - forces acting on dams - drainage gallery - joints in dams - elementary profile - limiting height of gravity dam - high and low dam - practical profile of a high gravity dam- design methods and design by gravity analysis only- arch dam – design methods – design by cylinder theory only. spillways and their types

Module II (18 hours*)
Tank structures
Surplus works – types of surplus works- surplus weir –surplus escapes, core wall type – flush escape
Outlet works - tank sluice with tower head
Canal structures
Canal outlets-review of requirements and types-modular, semi modular, non-modular outlets- design of direct sluice
(Detailed design and drawing of surplus weir, tank sluice and direct sluice are expected)

Module III (18 hours*)
Diversion head works- Types – design of surface and subsurface weirs - design of regulator cum Road Bridge
Canal falls- design of trapezoidal notch canal fall - design of syphon well drop-
(Detailed designs and drawings of canal regulator cum road bridge, trapezoidal notch fall and siphon well drop are expected.)

Module IV (18 hours*)

Cross drainage works - necessity - types of cross drainage works - selection of suitable type of cross drainage works - types of aqueducts- design of aqueduct - syphon aqueduct (type II and III) super passage and canal syphon

(Detailed designs and drawings of aqueduct and syphon aqueduct (Type II) are expected).
* Hours are inclusive of drawing classes.

Text books:

1. *Asawa, Irrigation Engineering, Wiley Eastern Publication*

2. *Sathyanarayana Murthy, Water Resources Engineering, Wiley Eastern*

3. *S. K Garg, Irrigation Engineering and Hydraulics, Khanna Publishers*

Reference books:

1. Varshney R.S., Theory & Design of Irrig. Structures, Nem Chand
2. Punmia B.C., Irrigation & Waterpower Engg., Laxmi Publications
3. Serge Liliavsky, Irrigation & Hydraulic Design, Chapman and Hall
4. IS: 6512 (1984) – Criteria for design of storage gravity dams
5. IS 7784 (Part I (1993), Part II Section 1 to 5 (1995)) Design of cross drainage works – Code of Practice
6. IS: 6966 Part I (1989) – Hydraulic design of barrages and weirs – Guidelines
7. IS: 11130 (1984) – Criteria for structural design of barrages and weirs
8. IS:6531 (1972) – Criteria for design of canal head regulator
9. IS:7114(1973) – Criteria for hydraulic design of cross regulator for canal
10. IS:6936 (1992) – *Guide for location ,selection and hydraulic design of canal escapes*
11. IS:12331 – *General requirement of canal outlets*

Internal Continuous Assessment *(Maximum Marks-30)*

10 marks - Tests (minimum 2)
16 marks - Assignments (8 Drawing Sheets)
4 marks - Regularity in the class

Note: Since drawing shall be given more importance in this subject apportioning of marks are kept different.

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: *Descriptive/derivative 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: questions for presenting *Design and drawing* *1×40 marks= 40 Marks*
Two questions from any module other than Ist module, with choice to answer one question.
Maximum Total marks: 70

PTCE 09 703 ENVIRONMENTAL ENGINEERING I

Teaching scheme **Credits: 3**
2 hours lecture per week

Objective:

- To provide detailed understanding regarding usage of water for drinking purpose - from identification of source, planning the treatment systems, distribution of treated water with development of distribution of layout and necessity of maintenance.

Module I (6 hours)

Water supply Engineering – Importance and necessity of community water supply schemes – essentials of water supply engineering – quantity of water – forecasting population – rate of consumption for various purposes – factors affecting consumption – fluctuations in demand.

Module II (10 hours)

Sources of water – surface water sources – suitability of the source with respect to quantity and quality – intakes of various surface water sources – design of intakes – ground water sources - development and protection of groundwater sources – estimation of yield from various ground water sources – construction of tube wells – maintenance.
Quality of water – drinking water standards – physical, chemical and bacteriological analysis of water.

Module III (10 hours)

Treatment of water – aeration – coagulation – flocculation – sedimentation – filtration – disinfection – design of all the units – miscellaneous treatments – removal of colour, taste and odor, iron and manganese, and hardness – fluoridation and deflouridation.

Module IV (10 hours)

Water supply schemes – gravitational, pumping and combined schemes – transmission of water – classification of conduits – shape and strength of conduits – location of conduits – materials of conduits – design of gravity and pumping main - distribution systems – different layout of pipe networks – analysis of pipe networks – house connection from mains – laying and joining of pipes – appurtenances – different valves – meters and hydrants – detection and prevention of leaks in distribution system – cleaning and maintenance of distribution system.

Text Books:

1. Garg S. K., *Environmental Engineering Vol I*, Khanna Publishers.
2. Birdie G.S & Birdie J.S, *Water Supply and Sanitary Engineering*, Dhanpat Rai & Sons.
3. Duggal K N, *Elements of Environmental Engineering*, S Chand & Co Ltd.

Reference Books:

1. Mark J Hammer Mark J Hammer Jr., *Water and Waste Water Technology*, Prentice Hall of India Pvt. Ltd.
2. Fair, Gayer and Okun, *Water and Waste water Engineering*, John Wiley.
3. Ernest W Steel, *Water Supply and sewerage*, McGraw Hill.

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* *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: *Descriptive/derivative 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: questions for presenting *Design and drawing* *4×10 marks= 40 Marks*
Two questions from each module, with choice to answer one question.
Maximum Total marks: 70

PTCE09 704: CONSTRUCTION ENGINEERING AND MANAGEMENT

Teaching scheme **Credits: 3**
2 hours lecture per week

Objective: To make the students familiar with the various facets of construction and its planning like project scheduling, resource and material management, construction procedures and professional ethics

Module I (10 hours)

Construction planning and management: Network Techniques: Introduction – Bar charts – Use of CPM and PERT for planning – Drawing network diagrams – time estimates – slack – critical path – Crashing and time-cost trade off - resource smoothing – resources levelling - construction, equipment, material and labour schedules. Preparation of job layout.

Module II (9 hours)
Construction methods and equipment: Factors for selection of equipment – equipment for excavation and transportation of earth – hauling equipment – piles and pile driving equipment – cranes.

Module III (9 hours)
Construction procedures: different methods of construction – types of contract - tenders – prequalification procedure - earnest money deposit – contract document – general and important conditions of contract - measurement and measurement book – arbitration.
Inspection and quality control - need, principles and stages.

Module IV (8 hours)
Concept of materials management – inventory – inventory control – Economic order quantity- ABC analysis.

Safety in construction – Safety measures in different stages of construction – implementation of safety programme.

Concept of ethics – Professional ethics – ethical problems – provisions of a professional code – Role of professional bodies.

Text Books:
1. L.S.Srinath – PERT and CPM –Principles and Applications, Affiliated East-West Press
2. Peurifoy and Schexnayder – Construction Planning, Equipment, and Methods, Tata McGraw Hill

Reference Books
1. Shrivastava, Construction Planning and Management, Galgotia Publications
2. Gahlot and Dhir, Construction Planning and Management, New Age International
3. F. Harris, Modern Construction and Ground Engineering Equipment and Methods, Prentice Hall.
4. P.P. Dharwadkar, Management in Construction Industry, Oxford and IBH
5. Charles D Fledderman, Engineering Ethics, Prentice Hall
6. BIS, National Building Code
7. Khanna, O.P., Industrial Engineering and Management., Dhanapat Rai Publications
8. V.N.Vazirani and S.P.Chandola, Heavy Construction

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* *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: *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 705 Lxx – ELECTIVE II

PTCE09 706 Lxx – ELECTIVE III

PTCE09 707(P): COMPUTER APPLICATIONS LABORATORY

Teaching scheme **Credits : 2**
2 hours practical per week

Objective:
To familiarize and give hands-on training to students in the following areas of civil engineering application software:

1. **Surveying** - Terrain mapping, computation of areas and volumes – Estimation of earth work
2. **Structural Engineering –** Plane and space frames (steel and R.C.C), spread sheet development for design of R.C.C/ steel structural elements.
3. **Water resources** –Circular Pipe Analysis / Trapezoidal Channel Analysis, analysis of pipe network for water distribution
4. **Geotechnical engineering –**stability analysis of slopes, computation of foundation settlement and stresses on layered soils, Geotechnical design of anchored and free retaining walls, Analysis and design of pile foundations.
5. **Road/railway system –** Fixation of vertical / horizontal alignment of highways, Design of rigid and flexible pavements.
6. **Environmental engineering**- Pipe Network Analysis
7. **Estimation and costing** - Use spread sheet / any standard software for estimation.
8. **Project management –** PERT and CPM**,** project scheduling, managing and documentation, Network Analysis.

Notes:

1. **Students are supposed to document each tutorial with drafting after each session.**
2. **At least five of the above eight areas shall be covered.**

Recommended software packages: The following packages or their equivalent are recommended for the above listed exercises:

- AutoCAD, Microstation, MS-Office, Matlab, Grapher/Sigmaplot
- Autocivil, SAP, StAAD, ANSYS, NISA, GTSTRUDL
- WaterCAD, FlowMaster, EPA NET, Geo4, Inroads
- MS-Project

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Note: Students shall be encouraged to take up a term-project on any of the above listed areas and complete it within the semester

End Semester Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

PTCE09 708(P): ENVIRONMENTAL ENGINEERING LABORATORY

Teaching scheme **Credits: 2**
2 hours practical per week

Objective

- To make students familiar with laboratory tests for water quality assessment.

List of Experiments

1. Determination of Solids (Total, dissolved and suspended) in water.
2. Determination of Turbidity of water and estimation of optimum coagulant dosage by jar test.
3. Determination of alkalinity of water.
4. Determination of hardness of water by EDTA titrimetric method.
5. Determination of chlorides in water.
6. Determination of iron and manganese in water
7. Determination of sulphates and sulphides in water.
8. Determination of dissolved oxygen in water.
9. Determination of available chlorine in bleaching powder and test for residual chlorine.
10. Determination of pH of water (by various methods).
11. Determination of B.O.D and C.O.D of wastewater sample.
12. Determination of MPN

Reference Books:

1. Standard methods for the examination of water and wastewater, 1995, ALPHA, AWWA, WPCF Publication.
2. Sawer and McCarty, Chemistry for Environmental Engineering, McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Note: Students shall be made aware of Computer integrated test methods for water quality assessment.

End Semester Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

PTCE09 709(P): PROJECT

Teaching scheme **Credits: 1**

1 hour per week

Objective

- *To develop the capacity of the students in converting the theoretical knowledge into practical systems either to perform creative works or to perform analysis and hence to suggest solutions to problems, pertaining to Civil Engineering domain.*

Project work is of duration of two semesters and is expected to be completed in the eighth semester. Each student group consisting of not more than five members is expected to design and develop a complete system or make an investigative analysis of a technical problem in the relevant area. The project work can be a planning and / or design project, experimental project, field surveying or computer application based project on any of the topics of civil engineering interest. HOD will frame the rules for forming batches. If required, HOD can combine project hours of many weeks together and allot a maximum of 4 weeks exclusively for project. The project batches are expected to fix their topics, complete preliminary studies like literature survey, field measurements etc. in the seventh semester.

Each project group should submit project synopsis within three weeks from start of seventh semester. Project evaluation committee consisting of three or four faculty members

specialised in the various fields of civil engineering, shall study the feasibility of each project work before giving consent.

As far as possible, students should execute the project work using the facilities of the institute. However, external projects can be taken up in government departments/institutions, reputed construction industries, if that work solves a technical problem of the external firm. Prior sanction should be obtained from the head of department before taking up external project work and there must be an internal guide for such projects.

The assessment of all the projects should be done at the end of the seventh semester by the project evaluation committee formed as mentioned earlier. The students will present their project details and progress of their project to the committee. The complete project report is not expected at the end of the seventh semester. However, a three-four page typed report based on the work done should be submitted by each student to the assessing committee. The assessment committee and project guides will award the marks for the individual students in a project as follows:
50% of the marks is to be awarded by the guide and 50% by the evaluation committee.

Internal Continuous Assessment:
20% - Technical relevance of the project
40% - Literature survey and data collection
20% - Progress of the project and presentation
10% - Report
10% - Regularity in the class

PTCE 09 801: ENVIRONMENTAL ENGINEERING II

Teaching scheme **Credits:** 5
2 hours lecture and 1 hour tutorial per week

Objectives

- To expose students to the area of waste treatment – with emphasis on domestic liquid wastes – its characterisation, collection, treatment and disposal at individual household level to community level - rural and urban.
- To impart the basic concepts of solid waste management and air pollution control.

Module I (18 Hours)

Waste water engineering – sanitary pumping – closets – urinals – wash basins – sinks – baths – traps – soil pipes – waste water pipes –systems of piping – pipe joints and pipe fittings – public lavatories and toilets in factories, railway stations, bus stations and air ports.

House drainage – principles of house drainage – inspection chambers – ventilation – testing of drains – connection of house drains and street sewer.

Systems of sewerage – separate – combines and partially combined systems – quantity of storm sewage – source of sewage – relation to water consumption – ground water infiltration –fluctuations of sewage flow – quantity of storm sewage – factors affecting storm water sewage – determination of storm water flow – time of concentration – sewers and sewer appurtenances – materials used in the construction of sewers – shape of sewers – hydraulics of sewers – design of sewers – manholes, inlets, catch basins, grease traps – regulators – leaping weirs – side weirs – siphon spillway - inverted siphons – sewage pumps – pumping stations – ejectors – sewer junctions – outlets - maintenance of sewers – cleaning of sewers- ventilation of sewers.

Module II (17 Hours)

Characteristics of sewage – physical, chemical and biological characteristics – physical and chemical analysis –sampling – population equivalent – characteristics of industrial wastes – treatment of wastewater – screens – grit chambers – detritus tank – skimming tanks – sedimentation tanks – oxidation ponds – design construction and operation of trickling filters, activated sludge treatment units – disinfection of sewage.

Module III (18 Hours)

Sewage disposal, dilution disposal into stream – pollution assimilation capacity of streams – disposal by irrigation – surface and subsurface irrigation.

Sludge treatment and disposal, quality of sludge – characteristics of sludge – sludge elutriation – sludge conditioning – vacuum filtration – sludge digestion – disposal of sludge.

Rural sanitation – conservancy and water carriage systems – sanitary latrines – septic tanks – (Design as per I.S. specification)

Module IV (19 Hours)

Solid waste management – solid waste collection – transportation and processing - types and sources of solid waste – solid waste characteristics – automation and mechanism of refuse collection – vehicles for solid waste collection and transportation - solid waste disposal – composting – incineration – sanitary landfill – prevention of malaria incidental to engineering construction.

Gaseous waste management (air pollution and control) – air pollution and health – types of pollutants and their source – air pollution control strategy – basic approaches – areas of legal responsibility – source identification – particulate control and control of gases and vapors.

Text Books

1. Birdie G.S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons.
2. Duggal K N, Elements of Environmental Engineering, S Chand & Co Ltd.
3. Garg S K, Environmental Engineering Vol II, Khanna Publishers.

Reference Books

1. Elhers and Steel, Municipal and Rural Sanitation, McGraw Hill.
2. Sawer and McCarty, Chemistry for Environmental Engineering, McGraw Hill.
3. Fair, Gayer and Okun, Water and Waste water Engineering Vol. II, John Wiley.
4. Metcalf and Eddy, Waste Water Engineering, Treatment, Disposal & Reuse, Tata McGraw Hill.

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
Maximum Total marks: 70

PTCE 09 802: QUANTITY SURVEY AND VALUATION**.**

Teaching scheme **Credits:** 3

2 hours lecture and 1 hour tutorial per week

Objectives

After studying the subject, the student should be able

1. To set out any civil engineering work which is the primary duty that is to be performed by a civil engineer in the construction field
2. To prepare detailed exact as well as approximate estimates to meet a number of requirements and also to have a clear picture of the project expenditure.
3. To have a thorough idea regarding the quality and quantity of materials, quantity and classes of skilled and unskilled labours and tools and plants required for the project.
4. To calculate the exact quantities of items of work done for affecting payment especially when direct measurements are difficult
5. To draw up specifications for the different items of civil engineering project and also to prepare the schedule of programming of the project.
6. To prepare valuation report of real and landed property

To mould themselves as entry level graduate engineers competent to manage any civil engineering project confidently either alone of jointly.

Module I (9 Hours)

Estimate – Basic terms - Types of estimate - Revised estimate - supplementary estimate - maintenance estimate - approximate estimate - plinth area method - cubic rate method - unit rate method - bay method - approximate quantity from bill method - comparison method - cost from materials and labour etc. - preparation of detailed estimate for buildings - centre line method and 'long wall - short wall' method .

Module II (9 Hours)

Methods of measurements of different items of work - Preparation detailed estimate for sanitary and water supply works - roads - irrigation works - steel structures - doors and windows - R C C Structures - Preparation of bar bending schedule.

Module III (9 Hours)

Detailed specifications for common building materials and items of work as per I.S specifications -

Preparation of conveyance statement - Calculation of quantities of materials for items of work - Analysis of rate for items of works required for civil engineering works - Preparation of abstract of estimate of civil engineering works.

Module IV (9 Hours)

Valuation - Explanation of items - types of values - sinking fund - years purchase - Depreciation - straight line method - constant percentage method - S.F method - obsolescence - valuation of real property - rental method - profit based method - depreciation method - valuation of land - belting method - development method - hypothecated building scheme method - rent calculation - lease and lease hold property.

Text books

1. M.Chakraborthi, Estimating costing & Specification in Civil Engineering
2. B.M.Dutta, Estimating and costing in civil engineering
3. S.C. Rangawala, Valuation of real properties

References

1. I.S.1200-1968 Methods of measurements of buildings and Civil Engineering works
2. Latest schedule of rates of Kerala P.W.D
3. Latest Data book of Kerala P.W.D

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
Maximum Total marks: 70

PTCE 803 09 Lxx: ELECTIVE IV.

PTCE 09 804 Lxx: ELECTIVE V.

PTCE 09 805 (P): SEMINAR

Conducting schedule **Credits: 2**

2 hours presentations per week

OBJECTIVE

TO MEASURE AS WELL AS FLOURISH THE ABILITY OF THE STUDENT TO STUDY A CURRENT AND RELEVANT TOPIC IN CIVIL ENGINEERING FROM TECHNICAL LITERATURE AND PRESENT A SEMINAR ON THAT TOPIC.

Individual students should be asked to choose a topic in any field of civil engineering, preferably from outside the B. Tech syllabus and give a seminar on that topic for about thirty minutes It enables the students to gain knowledge in any of the technically relevant current topics and acquire the confidence in presenting the topic. The student will undertake a detailed study on the chosen topic under the supervision of a faculty member, by referring papers published in reputed journals and conferences. Each student has to submit a seminar report (in two copies), based on these papers; the report must not be reproduction of any original paper. A committee consisting of three/four faculty members (preferably specialized in different sub-fields of Civil Engineering) will evaluate the seminar. One of the two copies submitted by the student should be returned to him/her after duly certifying it by the chairman of the assessing committee and the other shall be kept in the departmental library.

Internal Continuous Assessment
20% - Relevance of the topic and literature survey
50% - Presentation and discussion
20% - Report
10% - Regularity in the class and Participation in the seminar

PTCE 09 806: PROJECT

Teaching scheme **Credits: 7**

6 hour per week

The project work started in the seventh semester will continue in this semester. The students should complete the project work in this semester and present it to the assessing committee (as constituted in the seventh semester). The performance of the students in the project work shall be assessed on a continuous basis by the project evaluation committee through 'progress seminars' and demonstrations conducted during the semester. Each project group should maintain a log book of activities of the project. It should have entries related to the work done, problems faced, solution evolved etc.

There shall be at least an Interim Evaluation and a final evaluation of the project in the 8th semester. Each project group has to submit an interim report in the prescribed format for the interim evaluation. Each student is expected to prepare a report in the prescribed format, for final evaluations based on the project work. Members of the project group will present the relevance, design, implementation, and results of the project to the project evaluation committee.

Each group will submit the copies of the completed project report signed by the guide to the department. The head of the department will certify the copies and return them to the students. One copy will be kept in the departmental library and one by the respective guide. The assessment committee and project guides will award the marks for the individual students in a project as follows: 50% of the marks is to be awarded by the guide and 50% by the evaluation committee.

Internal Continuous Assessment

40% - Data collection, Planning/ Design and detailing/Simulation and analysis
30% - Presentation & demonstration of results
20% - Report
10% - Regularity in the class

PTCE 09 807(P): VIVA VOCE.

Objective **Credits:** 3

- *To examine the knowledge acquired by the student during the B.Tech. course, through an oral examination*

The students shall prepare for the oral examination based on the theory and laboratory subjects studied in the B.Tech. course, seminar, and project. There is only university examination for this. The university will appoint two external examiners and an internal examiner for conducting the viva voce examination. These examiners shall be senior faculty members having minimum five years of teaching experience at engineering degree level. For final viva-voce, candidates should produce certified reports of seminar and project (two interim reports and main report). If he/she has undergone industrial training/industrial visit/educational tour or presented a paper in any conference, the certified report/technical paper shall also be brought for the viva-voce. The examiners will ask questions from subjects studied for the B.Tech course, project, seminar and reports of industrial visits/trainings conducted by the student. Allotment of marks for viva-voce shall be as given below.

Assessment in Viva-voce

40% - Subjects
30% - Project
20% - Seminar
10% - Industrial training/industrial visit/educational tour or Paper presented at National-level

Pass minimum is 50%

Note: A student failed in viva voce but had passed in all other subjects shall be given with an additional chance for appearing the viva voce examination with in three months from the date of examination.

ELECTIVES

PTCE 09 L06: ADVANCED STRUCTURAL DESIGN I

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:

- To equip the students to assess the loads on some important types of structures, choose the method of appropriate analysis according to the situation and perform design

Module-1 (12 Hours)
Design of Deep beams & Corbels
Design of Ribbed Slabs
Yield line theory of slabs – Design of Square, Rectangular & Circular slabs for UDL and point load at centre

Module –II (14 Hours)
Design of flat slabs by direct design method and equivalent frame method as per IS 456-2000.
Design of multi-bay multi storied portal frames for gravity loads, Pattern loading - Use of SP 16 (Substitute Frame method of analysis may be followed)

Module III (14 Hours)
Design of Light Gauge members – compression and flexural members
Design of Self Supporting & Guyed steel Chimney (design for wind dynamics not expected)

Module – IV (14 Hours)

Basic principles of analysis of Base-excited SDOF and MDOF systems - formulation of basic equation– concepts of pseudo acceleration, velocity and displacement - Earthquake response spectra (concept only) .
Lumped mass modelling of multi-storey shear building and modes of vibration (concepts only- demonstration with example- students are not expected to solve numerical problem on evaluation of modes during examination)-modes superposition- SRSS and CQC (Introduction only)-Concept of design spectrum for earthquake- use of IS 1893.
Design of Multistoried framed structures for wind and Earthquake Loads- Equivalent static load method of IS 1893.
Ductility detailing for earthquake forces- IS 13920

Note
1. All designs shall be done as per current I.S. specifications.
2. Special importance shall be given to detailing in designs.
3. Limit state design shall be practiced wherever possible
4. Use of I.S. codes (IS 456, IS 801, IS 811, IS 1893) and SP16 (Design Aids) shall be permitted in the examination hall.

Text books

1. Varghese P.C., Advanced Reinforced Concrete Design , PHI
2. Winter and Nelson, Design of Concrete Structures, Tata McGraw Hill
3. Arya and Ajmani, Design of Steel Structures, Nemchand & Bros.
4. Anil K Chopra, Dynamics of structures-theory and applications to earthquake engineering, Pearson Education
5. R W Clough and J Penzien, Dynamics of structures, McGraw Hill
6. Jaykrishna, Elements of earthquake engineering, Saritha Prakasan, Naunchandi, Meerut.

Reference books

1. Krishnaraju.N., Advanced Reinforced Concrete Design, CBS Publishers
2. Mallick S.K. & Gupta A.P., Reinforced Concrete, Oxford & IBH Publishing Co.
3. Jain and Jaikrishna, Plain & Reinforced Concrete Vol.I & 11, Nem Chand
7. Ferguson, Reinforced Concrete, Wiley Eastern
8. Ramchandra, Design of Steel Structures Vol. II, Standard Book House
9. Park and Paulay, Reinforced Concrete Structures
10. Pankaj Agarwal and Manish Shrikandhe, Earthquake Resistant Design of Structures, PHI

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.

Maximum Total marks: 70

PTCE 09 L07: ADVANCED STRUCTURAL DESIGN II

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objective:

To familiarize the students with analysis & design aspects of some advanced structures like shell roofs, tall buildings and pre-stressed concrete structures

Module 1 (15 Hours)

Shell Roof – Introduction-Classification of shells, types of stresses, Analysis of cylindrical shells, Design of simply supported circular cylindrical shells using membrane theory, Beam theory and ASCE Manual No.31

Module II (15 Hours)

Folded Plates – Introduction- Analysis using ASCE Task Committee method – Design using Beam Method

Module III (9 Hours)

Tall Buildings –Introduction, Structural Systems, Principles of design and detailing of Shear wall

Module IV (15 Hours)

Principles of design of Pre-stressed Concrete Beams –Preliminary design- flexure and shear- Introduction to limit state method as per IS - Principles of design of anchorage zones (Theory only)

Note:

1. All designs shall be done as per current I.S. specifications.
2. Special importance shall be given to detailing in designs.
3. Limit state design shall be practiced wherever possible
5. Use of I.S. codes and SP16 shall be permitted in the examination hall.

Text Books :

1. Varghese P.C., Advanced Reinforced Concrete Design , PHI
2. N. Krishnaraju, Advanced Reinforced Concrete Design, CBS Publishers.
3. Jain and Jaikrishna, Plain & Reinforced Concrete Vol. 11, Nem Chand
4. Lin.T.Y.and Burns ,Design of Prestressed Concrete Structures ,John Wiley
5. Libby , Pre stressed Concrete ,CBS Publishers
6. N. Krishnaraju, Pre stressed Concrete, Oxford & IBH
7. Roy & Sinha, Pre stressed Concrete
8. B.S. Taranath, Structural Analysis and design of Tall Buildings, McGraw Hill

Reference books:

1. Park & Paulay, Reinforced Concrete Structures
2. Krishnaraju N, Structural Design and Drawing, University Press
3. IS 2210-1962, Criteria for The Design of R.C.C. Shell Roofs & Folded Plates
4. IS 1343- Code of practice for design of pre-stressed concrete structures
5. ASCE, Manual for Design of Cylindrical Concrete Shell Roofs No. 31
6. Ramaswamy G.S., Design & Construction of Concrete Shell Roofs
7. Advanced Engineering Bulletin No. 14, Design of Combined Frames & Shear Walls, Portland Cement Association
8. Special Publication, Shear Wall Frame Interaction - A Design Aid With Commentary By McLeod I.A., Portland Cement Association

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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.

Maximum Total marks: 70

PTCE 09 L08: ADVANCED GEOTECHNICAL ENGINEERING I

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Module 1 (13 Hours)

Clay mineralogy: Introduction-Gravitational and surface forces-Electrical charges on clay minerals-bonds-basic structural units of clay-isomorphs substitution-base exchange capacity-common clay minerals (Kaolinite, Montmorillionite and illite only)-Diffuse double layer-thixotrophy-activity of soils-capillary water – soil suction-capillary potential-capillary siphoning.

Module II (13 Hours)

Flow of water through soil: Introduction- Permeability of soil-aquifers-field methods for permeability-seepage of water –upward flow-effective stresses under steady seepage conditions-quick sand condition-failure of hydraulic structures by piping-Two dimensional flow-Laplace's equation-flow net and it's uses-construction of flownet for sheet pile wall and earth dams-phreatic lines-flow net for anisotropic soil(only basic aspects).

Module III (14 Hours)

Shear strength of soil-Introduction-Mohr-Coulomb failure criteria-modified failure envelope-total stress and effective stress analysis-stress vs. strain curves for soil-volumetric strain vs. axial strain-pore pressure vs. axial strain-critical void ratio-modified failure envelope-pore pressure parameters-choice of shear test and test conditions-liquefaction of sands-behaviour of over consolidated and normally consolidated soil during shearing-introduction to shear strength of partially saturated soil.

Module IV (14 Hours)

Earth and earth retaining structures- Introduction-Earth pressure theories-Types of retaining walls-Design of retaining walls-Gravity and cantilever retaining walls(only)-sheet pile walls-Types-Pressure distribution diagrams for cantilever and anchored sheet pile walls in cohesion less and cohesive soils-Features of earth dams(introduction only).

Reference books

1. Arora K.R., *Soil Mechanics & Foundation Engg.,* Standard Publications

2. Punmia B. C., *Soil Mechanics & Foundations*, Laxmi Publications

3. Venkatramiah, *Geotechnical Engineering*, New Age International Publishers

4. James K. Mitchell, Fundamentals of soil behavior, John Wiley and Sons,

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.

Maximum Total marks: 70

PTCE 09 L09: ADVANCED GEOTECHNICAL ENGINEERING II

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Module 1 (13 hours)
Well foundations: Introduction- Applications-Different shapes of wells-grip length-scour depth-design depth-forces acting on well foundation-Terzaghi's method of analysis (only general case)-bearing capacity based on N value(only IS recommendation)-design of individual components of well-sinking of wells-measures for rectification of tilts and shifts. Features of Box(floating) caisson and pneumatic caisson.

Module II (14 hours)
Foundation on expansive soils: Introduction to expansive soil- Identification of expansive soils-shrinkage and expansion of clay- -classification of expansive soil-direct measurement of swell and swell pressure-Free swell-swelling potential-Tests for swell pressure(only IS code method)-prediction of swell pressure from index properties-classification of damages in buildings-causes and types of damages in buildings on expansive soils- Damages and cracks in buildings on expansive soils-preventive measures for expansive soils-modification of expansive soils-principles of design of foundations in expansive soil deposits-environmental solutions such as soil replacement techniques and lime columns-structural solutions such as provision of rigid foundation, under reamed piles, T Beams as strip footing for walls (only basic aspects are to be discussed)

Module III(14 hours)
Soil dynamics and Machine foundations: Introduction- Soil behavior under dynamic loads and application-Difference between static and dynamic load behavior-soil properties relevant for dynamic loading- free vibrations and forced vibrations- Types of machines-Types of machine foundations - vibration analysis of a machine foundation-general design criteria for machine foundations- Design criteria for foundation for reciprocating machines(only IS specifications)-design procedure for block foundation for a reciprocating machine-reinforcement and construction details-vibration isolation and control,

Module IV(13 hours)

Stability of slope: Introduction- swedish circle method- location of most critical circle-use of N curve and T-curve-use of rectangular plot-stability of slope under steady seepage condition, sudden draw down condition and during construction- Improving stability of slopes.
Introduction to software packages in Geotechnical Engineering- for bearing capacity analysis and stability of slopes (application of a simple case on any one package)

Reference books

1.Joseph E. & Bowles, *Foundation Analysis & Design*, McGraw Hill

2.P.C.Varghese, Foundation Engineering,Prentice-Hall of India Private Ltd, New Delhi

3.Shashi K. Gulhati and Manoj Dutta, Geotechnical Engineering, Tata McGraw-Hill Publishing Compay Limited,New Delhi.

4.Leonards G.A., *Foundation Engineering*, McGraw Hill

5.Arora K.R., *Soil Mechanics & Foundation Engg.,* Standard Publications

6.Punmia B. C., *Soil Mechanics & Foundations*, Laxmi Publications

7.Venkatramiah, *Geotechnical Engineering*, New Age International Publishers

8.Teng W.C., *Foundation Design*, PHI

9.Tomlinson M.J., *Foundation Design & Construction*, Pitman

10.Coduto, *Geotechnical Engineering Principles and Practices*, Pearson Education

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.

Maximum Total marks: 70

PTCE09 L10 HIGHWAY PAVEMENT DESIGN

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week
To equip the students to carry out design and evaluation of flexible and rigid pavements in varied field conditions.

Note: IRC 37 2001 and 58-2002 and design charts are permitted for University Examinations

Module I (13 hours)
Introduction: types and component parts of pavements - factors affecting design and performance of pavements - comparison between highway and airport pavements - functions and significance of sub grade properties – various methods of assessment of sub grade soil strength for pavement design - cause and effects of variations in moisture content and temperature - depth of frost penetration - design of bituminous mixes by Marshall method

Module II (14 hours)
Stress analyses and methods of flexible pavement design: stresses and deflections in homogeneous masses - burmister 2 layer and 3 layer theories - wheel load stresses - ESWL of multiple wheels - repeated loads and EWL factors - empirical, semi - empirical and theoretical approaches for flexible pavement design - group index, CBR, triaxial, mcleod and burmister layered system methods

Module III (14 hours)
Stresses analysis and methods of rigid pavement design: types of stresses and causes - factors influencing
stresses, general conditions in rigid pavement analysis - ESWL- wheel load stresses - warping stresses – friction stresses - combined stresses - functions of various types of joints in cement concrete pavements - design and detailing of slab thickness ; longitudinal, contraction and expansion joints by IRC recommendations

Module IV (13 hours)
Pavement evaluation: structural and functional requirements of flexible and rigid pavements - pavement distress - evaluation of pavement structural condition by Benkelman beam rebound deflection and plate load tests - introduction to design of pavement overlays

Problems of highway rehabilitation – pavement rehabilitation programming.

Text Book:
Khanna S.K. and Justo, CEG, *Highway Engineering*, NemChand and bros.

References:
1. Yoder and W Nitezak, *'Principles of Pavement Design'*, John Wiley
2. Yang, *'Design of Functional Pavements'*, McGraw Hill
3. IRC: 37 - 2001, *'Guidelines for the Design of Flexible Pavements'*
4. IRC: 58 - 2002, *'Guidelines for the Design of Rigid Pavements'*
5. David Croney, *'The Design and Performance of Road pavements'*, HMSO publications
6. Hass and Hudson, *'Pavement Management System*', McGraw Hill Book Co.
7. IRC 81-1981- '*Tentative Guidelines for Strengthening of Flexible Pavements by Benklman Beam Deflections Techniques'.*

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Note: IRC 37-2001 and 58-2002 and design charts are permitted for University Examinations

Maximum Total marks: 70

PTCE09 L 11: ECOLOGY & ENVIRONMENTAL CHEMISTRY

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Module I (13 hours)
Introduction - definitions of ecology - subdivisions of ecology - approaches to the study of ecology - scope of ecology - ecology and human welfare - forestry - sericulture - horticulture and arboriculture - aquaculture fisheries and hatcheries - control of pest species - environmental conservation - conservation of natural resources - ecology in national affairs - ecology in education

Module II (13 hours)
Ecosystem - definition - principal steps and components of an ecosystem - tropic levels - food chains and food webs - energy flow in ecosystem - ecological pyramids - productivity of the ecosystem - homeostasis of the ecosystem and cybernetics - significance of ecosystem studies in developing countries - major ecosystems - definition and kinds of biogeo chemical cycles

Module III (14 hours)
Basic concepts from general chemistry - compounds - Avogadro's number - valancy, oxidation static - bonding - oxidation reactions - gas laws - solutions equilibrium and Lechatelier's principle - variation of equilibrium relationship - ways of shifting chemical equilibrium - basic concepts from physical chemistry - heat & work - energy - enthalpy - entropy - free energy - temperature dependence of equilibrium constant - vapor pressure of liquid - surface tension - binary mixture - osmosis - dialysis - principles of solvent extraction - electrochemistry - chemical kinetics - catalysis - absorption

Module IV (14 hours)
Basic concepts from organic chemistry - isomerism - aliphatic compounds - hydro carbons - alcohol - aldehydes - ketons - ester - ethers - alkyl halides - cyclic aliphatic compounds - mercaptans thioalcohols - aromatic compounds - hydrocarbons, phenols, alcohols, aldehydes, ketones, acids - hetero cyclic compounds basic concepts from colloidal chemistry - methods of formation - colloidal dispersion in liquid - colloidal dispersion in air - basic concepts from nuclear chemistry - nuclear theory - stable and radio active nuclides - atomic transmutation and artificial radio activity - nuclear reaction - nuclear fission - effects

Reference books
1. Kotpal R.L. & Bali N.P., Concepts of Ecology
2. Odum E.P., Ecology & Our Endangered Life Support Systems
3. Kudesia V.P., Environmental Chemistry
4. Sawyer, McCarty, Chemistry for Environmental Engineering, McGraw Hill

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 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: *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 L12: INDUSTRIAL STRUCTURES

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:
1. To familiarize with the design of special structures widely used in industrial plants.
2. To reinforce the fundamental courses in structural design in the perspective of industrial applications.

Module 1 (13hrs)

Functional design of industrial buildings: (7 hrs)

Classification of industrial structures-layout planning requirements –Guidelines from factories act – Lighting- Illumination levels – Principles of day lighting /artificial lighting design – Natural / Mechanical ventilation – Fire safety requirements – Corrosion protection – Protection against noise – Cladding systems- vibration isolation techniques - Industrial floors.

Introduction to diverse types of industrial structures: (6 hrs)

General overview of Thermal power plant/Nuclear power plant structures / Process plant steelwork – conveyor structures – Boiler supporting structures-Substation structures.

Module 2 (13 hrs)

Structural Design of Industrial Buildings:

Braced Industrial buildings – Unbraced Industrial frames – Gantry girders –Design of steel beam connections-Flexible & Rigid (Bolted and welded types)

Module 3 (14 hrs)
Special Industrial Structures:
Machine foundations – Types-Design Requirements-Analysis and design of block type machine foundations (IS 2974 method)

Design of Reinforced concrete bunkers and silos as per IS:4995
Tall Chimneys (RCC) –Types-Chimney sizing parameters- Overview of wind and temperature effects- Design principles of Reinforced concrete chimneys as per IS: 4998.

Module 4 (14 hrs)
Tower Structures:
Cooling Towers –Types and functions- Design principles of RC natural draught cooling towers as per IS: 11504
Transmission line Towers- Types-Design loadings-Analysis and design concepts- Description of TL tower foundations.

Textbooks:

1. Proceedings of an advanced course on industrial structures, SERC – 1982.
2. S.N.Manohar, Tall Chimneys-Design and Construction, Tata Mc Graw Hill.
3. P.Dayaratnam, Design of steel structures, Wheeler Publishing Co.
4. Ramchandra, Design of steel structures, Vol. 1 and 2, Standard Book house Delhi.
5. Srivasulu and Vaidyanathan, Handbook of machine foundations-Tata McGraw Hill.
6. Murthy and Santhakumar, Transmission Line structures, McGraw Hill

References:

1. SP: 32–1986,Hand book on functional requirements of Industrial buildings (Lighting and ventilation).
2. G.W.Owens, P.R.Knowles and P.J.Dowling- Steel Designers' manual – 5th edition – Blackwell scientific publications.
3. V.Kalayanaraman, Advances in steel structures. Tata McGraw Hill
4. Krishnaraju N., Advanced Reinforced concrete design, CBS Publishers.
5. K.K.Mc Kelvey and Maxey Brooke, The Industrial Cooling Tower, Elsevier Publishing Co.

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 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: *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 L13: STRUCTURAL DYNAMICS AND SEISMIC DESIGN

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:
To equip students with the basic knowledge on design of earthquake resistant structures

Module I (11 hours)
Overview of structural dynamics – Fundamental objective of structural dynamic analysis – types of prescribed loadings – essential characteristics of a dynamic problem – method of discretization, lumped mass procedure – generalized displacements – Single degree of freedom system – Components of the basic dynamic system – formulation of the equation of motion – D Alembert's principle - influence of gravitational forces - generalized SDOF system- Rigid body assemblage - expression for generalized system properties.

Module II (14 hours)
Solution of the equation of motion- undamped free vibration- damped free vibration- critical damping- under damped system- over damped system- negative damping-concept of Coulomb damping.
Response to harmonic loading - Undamped system- complementary solutions- particular solution- general solution- response ratio – Viscously damped system- resonant response-dynamic amplification factor- vibration isolation.
Response to periodic loading - Fourier series expression of the loading- Response to the Fourier series loading - Exponential form of Fourier series solutions – concept of four way logarithmic graph paper

Module III (15 hours)
Base-excited SDOF system - formulation of basic equation– concepts of pseudo acceleration, velocity and displacement - Earthquake response spectra (concept only).
Lumped mass modelling of multi-storey shear building and modes of vibration (concepts only- demonstration with example- students are not expected to solve during examination)
Performance of building and structures under earthquakes- Main Causes of Damage- Intensity of earth quake forces, lack of strength and integrity of buildings, quasi resonance – lack of ductility, lack of detailing.
Earth quake effects- On buildings, structures, power plants, switch yards, equipments or other life line structures, soil liquefaction- Assessment of damage
Philosophy and Principles of earthquake.-resistant design- Strength and stiffness- ductility-based design and detailing, concepts of seismic isolation and seismic active control, Building forms and architectural design concepts- Horizontal and vertical eccentricities due to mass and stiffness distribution (Numerical exercises not expected) IS specifications.

Module IV (14 hours)
Equivalent Static Method- Seismic zones and coefficients – response reduction factors -Estimations of fundamental time period, base shear and its distributions using IS: 1893 for multistory buildings (regular shape only).
Use of codes like IS: 4326, IS: 13828, IS: 13827, IS13920, SP:22 with reference to masonry, RCC and steel building Detailing of reinforcement and joints.
Restoration and retrofitting - Methodologies for restoration and retrofitting – For walls, roofs, slabs, columns and foundation of building in stones, brick or reinforced concrete structures

Text books

1. Anil K Chopra, Dynamics of structures-theory and applications to earthquake engineering, Pearson Education
2. R W Clough and J Penzien, Dynamics of structures, McGraw Hill
3. Jaykrishna, Elements of earthquake engineering, Saritha Prakasan, Naunchandi, Meerut.

References

1. Pillai & Menon, Reinforced concrete design, Tata McGrawHill
2. Park & Paulay, Reinforced concrete, McGrawHill
3. Madhujit Mukhopadhyay, Structural Dynamics – Vibrations and System, Ane Books India

IS Codes:

4. IS:1893 - (Part I), Criteria for Earthquake Resistant structures-General Provisions and Buildings
5. IS:13935 – Repair and Seismic strengthening of buildings
6. IS:4326 - Earthquake Resistant Design and Constructions of buildings
7. IS:13827 – Improving Earthquake Resistance of Earthen buildings
8. IS:13828 - Improving Earthquake Resistance of Low strength Masonry buildings
9. IS:13920 – Ductile detailing of RC Structures subject to Seismic forces.

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 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: *Analytical / Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
Maximum Total marks: 70

PTCE 09 L14: SOIL EXPLORATION, TESTING AND EVALUATION

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objective

- To equip students with techniques of exploration, testing and evaluation for soil parameters required for foundation choice and design

Module I (14 hours)

Soil Exploration: objectives-methods-depth, spacing, size and number of boreholes-different methods of boring-bore logs-sample requirements-sampling methods and equipments-handling, preservation and transporting of samples-rock core recovery-rock quality designation-geophysical and seismic methods-preparation of soil investigation reports(Students are expected to know how to choose type of exploration for different type of works, how to carry out the exploration and must be able to prepare soil investigation reports)

Module II (14 hours)

Laboratory Testing of Soil: water content, specific gravity, grain size analysis, Atterberg's limits and indices, Permeability: constant head and variable heads, Compaction: light and heavy, Consolidation: time-settlement, e-log(p) curve- pre-consolidation pressure-Shear Test: direct shear, triaxial, unconfined compression, vane shear –pore pressure measurement

(Students are expected to know the test procedures, computations o properties from observations and correlations and interpretation of results. Theoretical treatment – derivation etc is not required)

Module III (12 hours)

Field Testing of Soil: Plate load test, standard penetration test, static cone penetration test, Dynamic cone penetration test, Pressure meter test, Field Vane shear test, Field permeability test

(Students are expected to know the test procedures, computations o properties from observations and correlations and interpretation of results. Theoretical treatment – derivation etc is not required)

Module IV (14 hours)

Laboratory and Field Testing of Rocks: Laboratory tests: Tension, shear and flexure tests – Elastic Modulus by Brazilian and bending tests.

Insitu tests: Test for deformability, shear tests, strength tests and test for internal stresses.

Text Books

1. Alarm Sing, Soil Engineering- Theory and Practice, Asia Pub

Reference Books

1. Lambe, Soil Testing for Engineers, John Wiley, NewYork
2. Goodman R.E., Rock Mechanics, John Wiley, NewYork
3. Terzaghi, K. and Peek R.B., Soil Mechanics in Engineering Practice, John Wiley
4. Murthy V.N.S., Soil Mechanics anfd Foundation Engineering, DhanpathRai
5. Coduto, Geotechnical Engineering Principlres and Practices, Pearson Education
6. Joseph E., and Bowls, Foundation Analysis and Design, McGraw Hill
7. Tomlinson M J., Foundation Design and Construction, Pitman

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 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: *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 L15: SURFACE HYDROLOGY AND WATER POWER

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:
To make the students aware of the importance of surface water resources and strategic back ground information for its effective and wise utilization

Module I (14 Hours)
Introduction: Hydrologic cycle- application of hydrology in engineering – water balance equation – water resources of India – review of rainfall measurement and analysis.
Abstraction from precipitation: Evaporation – measurement, estimation and control of evapo-transporation (ET) – estimation of evapo-transpiration – evapo-transpiration and consumptive use – measurement of ET – lysimeters and field pots – potential ET and its computation – pav evaporation-Pennman's method – Blaney Criddle method – reference crop ET and crop coefficient – interception and depression storage – infiltration processes – measurement using infiltrometers – infiltration capacity – infiltration indices – Hortan's model of infiltration.
Rain water harvesting – water scarcity in Kerala – reasons – manmade alterations in hydrologic cycle – methods of water conservation

Module II (13 Hours)
Characteristics of run off – factors affecting run off – components of hydrograph – base flow separation – rain fall – run off relations – unit hydrograph theory – derivation of unit hydrograph – applications and limitations of unit hydrograph- S hydrograph – instantaneous unit hydrograph – unit hydrograph for ungauged catchments – synthetic hydrograph – conceptual elements – linear reservoirs – Nash model. Yield from a catchment – flow duration curves – flow mass curve.

Module III (13 Hours)
Floods – estimation of peak discharge – rational method- unit hydrograph method. Probabilistic and statistical methods – basic concept of probability and frequency distribution – skewness coefficient – return period discrete distribution – Binomial distribution – continuous distribution – flood frequency analysis – normal, lognormal, Gumbel and Log-Pearson Type III methods.
Flood routing – reservoir routing – Modified pulse method – channel routing – Muskinghum method.

Module IV (14 Hours)
Water power – types of hydro power schemes – runoff river plant- pumped storage plant – tidal power plants – hydro power potentials of India – economic considerations of water power – estimates of available water power – gross and net head – available power – power duration curve – assessment of water power potential - load factor, capacity factor, utilization factor- general layout of hydro power scheme – elements of hydro power scheme – intakes -functions – types – tail race, Penstocks – location – types – economical diameter- penstock accessories – anchor block – water hammer – water hammer equation – Cavitations – Surge Tanks – functions and types – turbines – review of basics – characteristic curves – draft tubes – governing of turbines.

Text books:
Subramanian K., Engineering Hydrology, Tata McGraw Hill
Reghunath H.M., Hydrology, Prentice Hall
Duggel K.N., and J.P. Soni, Elements of water resources engineering, New Age International Publishers.

References:
Chow V.T., Dr.Maidment and L.W. May, Applied hydrology, McGraw Hill Book Co., Singaopre 1988
McCuen R.H, Hydrologic analysis and design, Prentice Hall
Singh V.P., Elementary Hydrology, Prentice Hall of India
Veissman, W. Jr., G L Lewis and J W. Knapp, Introduction to hydrology, Harper and Row, NewYork
Rao K. L., Water resources of India,

PTCE09 L16 URBAN TRANSPORTATION PLANNING

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:
To equip the students with the basic principles of transportation planning.

Module I (14 hours)
Urban transportation planning process and concepts: Role of transportation - transportation problems – urban travel characteristics - evolution of transportation planning process - concept of travel demand - demand function - independent variables - travel attributes - assumptions in demand estimation - sequential, recursive and simultaneous process

Module II (13 hours)
Trip generation analysis**:** Definition of study area - zoning - types and sources of data - road side interviews - home interview surveys - expansion factors - accuracy checks. Trip generation models - zonal models – category analysis - household models - trip attractions of work centres

Module III (13 hours)

Trip distribution analysis**:** trip distribution models - growth factor models - gravity models - opportunity models

Module IV (14 hours)

Mode split and route split analysis**:** mode split analysis - mode choice behaviour - competing modes - mode split curves - probabilistic models - route split analysis - elements of transportation networks - coding - minimum path trees - all-or-nothing assignment - capacity restrained assignment

Text book

1 Khanna.S.K and Justo.C.E.G., Highway Engineering, Nemchand and Bros.
2 Kadiyali.L.R., Traffic Engineering and Transportation planning, Khanna Publishers, New Delhi.

References books

1. Hutchinson B.G., *Principles of Urban Transportation System Planning*, McGraw Hill
2. Khisty C.J., *Transportation Engineering - An Introduction*, Prentice Hall
3. Bruton M.J., *Introduction to Transportation Planning*, Hutchinson of London.
4. Papacostar, *Fundamentals of Transportation Planning*, Tata McGraw Hill
5. Dicky J.W., *Metropolitan Transportation Planning*, Tata McGraw Hill

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Maximum Total marks: 70

PTCE 09 L 17: ARCHITECTURE AND TOWN PLANNING

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:
The objective of this subject is to study the principles of architecture design and functional planning of buildings. The topic town planning helps to realise the process of resource mobilization, organization of landuse, transportation and infrastructure networks both for efficient functioning and creation of pleasant and well ordered environment.

Module I (14 hours)
Principles of architectural design – definition of architecture – factors influencing architectural development – characteristics features of style – historic examples – creative principles.
Principles of architectural composition – Unity – balance – proportion – scale –rhythm – harmony – Accentuation and contrast.
Organising principles in architecture – Symmetry – hierarchy – axis – linear – concentric, radial – and asymmetric grouping – primary and secondary masses.
Role of colour, texture, shapes/ forms in architecture.
Architectural space and mass, visual and emotional effects of geometric forms, space activity and tolerance space. Forms related to materials and structural systems.
Elements of architecture : Functions – Pragmatic utility, circulatory function, symbolic function, Physiological function. Structure – Physical structure, Perceptual structure. Space in architecture – Positive and negative space. Aesthetics: Visual perception. Protective: Protection from climate and other elements, architecture a part of the environment. Comfort factors.

Module II (13 hours)
Functional planning of buildings - occupancy classification of buildings - general requirements of site and building codes and rules - licensing of building works - the process of identifying activity areas and linkages – Design concepts and philosophies - checking for circulation, ventilation, structural requirements and other constraints - preparing sketch plans and working drawings - site plans - presentation techniques - pictorial drawings - perspective and rendering - model making - introduction to computer aided design and drafting

Module III (14 hours)
Town planning theory - evolution of towns - problems of urban growth - beginning of town planning acts - ideal towns - garden city movement - concept of new towns and conservative surgery - comprehensive planning of towns - survey and analysis of town - base maps - land use classification - transportation network – housing, demographic, socio - economic studies - Environmental aspects - theories of land use planning, transportation planning and housing development - urban area delineation - urban influence zone - urban region - concepts of regional planning

Module IV (13 hours)
Concepts of master plan, structure plan, detailed town planning scheme and action plan, estimating future needs - planning standards for different land use, allocation for commerce, industries, public amenities, open areas etc. - planning standards for density distributions - density zones - planning standards for traffic network - standard of roads and paths - provision for urban growth - growth models - plan implementation - town planning legislation and municipal acts - panning of control development schemes - urban financing - land acquisition - slum clearance schemes - pollution control aspects

Text Books:

1. Satish Chandra agarwala, Architecture and Town Planning, Dhanpat Rai & Co.
2. Gurucharan Singh and Jagdish Singh, Building Planning and Scheduling, Standard Publishers and Distributers.
3. S.C Rangwala, Town Planning, Charotar Publishing House.

Reference books:

1. Banister Fletcher, A History of World Architecture
2. Pency Brown, Indian Architecture - Vols I & II., D.B. Taraporevala Son's & co.
3. Scot, Design Fundamentals, McGraw Hill
4. Hazel Convay & Rowen Roenisch , Understanding Architecture.
5. Lewis Keeble, Principles and practice of Town and Country Planning.
6. Peter Hall, Urban & Regional Planning.
7. Peter Hall, Urban Future 21.
8. Broadbent, Theory of Architectural Design
9. Gallion, Urban Pattern, CBS
10. Lewis H.M., Planning the Modern City, John Wiely
11. Rame Gouda, Principles & Practices of Town Planning, University of Mysore, Manasa Gangotri

PTCE 09 L 18: ADVANCED CONSTRUCTION ENGINEERING & MANAGEMENT

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objective

To familiarise students with advanced construction methods and management techniques usually adopted in large projects

Module-I (11 hours)

Construction projects- project development process - project management - main causes of project failure.

Equipment intensive operations and risks - equipment types - selection of equipment–owning and operating cost of equipment - economic life of equipment – depreciation – replacement decisions.

Module – II (15 hours)

Earthwork construction: planning – graphical presentation – earthwork quantities – mass diagram and its use- properties of geotechnical materials – bank, loose and compacted measures - compaction specification and control – soil processing – compaction methods and equipment – stabilisation methods.

Flexible pavement construction : structure and materials – asphalt plants – batch plants, drum mix plants, dust collectors, asphalt storage and heating, reclaiming – paving equipment – sweeper, haul trucks, asphalt distributors and pavers – compaction equipment. Pavement laying methods – paving practice, laying width, surface dressing, repaving.

Module – III (15 hours)

Concrete production and placement**:** Significance of proportioning concrete mixtures – use of mineral admixtures in concrete – significance and applications of light weight concrete, high density concrete, polymer concrete composites, fibre reinforced concrete, high performance concrete, vacuum concrete.

Handling and batching concrete materials - mixing - types of mixers – Ready mixed concrete – transporting and placing methods – equipment for consolidation of concrete – finishing and curing methods – slipform paving - roller compacted concrete – Hot weather and cold weather concreting – under water concreting – shotcreting.

Module –IV (13 hours)

Project control methodology – control system framework – parameters to be controlled – performance base lines – performance accounting process – monitoring performance – information communication – control benefits.

Quality management - importance of quality - elements of quality - organisation for quality control - quality assurance techniques – documentation - quality control circles - total quality management - ISO 9000.

Text Books

1. R.L.Peurifoy and Schexnayder – Construction Planning, Equipment, and Methods, 6th Edition, Tata McGraw Hill
2. Chitkara, K.K. - Construction Project Management - Planning, Scheduling and Controlling, Tata McGraw Hill Publishing Co., New Delhi.

References books

1. Neville A.M. and Brooks.J.J. - Concrete Technology, Pearson Education.
2. Banga, Sharma, Agarwal. – Industrial Engineering and Management Science, Khanna Publishers.
3. F. Harris - Modern Construction and Ground Engineering Equipment and Methods, Prentice Hall.
4. Jagman Singh – Heavy Construction – Planning, Equipment an Methods, Oxford & IBH Publishing Co.
5. James E. Russell, Construction Equipment, Reston Publishing Company, Inc., Virginia.

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Maximum Total marks: 70

PTCE09 L19: COASTAL ENGINEERING AND MARINE STRUCTURES

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective
To develop basic knowledge on Ocean Engineering and related applications.

Module I (16 Hours)
Introduction: man-ocean interaction-effects of ocean on ecology and climate-ocean as a source of food and means of communication-minerals in ocean-ocean for disposal of wastes-integrated coastal zone management (ICZM) and its importance in India.
Theory of ocean waves: formulation of wave motion problem-assumptions made in two dimensional cases-small amplitude wave theory-orbital motions and pressures- problems-wave energy.

Module II (10 Hours)
Brief introduction to finite amplitude wave theories-mass transport-: Gerstner theory-Stokes theory, solitary wave theory-relationships among wave dimensions-wind and fetches-generation of waves-wave forecasting- S.M.B and P.N.J methods-problems

Module III (14 Hours)
Reflection, refraction and diffraction of waves: clapotis or standing waves-super position of waves-diffraction of waves around semi infinite break waters –detached breakwater of finite length-diffraction through openings. Wave forces on structures: forces on vertical walls due to non-breaking waves, breaking waves and broken waves based on linear theory-Forces on fixed vertical circular cylinder in the Morison regime- problems Introduction to Froude-Krylov force and Diffraction regime- -Tsunami: Generation, propagation-warning systems.

Module IV (14 Hours)
Shores and Shore processes: long term and short term changes of shores –factors influencing beach characteristics-beach wave interaction-beach profile modification-littoral drift-stability of shores-shore erosion due to sea level rise-on shore and off shore transport-long shore transport-interaction of shore structures-shore erosion in Kerala-mud banks

Shore Protection works: description and effects of break waters-sea walls-groynes of various types-beach nourishment, break waters, tetrapod, tribar etc. Hudson's formula and simple design problem.

Text Books:

Ippen A.T, R, Estuary and Coastline Hydrodynamics

.Sarpkaya, T.,Isaacson,M., Mechanics of Wave Forces on Offshore Structures, Van Nostrand Renhold Company

Reference Books:

1 Chakrabarti,S.K., Hydrodynamics of Offshore structures, Computational Mechanics Publications, Southampton, Boston

2. Wiegel R.L, Oceanographical Engineering, Prentice Hall.

3. Coastal Engineering Manual (CEM-Department of the Army-US Army Corps of Engineers-2001 or latest revision)

Internal assessment: Maximum marks:30

60% - Tests (Minimum 2)

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

10% - Regularity in the class

University examination pattern:

PART A : Short answer questions 5x2 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 4x5 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.4x10 marks= 40 Marks

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

Maximum Total marks:70

PTCE09 L20: GROUND WATER HYDROLOGY

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:

- To make the students aware of the importance of groundwater resources and to impart strategic background information for its effective and wise utilisation

Module I (14 hours)

Occurrence of ground water: origin - rock properties affecting ground water vertical distribution - geologic formations as aquifers -types of aquifers - aquifer parameters-ground water basins - springs - Laplace equation - potential flow lines - flow net – flownet for anisotropic soils- seepage under a dam -groundwater contours- determination of flow direction- steady unidirectional flows in aquifers- confined and unconfined -aquifer with percolation- steady radial flow towards a well- well in uniform flow - steady flow with uniform discharge- partially penetrating wells- steady flow in leaky aquifer.

Module II (13 hours)

Unsteady flow-general equation- Cartesian and polar coordinate- unsteady radial flow in to a well - confined, unconfined and leaky aquifers –multiple well system - pumping tests - non equilibrium equation for pumping tests - Thies' method - Jacob method - Chow's method -characteristics well losses –step draw down test- well near aquifer boundaries -determination of boundaries from pumping test .Image wells. for various boundary conditions-
Cavity well and open well- yield tests-pumping and recuperation test.

Module III (14 hours)

Tube wells: design - screened wells - gravel packed wells - well loss-selection of screen size - yield of a well - test holes - well logs - methods of construction - dug wells -shallow tube wells - deep wells - gravity wells - drilling in rocks - screen installation - well completion - well development - testing wells for yield - collector - or radial wells - infiltration galleries - well point system - failure of tube wells

Module 1V (13 hours)

Quality of ground water: ground water samples - measurement of water quality- chemical, physical and bacterial analysis - quality for domestic use - quality for agricultural use - pumps - shallow well pumps - ground water investigation - geographical investigation - electrical resistivity method - seismic refraction method - gravity and magnetic method - test drilling - resistivity logging - potential logging - artificial recharge - recharge by water spreading –
sewage recharge - recharge through pits, shafts and wells-rain water harvesting

Text Book
Raghunath H. M., Ground water Hydrology, Wiley

Reference books:

1. Todd D.K., Ground Water Hydrology, John Wiley
2. Garg S.P., Ground Water & Tube wells, Oxford & IBH
3. Raghunath H.M., Hydrology, Wiely Eastern

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 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: *Analytical / Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.
Maximum Total marks: 70

PTCE 09 L21 GROUND IMPROVEMENT TECHNIQUES

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Objective of ground improvement-In-situ ground improvement method**s-**Introduction to soil improvements without the addition of many material - surface compaction –compaction piles in sand-

impact compaction/dynamic compaction of sands – vibratory compaction in sand-vibroflotation in sand–explosions in sand- Terra probe method- replacement process - vibroflotation in clays--preloading techniques- sand drains-stone columns-introduction to soil improvement by thermal treatment- introduction to bio technical stabilization

Module II (13 hours)

Introduction to soil improvement by adding materials - lime stabilization –Mechanism-optimum lime content-lime fixation point-effect of lime on physical and engineering properties of soil- lime column method - stabilization of soft clay or silt with lime – stabilization with cement-suitability for soils-effect on properties of soils

Groting-types-desirable characteristics of grouts-grouting methods-grouting pressure-grouting materials - grouting technology- permeation grouting- compaction grouting- soil fracture grouting-jet grouting -- application and limitations - slab jacking, grouted columns-application to dams.

Module III (12 hours)

Soil improvement using reinforcing elements - introduction to reinforced earth - load transfer mechanism and strength development - soil types-reinforcing materials - Reinforced earth retaining walls- reinforced embankments-soil nailing -improvement using natural materials (introduction only).

Module IV (14 hours)

Geosynthetics–Types-applications (only general applications)- types of geotextiles and geo grids - physical and strength properties of geotextiles and geogrids - behaviour of soils on reinforcing with geotextiles and geogrids- - design aspects with geotextiles and geogrid for clay embankments, retaining walls and unpaved roads.

Reference books:

1. Moseley, *Text Book on Ground Improvement*, Blackie Academic Professional, Chapman & Hall
2. Purushotham S. Raju, *Ground Improvement Technique,* Laxmi Publications
3. Shashi K. Gulhati and Manoj Dutta, Geotechnical Engineering, Tata McGraw-Hill Publishing Compay Limited,New Delhi.
4. Boweven R., *Text Book on Grouting in Engineering Practice*, Applied Science Publishers Ltd
5. Jewell R.A., *Text Book on Soil Reinforcement with Geotextiles*, CIRIA Special Publication, Thomas Telford
6. Donald .H. Gray & Robbin B. Sotir, *Text Book On Bio Technical & Soil Engineering Slope Stabilization*, John Wiley
7. Rao G.V. & Rao G.V.S., *Text Book On Engineering With Geotextiles*, Tata McGraw Hill
8. Korener, *Construction & Geotechnical Methods In Foundation Engineering*, McGraw Hill

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Maximum Total marks: 70

PTCE09 L22: ENVIRONMENTAL POLLUTION CONTROL ENGINEERING*

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objective:

- To provide students with balanced information regarding different elements of pollution and its control measures
- To make students aware of statutory controls for pollution control.

Module I (14 Hours)

Environmental pollution – interrelationship between various forms of pollution – surface water pollution surveys – integrated river basin water management – restoration of water bodies – water quality parameters and optimization of treatment – water quality changes by domestic use – radioactive materials – thermal pollution and underground disposal – types of water pollutants and their effects – instrumentation for water quality and treatment – role of wastewater treatment as pollution control measure.

Module II (13 Hours)

Air pollution control strategy – basic approaches – areas of legal responsibility – source identification – particulate control and control of gases and vapours – factors affecting control approach selection – air pollution control technology – settling chambers – filters – electrostatic precipitators – wet scrubbers – entrainment separators – gas adsorption, gas absorption and combustion.

Module III (14 Hours)

Land pollution – pollution cycle – ecological factors in plant site selection – ecological aspects of vegetation control – noise pollution – the physics of sound and hearing – effects of noise – sources – instruments and techniques for noise measurements – light and glare pollution – light and its characteristics - glare – outdoor lighting and glare sources – corrective procedures.

Module IV (13 Hours)

Environmental impact analysis – physical, social, aesthetic and economic assessment of highway project, mining and power plants – legislative control – water pollution laws and regulations – Air pollution control act of India – chimney heights – land pollution laws and regulations.

Reference Books:

1. Rao C S, Environmental Pollution Control Engineering, New Age International (P) Ltd.
2. Goel P K, Water Pollution Causes, Effects and Control, New age International (P) Ltd.
3. Birdie G.S & Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons.
4. Bethea R.M, Air Pollution Control technology, Van Nostrand Reinhold Co.
5. Flintoff F, Management of solid waste in developing countries, WHO.
6. Liptek Bela G & Bouis P.A., Environmental Engineers Handbook Vols I, II, III, Chilton Book Company.
7. Water Pollution Act (1974) passed by Govt. of India.
8. Air pollution Control act of India.
9. Relevant Indian Standards & factory Acts.

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 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: *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 L23: EXPERIMENTAL STRESS ANALYSIS*

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective
To make students aware of various measurement techniques and experimental planning and procedures adopted in laboratory

Module I (14 hours)
Strain gauges - definition of gauge length - sensitivity and range - characteristics of an ideal strain gauge - different types of mechanical strain gauges, optical strain gauge - acoustic strain gauge - pneumatic strain gauge - merits and demerits - electrical strain gauges - inductance, capacitance and piezo electric gauges - bonded and unbonded resistance gauges and their application in stress analysis - fixing techniques and measurement of strains - rosettes - determination of principal stress - construction of stress, strain circles - analytical solution

Module II (13 hours)
Photo elasticity - basics of optics, stress optic law - plane and circularly polarized light and their use in photos elasticity - polariscopes - diffusion type - lens type polariscopes - isoclinics and isochromatics

Module III (14 hours)
Model materials - calibration methods for finding material fringe values - model fringe values - examples of beam flexure and diametrically loaded circular plates.

Non Destructive Testing Methods – Ultrasonic Methods – Hardness methods – Rebound Hammer – Detection of embedded reinforcement.
Computer based data acquisition systems.

Module IV (13 hours)
Model analysis - direct and indirect models - laws of structural similitude - choice of scales - limitation of model studies - buckingham pi-theorem - dimensional analysis - model materials - Begg's deformater and its use - simple design of direct and indirect models

Text Books

1. Dally, J. W. and Raliey W.F., Experimental Stress Analysis, McGraw Hill.
2. Srinath L.S., Experimental Stress Analysis, Tata McGraw Hill
3. Roy, T.K., Experimental Analysis of stress and strain

Reference Books

1. Dove and Adams, Experimental Stress Analysis and Motion measurement, Prentice Hall
2. Hetenyi M., Hand book of Experimental Stress Analysis, John Wiley
3. Bently JP – Principles of Measurement Systems, Longman, 1983
4. Nakra & Chowdhary – Instrumentation Measurement & Analysis – Tata McGraw Hill, 1995

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 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: *Problem solving questions.4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

Maximum Total marks: 70

PTCE09 L24: REMOTE SENSING AND GIS*

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective
To make the students aware of the technological developments in the geographical database management and its advantages

Module I (14 Hours)
Remote sensing: definition – components of remote sensing- energy sensor, interacting body – active and passive remote sensing – platforms – arial and space platforms – balloons ,helicopters, aircrafts and satellites – synoptivity and repeativity – electromagnetic radiation (EMR) – EMR spectrum – visible, infrared (IR) near IR, middle IR, thermal IR and microwave – black body radiation – Plancks Law – Stefan –Boltzman law.
Atmospheric characteristics – scattering of EMR – Raliegh, Mie, Non-selective and Raman scattering – EMR interaction with water vapur and ozone – atmospheric windows – significance of atmospheric windows – EMR interaction with earth surface material, radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface.

Module II (14 Hours)
Opticaa and Microwave Remote sensing:
Satellites – classification – based on orbits – sun synchronous and geo synchronous – based on purpose – earth resources satellites , communication satellites, weather satellites, spy satellites – satellite sensors – resolution – spectral, spatial, radiometric and temporal resolution – description of multi-spectral scanning – along and across track scanners- description of sensors in IRS series – current satellites – radar – speckle – back scattering- side looking air borne radar – synthetic aperture

radar – radiometer radar – geometrical characteristics. Principles of thermal remote sensing. Principles of microwave remote sensing.

Module III (13 Hours)

Geographic information system – components of GIS – hardware, software and organisational context – data – spatial and non spatial maps – types of maps – projection- types of projection – data input- digitiser, scanner, editing – raster and vector data structures – comparison of raster and vector data structure – analysis using raster and vector data – retrieval, reclassification, overlaying, buffering - data output – printers and plotters.

Module IV (13 Hours)

Miscellaneous topics: interpretation of satellite images- elements of interpretation – visual interpretation – digital image processing techniques – image enhancement – filtering – image classification – FCC composites - supervised and unsupervised integration of GIS and remote sensing –application of remote sensing and GIS – urban applications – water resources – urban analysis – watershed management – resources information system – hazard mitigation.

Text books:

1. Anji Reddy, Remote sensing and Geographical systems, BS Publications
2. M G Srinivas (Edited by), remote sensing applications, Nerusa publishing house
3. Lillesand T M and Kuefer R W., Remote sensing and image interpretation, John Wiley and sons
4. Jensan J R, Introductory digital image processing, Prentice Hall of India
5. Sabins, Flyod, F., Remote sensing principles and Interpretation, W H Freman and Co., NewYork

References:

1. Janza F J, Blue H M and Johnston, J E., Manual of remote sensing vol. I., American Society of Photogrammetry, 1975
2. Burrough P A., Principles of GIS for land resource assessment, Oxford
3. Star Jeffrey L (Ed), Ests Joh E and McGwire Kenneth, Integration of geographical systems and remote sensing, Cambridge university.
4. De Merse, Michael N., Fundamentals of geographic information system, 2nd edn., John Wiley and sons.

PTCE09 L25: FINITE ELEMENT METHODS*

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objective:
To make the back ground, basic concepts and basic formulation of finite element method clear to the students

Module I (14 hours)
Introduction to Finite Element Methods: Physical problems, mathematical models and finite element solutions – Mathematical model of Discrete systems – elements and assemblage - matrix formulation – Equations of equilibrium - element assembly and solution for unknowns –Gauss elimination method, LDL^{-T} Method - Basic equations of elasticity – stress–strain and strain-displacement relations - theory of stress and deformation - stress-strain-temperature relations
Review of direct stiffness method: Descretization – element and structure stiffness matrices DOF relationship- assembly of global stiffness matrix and load vector - solution of equations for unknowns - displacement boundary conditions - computation of stress - support reactions.

Module II (13 hours)
Continuous systems: Practical Examples –mathematical models- differential formulation – limitations – Variational formulation – Total potential energy - principle of stationary potential energy - problems having many d.o.f - potential energy of an elastic body - the Rayleigh-Ritz method - piecewise polynomial field - finite element form of Rayleigh-Ritz method - finite element formulations derived from a functional - interpolation - shape functions for C^0 and C^1 elements - Lagrangian interpolation functions for two and three dimensional elements

Module III (13 hours)
Displacement based elements for structural mechanics: formulas for element stiffness matrix and load vector - overview of element stiffness matrices - consistent element nodal vector - equilibrium and compatibility in the solution - convergence requirements - patch test - stress calculation - other formulation methods
Straight sided triangles and tetrahedral: natural coordinates for lines - triangles and tetrahedral - interpolation fields for plane triangles - linear and quadratic triangle - quadratic tetrahedron
Module IV (14 hours)
The isoparametric formulation: introduction - an isoparametric bar element - plane bilinear element - summary of gauss quadrature - quadratic plane elements - direct construction of shape functions for transition elements - triangular isoparametric elements - consistent element nodal loads - validity of isoparametric elements - appropriate order of quadrature - element and mesh instabilities - remarks on stress computation
Coordinate transformation: transformation of vectors - transformation of stress, strain and material properties - transformation of stiffness matrices - transformation of flexibility to stiffness - inclined support - joining dissimilar elements to one another- rigid links - rigid elements

Text books:

1. Bathe K.J., Finite Element Procedures in Engineering Analysis, Prentice Hall of India
2. Cook R.D., Malkus D.S. & Plesha M.F., Concepts & Applications of Finite Element Analysis, John Wiley
3. Reddy, J.N., An Introduction to the Finite Element Method, McGraw Hill, 2006.

Reference books:

1. Desai C.S., Elementary Finite Element Method, Prentice Hall of India
2. Chandrupatla T.R. & Belegundu A.D., Introduction to Finite Elements in Engineering, Prentice Hall of India
3. Cook, R.D., Finite Element Modelling for Structural Analysis, John Wiley and sons.
4. Gallaghar R.H., Finite Element Analysis: Fundamentals, Prentice Hall Inc.
5. Rajasekaran S., Finite Element Analysis in Engineering Design, Wheeler Pub.
6. Krishnamoorthy C. S., Finite Element Analysis - Theory and Programming, Tata McGraw Hill
7. Zienkiewics O.C. & Taylor R.L., The Finite Element Method, Vol I & II, McGraw Hill
8. Segrelind., The Finite Element Method.

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 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: *Problem solving questions.4×10 marks= 40 Marks*

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

Maximum Total marks: 70

GLOBAL ELECTIVES from Other Branches

CS09 L24 : COMPUTER BASED NUMERICAL METHODS

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of mathematical modelling of problems in science and engineering and to know procedures for solving different kinds of problems.*
- *To understand the various numerical techniques which provide solutions to non linear equations, partial differential equations etc that describe the mathematical models of problems.*

Module I (13 hours)
Errors in numerical computation - mathematical preliminaries - errors and their analysis - machine computations - computer software. Algebraic and Transcendental Equations - bisection method - iteration method - method of false position - rate of convergence - method for complex root - Muller's method - quotient difference method - Newton-Raphson method.

Module II (13 hours)
Interpolation – introduction - errors in polynomial interpolation - finite differences - decision of errors - Newton's formula for interpolation. Gauss, Sterling, Bessel's, Everett's Formula - interpolation by unevenly spaced points - Lagrange interpolation formula - divided difference - Newton's general interpolation formula.

Module III (13 hours)
Numerical Integration and Differentiation – introduction - numerical differentiation - numerical integration - trapezoidal rule - Simpson 1/3 rule - Simpson 3/8 rule - Boole's and Weddle's rules - Euler-Maclariaun formula - Gaussian formula - numerical evaluation of singular integrals.

Module IV (13 hours)
Statistical Computations - frequency Chart - method of least square curve fitting procedures - fitting a straight line - curve fitting by sum of exponential - data fitting with cubic splines - approximation of functions. Regression Analysis - linear and nonlinear regression - multiple regression - statistical quality control methods.

Text Books

1. E. Balagurusamy, *Numerical Methods*, Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.
2. C.F. Gerald and P.O. Wheatley, *Applied Numerical Analysis, 6th Ed.*, Pearson Education Asia, New Delhi, 2002.

Reference Books

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, *Numerical Methods*, S.Chand Co. Ltd., New Delhi, 2003.
2. R.L. Burden and T.D. Faires, *Numerical Analysis, 7th Ed.*, Thomson Asia Pvt. Ltd., Singapore, 2002.
3. Shastri, *Introductory methods of numerical analysis*, Prentice Hall International.
4. V. Rajaraman, *Introduction to Numerical Methods*, Tata McGraw Hill.

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

PE09 L24: INDUSTRIAL PSYCHOLOGY

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives

- *To give awareness on the Human and Industrial Psychology*

Module I (14 hours)
Introduction- psychology as a science- area of applications – study of individual- individual differences- study of behaviour- stimulus- response behaviour- heredity and environment- human mind- cognition- character- thinking- attention- memory- emotion- traits- attitude- personality

Module II (14 hours)

Organizational behaviour- definition –development- fundamental concept- nature of people- nature of organization – an organizational behaviour system- models- autocratic model- hybrid model- understanding a social-system social culture- managing communication- downward, upward and other forms of communication

Module III 13 hours)

Motivation- motivation driver- human needs- behavior modification- goal setting- expectancy model- comparison models- interpreting motivational models- leadership- path goal model- style – contingency approach

Module IV (13 hours)
Special topics in industrial psychology- managing group in organization- group and inter group dynamics- managing change and organizational development- nature planned change- resistance- characteristic of OD-OD process

Text Books

1. Davis K. & Newstrom J.W., *Human Behaviour at work*, Mcgraw Hill International

Reference Books

1. Schermerhorn J.R.Jr., Hunt J.G &Osborn R.N., *Managing Organizational Behaviour*, John Wiley
2. Luthans, *Organizational Behaviour*, McGraw Hill, International
3. Morgan C.t.,King R.A.,John Rweisz &John Schoples, *Introduction to Psychology*, McHraw Hill
4. Blum M.L. Naylor J.C., Harper & Row, *Industrial Psychology*, CBS Publisher

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

PE09 L25: Entrepreneurship

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives

- *To give an idea on entrepreneurial perspectives*

Module I (14 hours)
Entrepreneurial perspectives- understanding of entrepreneurship process- entrepreneurial decision process- entrepreneurship and economic development- characteristics of entrepreneur- entrepreneurial competencies- managerial functions for enterprise.

Module II (14 hours)

Process of business opportunity identification and evaluation- industrial policy- environment- market survey and market assessment- project report preparation-study of feasibility and viability of a project- assessment of risk in the industry

Module III (13 hours)

Process and strategies for starting venture- stages of small business growth- entrepreneurship in international environment- entrepreneurship- achievement motivation- time management creativity and innovation structure of the enterprise- planning, implementation and growth

Module IV (13 hours)
Technology acquisition for small units- formalities to be completed for setting up a small scale unit- forms of organizations for small scale units-financing of project and working capital-venture capital and other equity assistance available- break even analysis and economic ratios technology transfer and business incubation

Text Books

1. Harold Koontz & Heinz Weihrich, *Essentials of Management*, McGraw hill International
2 Hirich R.D. &Peters Irwin M.P., *Entrepreneurship*, McGraw Hill
3. Rao T.V., Deshpande M.V., Prayag Mehta &Manohar S. Nadakarni, *Developing Entrepreneurship a Hand Book*, Learning systems
4. Donald Kurado & Hodgelts R.M., *Entrepreneurship A contemporary Approach*, The Dryden Press
5. Dr. Patel V.G., *Seven Business Crisis*, Tata McGraw hill
   Timmons J.A., *New venture Creation- Entrepreneurship for 21st century*, McGraw Hill International
6. Patel J.B., Noid S.S., *A manual on Business Oppurnity Identification*, selections, EDII
7. Rao C.R., *Finance for small scale Industries*
8. Pandey G.W., *A complete Guide to successful Entrepreneurship*, Vikas Publishing

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

ME09 L22: QUALITY ENGINEERING AND MANAGEMENT

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objectives

- *To analyse key definitions of quality, focusing on a customer-centric approach.*
- *To provide knowledge on the managerial tools and techniques on quality*
- *To analyze the relationship of statistics to a process and to use the statistical tools*
- *To analyze and generate acceptance sampling plans*
- *To provide knowledge on the reliability and life testing of components and systems*

Module I (14 hours)

Concepts of quality: Quality – Quality control – Quality assurance – Quality management- Quality costs

Total Quality Management: Axioms – Management commitment- Deming's approach – Quality council – Customer satisfaction and retention – Employee involvement and empowerment – Suggestion system – Quality circle – Continuous process improvement – Juran's trilogy – PDSA cycle – Kaizen – Six-sigma – Crosby's quality treatment

Module II (13 hours)

Management tools and techniques: Benchmarking – ISO quality management systems – Quality function deployment – Quality by design – Failure mode and effect analysis – Affinity diagram – Block diagram – Pareto chart – Fish bone diagram – Flow chart – Run chart – Scatter diagram – Tree diagram – Matrix diagram

Module III (14 hours)

Statistical tools 1-control charts: Basic concepts - Attributes and variables - Random and assignable causes of variations- Patterns of variation - Measures of central tendency and dispersion - Probability distributions: Binomial, Poisson and Normal

Control charts for variables : $\bar{X}$, R and sigma charts – Details of construction and uses

Control charts for attributes: p, np, c and u charts – Details of construction and uses

(Numerical problems included)

Module IV (13 hours)

Statistical tools 2- Acceptance sampling, Reliability and Life testing: Sampling Vs inspection - OC curve - Single and double sampling plans - ATI - AOQL - Life testing - Bathtub curve – MTBF - OC curve for Life testing - System reliability (Numerical problems included)

Reference Books

1. Bester Field, Dale H, Carol Boeterfreld – Muchna, Glen H, Boeterfreld Mery Boeterfeld-Scare, 2003, *Total Quality Management*, 3rd edition, Pearson, Education, New Delhi.
2. Logethetis, N. (1992), *Managing for Total Quality*, Prentice Hall International, Englewood Cliffs, NJ.,
3. Grant.E.L., *Stastical Quality Control*, McGraw Hill
4. Juran J.M, Gryna I.M., *Quality Planning and Analysis*, Tata McGraw Hill Publishing Company
5. Montgomery, Douglas C, 2001, *Introduction to Statistical Quality Control*, Fourth edition, John Wiley and Sons, Inc, New Delhi
6. Gerals M Smith- 2004, *Statistical Process Control and Quality Improvement*- 5th edition, Pearson Education, New Delhi

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

ME09 L25: ENERGY ENGINEERING AND MANAGEMENT

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives

- *To provide knowledge on energy conservation and management.*
- *To impart the basics of renewable energy technology*

Pre-requsites: *Nil*

Module I (13 hours)
Energy and environment: Introduction – fossil fuel reserves – world energy consumption – green house effect – global warming – renewable energy sources – environmental aspects utilization – energy prices – energy policies

Module II (14 hours)

Energy conservation: Industrial energy use – energy surveying and auditing – energy index – energy cost – energy conservation in engineering and process industry, in thermal systems, in buildings and non conventional energy resources schemes.

Module III (14 hours)

Energy technologies: Fluidized bed combustion – fluidized bed boilers – waste heat recovery systems – heat pump and refrigerators – wind energy collectors and storage systems – insulated pipe work systems.

Module IV (13 hours)
Energy management: Energy management principles – energy resources management – energy management information systems – computerized energy management. Costing techniques – cost optimization – optimal target investment schedule – financial appraisal and profitability.

Text Books

1. W. R. Murphy, G. Mc Kay, *Energy Management*, Butterworth*s*, London

Reference Books

1. O. Callaghn, *Design and Management for energy conservation*, Pergamon Press, Oxford
2. D. Merick, *Energy - Present and Future Options*, vol 1 and 2, John Wiley and Sons
3. N. A. Chaigier, *Energy Consumption and Environment*, McGraw Hill

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

ME09 L23: Industrial Safety Engineering

Teaching scheme **Credits: 4**
2 hours lecture and I hour tutorial per week

Objectives

- *To provide on concept of safety in industry, principle of accident prevention, major hazards, consequences and concept of reliability.*

Pre-requisites: *Nil*

Module I (14 Hours)
Introduction to the concept of safety-Need-safety provisions in the factory Act-Laws related to the industrial safety-Measurement of safety performance, Safety Audit, Work permit system, injury and accidents-Definitions-Unsafe act –unsafe condition- causes, investigations

and prevention of accidents, hazards, type of industrial hazards-nature, causes and control measures, hazard identifications and control techniques-HAZOP, FMEA,FMECA etc.

Module II (14 Hours)
Concept of Industrial hygiene, programmes-Recognition –Evaluation- Control, Noise- source –effects and noise control, exposure limits –standards, Hearing conservation programmes, Fire –fire load-control and industrial fire protection systems, Fire Hydrant and extinguishers, Electrical Hazards, protection and interlock-Discharge rod and earthling device, safety in the use of portable tools.

Module III (13 Hours)
Logics of consequence analysis-Estimation-Toxic release and toxic effects-Threshold limit values, Emergency planning and preparedness, Air pollution-classification- Dispersion modeling -pollution source and effects- -control method and equipments-Gravitational settling chambers-cyclone separators-Fabric filter systems-scrubbers etc.

Module IV (13 Hours)
Concept of reliability-Definition-Failure rate and Hazard function, System reliability models-series, parallel systems, reliability hazard function for distribution functions-exponential-normal –lognormal-weibull and gamma distribution.

Text books

1. Thomas J. Anton, *Occupational Safety and Health Management*, McGraw Hill
2. Ian T.Cameron & Raghu Raman, *Process Systems Risk Management*, ELSEVIER Academic press.
3. C.S.Rao, *Environmental Pollution Control Engineering*, New Age International Limited
4. L. S. Srinath, *Reliability Engineering*, East west Press, New Delhi.

Reference books

1. Frank E. McErloy,P.E; C.S.P, *Accident Prevention Manual for Industrial Operations*,NSC Chicago.
2. Lees F.P, *Loss Prevention in Process Industries*, Butterworths, New Delhi.
3. BHEL,*Occupational Safety Manual*, Tiruchirappalli.
4. Dr. A.K. Gupta, *Reliability, Maintenance and Safety Engineering*, Laxmi Publications, New Delhi.

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

AN09 L24: PROJECT MANAGEMENT

Teaching scheme
2 hours lecture and 1 hour tutorial per week **credits 4**

Objectives:

To give an exposure to the major aspects of project viz. Project Planning, Analysis, Selection, Implementation and review.

Module I (13 hours)

Planning -Capital Expenditures -Phases of Capital Budgeting -Levels of decision Making -Facets of Project analysis-Feasibility Study -Objectives of Capital Budgeting -Resource Allocation framework Key Criteria-Elementary Investment strategies -Portfolio planning tools -Generation of ['project Ideas Monitoring the environment -Corporate appraisal -Scouting for project ideas -Preliminary Screening Project rating index -Sources of Positive net present value

Module II (14hours)

Analysis -Market and demand analysis -Situational analysis and specification of objectives -Collection of secondary information -Conduct of market survey -Characterization of Market -demand Forecasting -Market planning -Technical analysis-Material inputs and utilities -Manufacturing process/technology

-Product Mix -Plant capacity -Location and site -machineries and equipments -Structures and civil works -Project charts and layouts -Work schedule -Financial Analysis -Cost of project -means of finance -Estimates of sales and Production -Cost of production -Working capital requirements and its financing -Profitability projections -Break even point -projected cash flow statements and balance sheets

Module III (13hours)

Project Cash flows -Basic I single amount -Future value of an annuity -Present value of a single amount -Present Value of an annuity-Cost of capital -Cost of debt capital -cost of preference capital -Rate of return -Cost of external equity and retained earnings -Determination of weights -Appraisal criterion -Net present value Cost benefit ratio-Internal rate of return-Urgency -payback period

Module IV (14hours)

Implementation-Forms of Project organization -Project planning -Project control -Human Aspects of Project management -Network Techniques -Development of Network -Time estimation -Critical path determination -Scheduling under limited resources -PERT Model-CPM Model -Network Cost System -Project review-Initial; review -Performance evaluation-Abandonment **analysis**

Text Book:

Prasanna Chandra, *Projects Planning, Analysis, Selection, Implementation and Review·. Fourth Edition,* Tata McGraw-Hill.

Reference books

I. Dennis Lock, *Project Management,* Grower Publications

2. Prasanna Chandra, *Financial Management Theory and Practice,* Tata McGraw Hill Publishers

3. Parameswar P Iyer, *Engineering Project management,* Vikas publishers

4. Gido & Clements, *Success/iii Project Management,* Vikas Publishers

5. Harold.T..Amrine John.A.Ritchey, *Manufacturing Organisation and Management,* Pearson Education

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

CH09 L24 INDUSTRIAL POLLUTION CONTROL

Teaching scheme **Credits:** 4

2 hours lecture & 1 hour tutorial per week

Objectives

- *To impart the basic concepts of industrial pollution control*
- *To develop understanding about water, air, light pollution control*

No Pre-requisites

Module 1 (13hours)

Classification of industrial wastewater - types of pollutants and their effects - monitoring and analysis methods - water pollution laws and standards - industrial wastewater treatment - processes and equipment

Module 2 (13hours)

Water pollution control in industries - pulp and paper, textile processing, tannery wastes, dairy wastes, cannery wastes, brewery, distillery, meet packing, food processing wastes, pharmaceutical wastes, chlor-alkali industries, fertilizer industry, petrochemical industry, rubber processing industry, starch industries, metal industries, nuclear power plant wastes, thermal power plant wastes.

Module 3 (13hours)

Air pollution control in industries: source and classification of industrial air pollutants - monitoring equipment and method of analysis - damages to health, vegetation and materials - air pollution laws and standards - treatment method in specific industries - thermal power plants - cement - fertilizers - petroleum refineries - iron and steel - chlor-alkali - pulp and paper

Module 4 (13hours)

Industrial odour control - sources and solutions - odour control by adsorption and wet scrubbing - industrial noise control methods - sludge treatment and disposal - industrial hazardous waste management, waste minimization. Environmental Impact Assessment and risk assessment-Environmental Audit and Environmental management system- Concept of common effluent treatment plants.

References:

1. Nelson & Nemerow, Industrial Water pollution-Origin, Characteristics and treatment, Addison, Wesley Publishing Co.
2. Gerard Kiely,Environmental Engineering, McGraw Hill
3. Rao M.N. & Rao H,Air Pollution, Tata McGraw Hill
4. Sincero A.P.& Sincero G.A., Environmental Engineering, A Design Approach, Prentice Hall of India
5. Rao C.S., Environmental Pollution Control Engineering, New Age Int. Pub.
6. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw Hill
7. Babbitt H.E, Sewage & Sewage Treatment, John Wiley
8. Abbasi S.A, & Ramasami E, Biotechnical Methods of Pollution Control, Universities Press(India) Ltd.

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

EC09 L023: Data Structures & Algorithms

Teaching scheme **Credits:** 4

2 hours lecture and 1 hour tutorial per week

Objectives

- *To give ideas of basic data structures*
- *To impart knowledge about algorithm specification*

Module I (14hours)

Study of basic data structures – Arrays- Structures-Sparse matrix – Stacks – Queues- Circular queues- Priority queues - Dqueues. Evaluation of expressions – Polynomial representation using arrays.

Module II (14 hours)

Linked Lists - Linked stacks and queues - Doubly linked lists - Polynomial representation using linked lists, Strings – Data representation – Pattern matching.

Module III (15 hours)

Trees - Binary Trees – Tree Traversal – Inorder - Preorder and Postorder, Graphs – Depth first and breadth first search. Sorting methods: Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, External sorting methods (basic idea only).

Module IV (11 hours)

Principles of programming – System Life Cycle - Algorithm Specification-Recursive Algorithms-Documentation- Performance Analysis and Measurements- Time and Space complexity-Complexity calculation of simple algorithms.

Text Books

1. Classic Data Structures: Samanta, PHI
2. Data Structures and program design in C: Robert Kruse, Pearson Education Asia
3. An introduction to Data Structures with applications: Trembley & Sorenson, McGraw Hill

Reference Books

1. Fundamentals of Data Structures in C++: Horowitz, Sahni & Mehta, Galgottia Pub.
2. Data Structures using C & C++: Langsam, Augenstein & Tanenbaum
3. Fundamental Algorithms: Knuth.
4. Algorithms + Data Structures & Programs: N.Wirth, PHI
5. Data structures in Java: Thomas Standish, Pearson Education Asia

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

One of the assignments shall be simulation using any of the tools

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

EE09 L 22 SOFT COMPUTING TECHNIQUES

Teaching scheme **Credits:** 4
2 hours lecture and 1 hour tutorial per week

Objectives

- *To acquaint the students with the important soft computing methodologies- neural networks, fuzzy logic, genetic algorithms and genetic programming*

Module I (12 Hours)
Artificial Intelligent systems – Neural Networks, Fuzzy Logic and Evolutionary Programming concepts. Artificial Neural Networks – Biological neural networks – Model of an artificial neuron- Comparison between biological neuron and artificial neuron– Basic models of artificial neural network –Learning methods – - Activation function and terminologies of ANN- - Mc Culloch Pitts Neuron – Linear Separability – Hebb network – Perceptron Networks , Adaline, Madaline.

MODULE II (14 Hours)
Back propagation Networks : Architecture - Multi layer perceptron –Back propagation learning – Input layer, Hidden Layer , Output Layer computations, Calculation of error, Training of ANN, Back propagation Algorithm, Momentum and Learning rate, Selection of various parameters in BP networks- Radial Basis Function Networks [T. B. 1].
Variations in standard BP algorithms – Decremental iteration procedure, Adaptive BP, GA based BP, Quick prop training, Augmented BP networks, Sequential learning Approach for single hidden layer Neural networks.

Module III (14 Hours)
Fuzzy sets and crisp sets-Fuzzy sets –Fuzzy set operations-Fuzzy relations- Membership functions – Features of the membership functions-Fuzzification- Methods of membership value assignments-Defuzzification- Defuzzification methods-Fuzzy Rule Base and approximate reasoning- Truth values and tables in fuzzy logic, Fuzzy propositions, Formation of rules, Decomposition of rules, Aggregation of fuzzy rules- Fuzzy Inference Systems- Construction and Working Principle of FIS- Methods of FIS- Mamdani FIS and Sugeno FIS- Fuzzy Logic Control Systems- Architecture and Operation of FLC System- FLC System Models- Application of FLC Systems.

Module IV (14 Hours)
Genetic Algorithms- Basic Concepts- Creation of off- springs- Working Principle- Encoding- Fitness function- Reproduction- Roulette- Wheel Selection, Boltzmann Selection- Tournament selection- Rank Selection- Steady- State Selection- Elitism- Generation gap and steady state replacement- Inheritance operators- Cross Over- Inversion and deletion- Mutation Operator- Bit- wise operators- Generational Cycle- Convergence of Genetic Algorithm- Differences and Similarities between GA and other traditional methods- Applications.

.

Text Books

1. S. N. Sivanandam, S. N. Deepa, *Principles of Soft Computing,* Wiley India Pvt. Ltd.[Module I& III]
2. R.Rajasekharan and G.A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithms- Synthesis and Applications,* Prentice Hall of India. [Module II, & IV]

Reference Books

1. Fakhreddine O.Karray, Clarence De Silva, Intelligent Systems Design, Theory, Tools and Application, Pearson Education
2. S. Haykins, Neural Networks – A Comprehensive Foundation , Prentice Hall 2002.
3. L. Fausett, Fundamentals of Neural Networks, Prentice Hall 1994.
4. T.Ross, Fuzzy Logic with Engineering Applications, Tata McGrawHill, New Delhi 1995.
5. D.E. Goldberg, Genetic Algorithms in search, Optimization and Machine Learning, Addison Wesley MA, 1989.
6. John Yen, Reza Lengari, *Fuzzy Logic- Intelligence, Control and Information,*Pearson Education

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
Note: *One of the assignments may be simulation of systems using any technical software*

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