

UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

THIRD AND FOURTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

CE: CIVIL ENGINEERING

THIRD SEMESTER

Code	Subject	Hours/week			Sessional marks	University Examination	
		L	T	P/D		Hours	Marks
EN04 301A	ENGINEERING MATHEMATICS-III	3	1	-	50	3	100
CE04 302	COMPUTER PROGRAMMING IN C	2	-	2	50	3	100
CE04 303	MECHANICS OF SOLIDS	3	1	-	50	3	100
CE04 304	BUILDING TECHNOLOGY I	3	1	-	50	3	100
CE04 305	SURVEYING II	3	1	-	50	3	100
CE04 306	ELECTRICAL AND ELECTRONICS ENGINEERING	3	1	-	50	3	100
CE04 307(P)	SURVEYING PRACTICAL II	-	-	3	50	3	100
CE04 308(P)	MATERIAL TESTING LAB I	-	-	3	50	3	100
TOTAL		17	5	8	400		800

FOURTH SEMESTER

Code	Subject	Hours/week			Sessional marks	University Examination	
		L	T	P/D		Hours	Marks
EN04 401A	ENGINEERING MATHEMATICS-IV	3	1	-	50	3	100
EN04 402	ENVIRONMENTAL STUDIES	3	1	-	50	3	100
CE04 403	STRUCTURAL MECHANICS I	3	1	-	50	3	100
CE04 404	FLUID MECHANICS	3	1	-	50	3	100
CE04 405	BUILDING ARCHITECTURE AND TOWN PLANNING	3	1	-	50	3	100
CE04 406	ENGINEERING GEOLOGY	3	1	-	50	3	100
CE04 407(P)	CIVIL ENGINEERING DRAWING I	-	-	3	50	3	100
CE04 408(P)	MATERIAL TESTING LAB II	-	-	3	50	3	100
TOTAL		18	6	6	400		800

SYLLABI OF THIRD SEMESTER

EN04 301A ENGINEERING MATHEMATICS-III

(Common for all branches except CS and IT)

3 Hours Lecture and I Hour Tutorial per Week

Module I: Linear Algebra (13hours)

Vector spaces – Linear dependence and independence and their computation – Bases and dimension – Subspaces – Inner product spaces – Gram – Schmidt orthogonalisation process- Linear transformation – Elementary properties of linear transformations – matrix of linear transformation. (Proofs of theorems omitted)

Module II: Fourier Transforms (13hours)

Fourier integral theorem (proof not required) – Fourier sine and cosine integral representation – Fourier transforms – Fourier sine and cosine transforms – Properties of Fourier transforms – Singularity functions and their Fourier transforms

Module III: Probability Distributions (13hours)

Random variables – Mean and variance of probability distributions – Binomial and poisson distributions – Poisson approximation to binomial distribution – Hypergeometric and geometric distributions – Probability densities – Normal, uniform and gamma distributions

Module IV: Theory of Inference (13hours)

Population and samples – Sampling distributions of mean and variance – Point and interval estimations – Confidence intervals for mean and variance – Tests of hypotheses – Hypotheses concerning one mean, two means, one variance and two variances – Test of goodness of fit.

Text Books:

For Module I

K.B.Datta, Matrix and linear algebra for Engineers, Prentice-Hall of India, New delhi, 2003
(Sections: 5.1, 5.2, 5.3, 5.4, 5.5, 5.8, 6.1, 6.2, 6.3)

For Module II

C.R.Wylie & L C Barrett, Advanced Engineering Mathematics (sixth Edition), McGraw Hill
(Sections: 9.1, 9.3, 9.5)

For Module III

Richard A Johnson, Miller & Freund's probability and Statistics for Engineers, Pearson Education,2000
(Sections : 4.1, 4.2, 4.3, 4.4, 4.6, 4.8, 5.1, 5.2, 5.5, 5.7)

For Module IV

Richard A Johnson, Miller & Freund's probability and Statistics for Engineers, Pearson Education,2000
(Sections : 6.1, 6.2, 6.3, 7.1, 7.2, 7.4, 7.5, 7.8, 8.1, 8.2, 8.3, 9.5)

Reference Books:

1. Bernad Kolman & Dravid R Hill, Introductory Linear Algebra with Applications (Seventh Edition), Pearson Education, 2003
2. Lipschutz. S, Linear Algebra – Schaum's Outline Series, McGraw Hill
3. Erwin Kreyszig, Advancd Engineering Mathematics (Eighth Edition), John Wiley & sons.
4. Larry C Andrews & Bhimsen K Sivamoggi, Integral Transforms for Engineers, Prentice hall of India, 2003
5. Ronald E Walpole, et al, Probability and statistics for Engineers and scientists(seventh Edition), Pearson Education, 2004.
6. Robert V Hogg & Elliot A Tanis, Probability and statistical Inference, Pearson Education, 2003
7. Chatfield C, Statistics for Technology, Chapman & Hall

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

University examination pattern:

- Q I - 8 short type questions of 5 marks, 2 from each module
- Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
- Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
- Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
- Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CE04 302 COMPUTER PROGRAMMING IN C
(Common for all B.Tech. Programmes except CS, IT & PT)

2 Hours Lecture and 2 Hours Practical per Week

Objective: To equip the students for programming needs for the future semesters

Module I (10 hours)

Programming and problem solving – Basic computer organization – Developing algorithms – Flow charts – High level and low level languages – Compilers and Interpreters – Steps involved in computer programming – Writing, Compiling and Executing a program – Debugging a program – Description of a programming language.

Module II (13 hours)

Basics of c – Overview of C – Program structure – Lexical elements – Numerical constants – Variables – Arithmetic operators – arithmetic Expressions – Arithmetic conversion – Increment and Decrement operators – Assignment Expressions – multiple Assignments – input and Output – Format specifiers – Fundamental data types – Bit level operators and applications – relational operators- Relational expressions – logical operators – Logical expressions – Conditional operator - Precedence and associativity of operators.

Module III (14 hours)

Compound statement – Conditional statements – if statement – if else statement – nested if statement – switch statement – Loop control statement - while statement – do while statement – for statement – continue statement – break statement – goto statement – Functions – user-defined functions – library functions – Recursion – Global, local and static variables.

Module IV (15 hours)

Arrays – single dimensional – multi dimensional – Arrays in functions – Stacks – Strings – String processing – Bit-wise operators – Enumerated data types – structures – Typedef – Structures in arrays – Arrays in Structures – Unions – Pointers – Pointers and Arrays – pointers and Functions – Linear lists and list operations – Files – sequential files – unformatted files – text files

Text Book:

Rajaraman V, Computer Programming in C, Prentice Hall of India

Reference Books:

1. Kernighan B.W. & Ritchie, D.M., The C Programming Language, Prentice Hall of India
2. Balaguruswami E, Programming in ANCI C, Tata McGraw Hill
3. Venugopal K.R. & Prasad S.R., Programming with C, Tata McGraw Hill

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

University examination pattern:

- Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CE04 303 MECHANICS OF SOLIDS

3 Hours Lecture & 1 Hour Tutorial per Week

Objective:

The objective of this subject is to study the internal effects produced and deformations of bodies caused by externally applied forces. The subject projects strength characteristics of different materials and structural members subjected to shear, torsion and bending.

Module I (13 hours)

Tension, compression & shear:(8Hours)

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 –Force & Displacement methods of analysis-Temperature and Prestrain effects - strain energy.

Analysis of stress on oblique sections and strain: (5 hours)

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

Module II (13 hours)

Review of Bending Moment & Shear force for various types of loading (Simply supported and overhanging beams) (3hours)

Stresses in laterally loaded symmetrical beams (7 hours)

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 (3 hours)

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 (12 hours)

Deflection of beams: (12 hours)

Differential equation of the elastic curve - Method of successive integration, Method of superposition, moment area method and conjugate beam method

Module IV (14hours)

Theory of columns: (6 hours)

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-Eccentric loads and the secant formula-Rankine's formula -Imperfections in columns.

Torsion: (3 hours)

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

Springs (2 hours)

Close coiled and open coiled helical springs.

Thin and Thick Cylinders: (3 hours)

Wire wound pipes and cylinders Stresses in thin cylinders -Lame's equation - stresses in thick cylinders due to internal and external pressures - 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.

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

Internal work assessment:

2 tests	15x2 = 30
Assignments (minimum 2)	= 15
Regularity	= 5
Total marks	= 50

University Examination pattern:

- Q I - 8 short type questions of 5 marks, 2 from each module
- Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
- Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
- Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
- Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CE04 304 BUILDING TECHNOLOGY-I

3 Hours Lecture & 1 Hour Tutorial per Week

Objective:

To study (i) Details regarding the construction of all the building components (ii) Properties of concrete and concrete mix design (iii) General idea on different types of concrete.

Module I (12 hours)

Types of buildings – components of a building

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

Brick and stone masonry –Classification of masonry construction - factors influencing compressive strength – stress strain properties - advantages and limitations of masonry construction – Types of stone masonry – Bonds in brickwork – corbels, cornice and copings – general principles of construction – composite walls.

Lintels and arches – types and construction details.

Cavity walls and Partition walls – different types – construction details and features.

Module II (12 hours)

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 – Layout and planning of different types of – timber, masonry, steel and concrete stairs – pre-cast concrete stairs.

Finishing works – Plastering, pointing, white washing, colour washing, distempering, painting.

Dampness prevention – causes and effects of dampness – methods of providing DPC.

Termite proofing – general methods.

Scaffolding, shoring and underpinning – types – uses.

Module III (14 hours)

Concrete: Water quality of concrete – .B.I.S specification – suitability of sea water – Admixtures – types and uses – plasticizers – accelerators – retarders – water reducing agents – batching – mixing – types of mixers – transportation – placing – compacting – curing.

Properties of concrete – factors affecting workability & strength – tests on workability – 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 – freezing and thawing – exposure to marine environment.

Module IV (14 hours)

Concrete quality control – frequency of sampling – BIS specifications – statistical analysis of results – standard deviation – acceptance criteria – mix proportioning – factors influencing mix proportioning – normal mixes – mix design as per B.I.S method.

Special concrete – properties and applications – lightweight – high-density – fibre reinforced – polymer concrete – shotcrete – ferrocement – concept of pre-stressed concrete.

Text books:

- 1.Punmia B.C., Building Construction, Laxmi Publications.
- 2.Neville A.M., Properties of concrete, Pitman.
3. Shetty M.S., “ Concrete Technology”, S. Chand & company.

Reference books:

1. Gambhir M L, Concrete Technology, Tat McGraw Hill.
2. Krishna Raju N, Design of Concrete Mixes, CBS publishers.
3. Raina V.K, Concrete for construction- Facts & Practices, Tata McGraw-Hill Publishing company.
4. Akroyd T.N.W, Concrete: Properties & Manufacture, Pergamon Press.
5. Murdock L.J, Concrete: Materials & Practice, Edward Arnold.
6. Huntington W.C., Building Construction, John Wiley

Internal work assessment:

Assignments	(minimum 2)	= 15 marks
1 Collection and presentation of literature, product details and any other relevant information regarding different building construction methods.		
2 Mix design of concrete using spread sheet may be encouraged		
2 tests		15x2 = 30
Regularity		= 5
Total marks		= 50

University examination pattern:

- Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions A and B of 15 marks each from module I with choice to answer any one
Q III -2 questions A and B of 15 marks each from module II with choice to answer anyone
Q IV -2 questions A and B of 15 marks each from module III with choice to answer anyone
Q V -2 questions A and B of 15 marks each from module IV with choice to answer any one

NOTE: Use of IS-10262-1980 for concrete mix design is permitted in the examination Hall

CE04 305 SURVEYING -II

3 Hours Lecture & 1 Hour Tutorial per Week

Objective:

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

Module I (15 hours)

Tacheometric surveying – stadia system – fixed and movable hair methods – staff held vertical & normal – instrument constants – analytic lens – tangential system – subtense bar

Curves – Types of curves – elements of a curve – simple curves – diff: methods of setting out compound curve – reverse curves – transition curves – vertical curves – hydrographic survey – scope – shoreline survey - soundings - sounding equipment - methods - ranges - locating sounding - plotting - three point problem

Module II (11 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 (13 hours)

Field astronomy - definitions - solution of an astronomical triangle - co-ordinate systems - time - solar, sidereal 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 - 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 work assessment:

2 tests	15x2 = 30
Assignments (minimum 2)	= 15
Regularity	= 5
Total marks	= 50

University examination pattern:

- Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CE04 306 ELECTRICAL AND ELECTRONICS ENGINEERING

3 Hours Lecture & 1 Hour Tutorial per Week

Objectives:

To understand fundamentals of electrical and electronics engineering

Module I (15 hours)

Review of basic circuit Laws – Ohm’s law, Kirchoff’s Laws- Single phase series and parallel RLC Circuits- Poly phase AC Circuits – Generation of three phase e.m.f.-Voltage and current –Relation of Star and Delta connection - Transformer – Construction – Voltage and current relations, losses. efficiency- Three phase induction motor construction –Principles of operation – Speed- Frequency – Slip - types- Starting – Single phase induction motor – Construction – Different methods of Starting

Module II (11hours)

Wiring of simple lamp controlled by a switch – Lamp and plug – Tube light wiring –Different system of wiring and basics of earthing - building codes for electrical wiring- Indian Electricity rules – Specification of important electrical appliances including lamps - electrical estimation of residential buildings.

Module III (13 hours)

P and N type semi conductors – Junction diodes – Construction characteristics and rating – Zener diode – Rating – NPN and PNP transistors - characteristics and rating of transistors – Rectifiers and filters – Single phase half wave and full wave rectifier – Bridge rectifier – Expression for average voltage and current – Ripple factor – Simple zener diode voltage regulator - Basic principle of switching regulator – Amplifiers – Common emitter configuration – Basic idea about amplification using characteristic curves – Basics of DAC and ADC .

Module IV (13 hours)

Transducers – definition – transducer for the measurement of strain, acceleration, altitude, displacement, flow, force torque, humidity and moisture – Cathode ray oscilloscope – Block diagram – Recording instruments – LVDT type Recorder , XY Recorder, magnetic type Recorder – Basic idea of LED, LCD & opto couples.

Reference books:

1. Hughes E., *Electrical Technology*, ELBS
2. Cotton H., *Electrical Technology*, Pitman
3. Malveno, *Electronics Principles*, Tata McGraw Hill
4. Doebelin E.D., *Measurement System and Application*, Tata McGraw Hill
5. Uppal, *Electrical Wiring*, Khanna Publishers
6. Bhargava N.N., *Basic Electronics and Linear circuits*, Tata McGraw Hill
7. Theodore F. Bogart, *Electronic Devices and circuits*, Pearson Education
8. IS 732- 1989 Code practice for Electrical wiring and Installation
9. BIS :SP-30-1984: National Electrical code.

Internal work assessment:

2 tests	15x2 = 30
Assignments (minimum 2)	= 15
Regularity	= 5
Total marks	= 50

University examination pattern:

Q I -8 short type questions of 5 marks each, 2 from each module

Q II -2 questions A and B of 15 marks each from module I with choice to answer any one

Q III -2 questions A and B of 15 marks each from module II with choice to answer any one

Q IV -2 questions A and B of 15 marks each from module III with choice to answer any one

Q V -2 questions A and B of 15 marks each from module IV with choice to answer any one

CE04 307(P) SURVEYING PRACTICAL-II

3 Hours Practical per Week

Objective:

To give a practical knowledge in Different aspects of Theodolite Surveying & Tacheometry

List of exercises

1. Theodolite surveying & repetition – horizontal angle
2. Theodolite surveying of reiteration – horizontal angle
3. Determination of tacheometric constants
4. Heights and distances by stadia tacheometry
5. Heights and distances by tangential tacheometry
6. Heights and distances by solution of triangles
7. Setting out of simple curves-linear methods
8. Setting out of simple curves-angular method
9. Setting out of transition curve
10. Permanent adjustment of theodolite
11. Setting out of columns using theodolite for a given column layout.
12. Study of minor instruments - planimeter, pentagraph, handlevels, clinometer, Ceylon ghat tracer and sextant
13. Theodolite traversing
14. Study of modern instruments - automatic levels and total station / Electronic theodolite

Internal assessment:

Survey practicals & record	= 25
Regularity	=5
Tests	= 20
Total marks	= 50

CE04 308(P) MATERIALS TESTING LAB-I

3 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

- a) Transverse strength

Internal assessment:

Lab practical and record	= 25
Test	= 20
Regularity	= 5
Total marks	= 50

SYLLABI OF FOURTH SEMESTER

EN04 401A ENGINEERING MATHEMATICS-IV

(Common for all branches except CS and IT)

3 Hours Lecture & 1 Hour Tutorial per Week

Module I (13 hours)

Functions of Complex Variable I

Functions of a complex variable – Derivatives and analytic functions – Cauchy – Riemann equations – Laplace's equation – Conformal mapping – Exponential function- Trigonometric functions – hyperbolic functions – Logarithm – Linear fractional transformations

Module II (13 hours)

Functions of Complex Variable II

Line integral in the complex plane – Cauchy's integral theorem (Proof of existence of indefinite integral to be omitted) – Cauchy's integral formula – Derivatives of an analytic functions (Proof to be omitted) – Taylor series – Laurent series – Singularities and zeros – Residues and residue theorem – Evaluation of real integrals

Module III (13 hours)

Series Solutions of Differential Equations

Power series method for solving ordinary differential equations – Legendre polynomials – Rodrigue's formula- Generating functions- Relations between Legendre polynomials – Orthogonality property of Legendre polynomials (proof omitted)

Frobenius method for solving ordinary differential equations – Bessel's equation – Bessel functions – Generating functions – Relations between Bessel functions – Orthogonality property of Bessel functions (proof omitted)

Module IV (13 hours)

Partial Differential Equations

Basic concepts – Classification of linear PDE's – Derivation of the one-dimensional wave equation and the one-dimensional heat equation – Solutions of these equations by the method of separation of variables – solutions satisfying initial and boundary conditions – D' Alembert's solution of the one dimensional wave equation – Steady-state two dimensional heat flow

Text Book:

Ervin Kreyszig, Advanced Engineering mathematics (8th Edition) John Wiley & Sons

Module I

Sections: 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9

Module II

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

Module III

Sections: 4.1, 4.3, 4.4, 4.5

Module IV

Sections: 11.1, 11.2, 11.3, 11.4, 11.5

References:

1. C.R. Wiley & L.C. Barrett, Advanced Engineering Mathematics (Sixth Edition), McGraw Hill
2. Churchill R.V. Brown J W & Verhey R F, Complex variables and Applications, McGraw Hill
3. Pipes L.A. & Harvill L.R., Applied mathematics for Engineers and Physicists, McGraw Hill
4. Michael D Greenberg, Advanced Engineering Mathematics (Second Edition), Pearson Education Asia
5. Sastry S.S., Engineering Mathematics – Volumes 1 & 2, Prentice Hall of India

Internal assessment:

Assignments (Minimum 2)	= 15
2 Tests (2 x 15)	= 30
Regularity	= 5
Total marks	= 50

University examination pattern:

- Q I - 8 short type questions of 5 marks, 2 from each module
- Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
- Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
- Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
- Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EN04 402 ENVIRONMENTAL STUDIES
(Common for all branches)

3 Hours Lecture & 1 Hour Tutorial per Week

Objective:

The importance of environmental science and environmental studies cannot be disputed. Continuing problems of pollution, loss of forest, solid waste disposal, degradation of environment, loss of bio diversity etc have made everyone aware of environment issues. The objective of this course is to create general awareness among the students regarding these environmental issues.

Module I (12 Hours)

The Multidisciplinary nature of environmental studies

Definition - scope and importance-need for public awareness.

Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems - forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their defects on forests and tribal people. - Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies - Land resources: Land as a resource, land degradation, man induced land slides, soil erosion and desertification - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyle.

Module II (14 Hours)

Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features , structure and function of the following ecosystem:-Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystem(ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels - India as a mega-diversity nation – Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wild life, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module III (11 Hours)

Environmental Pollution

Definition - Causes, effects and control measures of :- Air pollution - Water pollution - Soil pollution - Marine pollution-Noise pollution -Thermal pollution - Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes -Role of an individual in prevention of pollution - Pollution case studies - Disaster management : floods, earthquake, cyclone and landslides - Environmental Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and Control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public Awareness

Module IV (10 Hours)

Social Issues and the Environment

From unsustainable to sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns, case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies - Wasteland reclamation - Consumerism and waste products

Human Population and the environment

Population growth, variation among nations - Population explosion – Family welfare Programme - Environment and human health – Pollution hazards, Sanitation and health - Human Rights for clean environment - Value Education - HIV/AIDS-social concern - Women and Child Welfare - Role of information Technology in Environment and human health - Case studies

Field Work (5 Hours)

- ❖ Visit to a local area to document environmental assets – river/forest/grassland/hill/mountain
- ❖ Visit to local polluted site – Urban/Rural/Industrial/Agricultural
- ❖ Study of common plants, insects, birds
- ❖ Study of simple ecosystems – pond, river, hill slopes, etc.

Text books:

1. Clark, R.S. Marine Pollution. Clanderson Press Oxford
2. Mhaskar A.K, Matter Hazardous. Techno-science Publications
3. Miller, T.G. Jr. Environmental Science. Wadsworth Publishing Co.
4. Townsend, C., Harper, J. and Michael Begon, Essential of Ecology. Blackwell Science
5. Trivedi. R.K. and Goel . P.K. Introduction to air pollution. Techno – Science Publications
6. S. Deswal & A. Deswal, A Basic Course in Environmental Studies, Dhanpat Rai & Co., Delhi
7. Kurian Joseph & R. Nagendran, Essentials of Environmental Studies, Pearson Education.

References:

1. Agarwal. K.C. 2001 Environmental biology. Nidi Publ. Ltd. Bikaner
2. Bharucha Erach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: mapin@icenet.net
3. Brunner, R.C. 1989. Hazardous Waste Incineration. McGraw Hill Inc. 480p
4. Cunningham, W.P., Cooper, T.H., Gorhani, E & Hepworth, M.T. 2001 Environmental encyclopedia Jaico publ. House Mumbai 1196p
5. De, A.K. Environmental Chemistry. Wiley Eastern Ltd.
6. Down to Earth, Centre for Science and Environment
7. Gleick, H.P. 1993. Water in crisis. Pacific Institute for Studies in Dev., Environment and security, Stockholm Env. Institute. Oxford Univ. Press. 473p
8. Hawkins, R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay
9. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
10. Jadhav, H. & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi
11. Mckinney, M.L. & School, R.M. 1996. Environmental Science system & Solutions, Web enhanced edition, 639p.
12. Odum, E.P. 1971. Fundamentals of Ecology. W.B.Saunders Co. USA, 574p
13. Rao, M.N. & Datta, A.K 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd., 345p
14. Sharma, B.K. 2001. Environmental Chemistry. Goel Publ. House, Meerut.
15. Survey of the Environment, The Hindu (M)
16. Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II . Enviro Media
17. Wagner.K.D. 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

(M) Magazine

Internal assessment:

2 Tests	= 20
Field work and Report (Internal Assessment)	= 25
Regularity	= 5
Total marks	= 50

University Examination Pattern :

Q I- 16 short answer questions (4 from each module) of 5 marks each with a choice to answer any 12 (12X5)

Q II - 2 questions A and B of 10 marks from module I with choice to answer any one

Q III - 2 questions A and B of 10 marks from module II with choice to answer any one

Q IV - 2 questions A and B of 10 marks from module III with choice to answer any one

Q V - 2 questions A and B of 10 marks from module IV with choice to answer any one

CE04 403 STRUCTURAL MECHANICS-I

3 Hours Lecture & 1 Hour Tutorial per Week

Objective:

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

Module 1 (12 hours)

Elastic theorems and energy principles

Strain energy and complementary energy –review of strain energy due to axial load-bending, 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 method of virtual work(unit load method) and strain energy method for determination of deflection of statically determinate beams-pin jointed trusses and rigid frames-temperature effects

Module II (14 hours)

Fixed and continuous beams

Statically indeterminate structures-degree of static and kinematic indeterminacies-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.

Analysis of fixed beam by strain energy method

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 Bresleau principle-Application to propped cantilevers -influence lines for forces in 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 & 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 -settlement and temperature effects

Text books:

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

References:

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

Internal work assessment:

2 tests	15x2 = 30
Assignments (minimum 2)	= 15
Regularity	= 5
Total marks	= 50

University examination pattern:

Q I - 8 short type questions of 5 marks, three questions from module I, two questions each from modules II and III, and one question from module 4

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one

Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CE04 404 FLUID MECHANICS

3 Hours Lecture & 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 (13 hours)

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 flownet

Module II (13 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 (13 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 - syphons - laminar flow in pipes.

Module IV (13 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 book

Modi P.N. & Seth S.M., *Hydraulics & Fluid Mechanics*, Standard Book House

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

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

Internal work assessment:

2 tests	15x2 = 30
Assignments	= 15
Regularity	= 5
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module

Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one (40 to 50 % Numerical questions)

Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one (30 to 50 % Numerical questions)

Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one (40 to 60 % Numerical questions)

Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one (40 to 70 % Numerical questions)

CE04 405 BUILDING ARCHITECTURE AND TOWN PLANNING

3 Hours Lecture & 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 (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 II (13 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 III (13 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. Percy Brown, *Indian Architecture - Vols I & II.*, D.B. Taraporevala Son's & co.
3. Scot, *Design Fundamentals*, McGraw Hill
4. Hazel Conway & 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 Wiley
11. Rame Gouda, *Principles & Practices of Town Planning*, University of Mysore, Manasa Gangotri

Internal work assessment:

2 tests	15x2 = 30
Assignments	= 15
Regularity	= 5
Total marks	= 50

University examination pattern

- Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions A and B of 15 marks each from module I with choice to answer any one
Q III -2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV -2 questions A and B of 15 marks each from module III with choice to answer any one
Q V -2 questions A and B of 15 marks each from module IV with choice to answer any one

CE04 406 ENGINEERING GEOLOGY

3 Hours Lecture & 1 Hour Tutorial per Week

Module I (15 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

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 (13 hrs)

Structural Geology, Hydrogeology and Exploration Geology

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

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

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

Module IV (12 hrs)

Geoinformatics and Engineering Geology

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

Geographical Information Systems.

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

Text books:

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

Reference books:

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

Internal work assessment:

2 tests	15x2 = 30
Assignments (Minimum 2)	= 15
Regularity	= 5
Total marks	= 50

University examination pattern:

- Q I - 8 short type questions of 5 marks, 2 each from modules 2 and 3, 3 questions from module 1 and 1 question from module 4
- Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
- Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
- Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
- Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CE04 407 CIVIL ENGINEERING DRAWING -I

3 Hours per Week

Objective :

1. To make the students aware about the basic principles of Building Drawing
2. To familiarise the students with a popular drafting package
3. Make the students to draw plan, elevation and section of buildings

Module 0: Introduction of a Popular Drafting Package (3 Hours) – Basic Commands and simple drawings

Module 1 : Detailed drawing of Components (15 Hours)

1. Panelled doors, glazed windows and ventilators in wood (2 Sheets)
2. Steel windows (1 Sheet)
3. Roof truss in structural steel sections (1 sheet)
4. Reinforced Concrete staircase (1 sheet)

Module –II : From given line sketch and specification, develop Working drawings (plan, elevation and section) of the following buildings (21 Hours)

1. Single storied residential building with flat and tiled roof (4 Sheets)
2. Public buildings like office, dispensary, post office, bank etc. (3 sheets)
3. Factory building with trusses supported on Brick walls and pillars(1 sheet)

Assignment : Drawing in any popular drafting package

Reference Books :

Balagopal T.S. Prabhu, Building drawing and detailing, Spades Publishers
Shah & kale ,Building Drawing, Tata Mc Graw Hill
B.P.Verma, Civil Engineering Drawing and housing Planning, Khanna Publishers

Internal assessment:

Module I (sheets)-	= 10 marks
Module II (sheets)	= 15 Marks
Regularity	= 5 marks
Test	= 20 marks
Total	= 50 marks

University Examination pattern:

1. No Questions from Module 0
 2. 3 Questions A, B and C of 15 marks each from Module I with Choice to answer any two (2 x 15 = 30 marks)
 3. 2 Questions A and B of 70 marks from Module II with Choice to answer any one (1 x 70 = 70 marks)
- Total = 100 Marks

CE04 408(P) MATERIAL TESTING LAB-II

3 Hours per Week

Objective :

To study strength aspect of concrete & Metals

1. Tension test on mild steel specimens using UTM & suitable extensometer
2. Shear test on mild steel rod
3. Torsion test on metal rods
4. Torsion test on metal wires
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 [Study only]
8. Casting of concrete cubes & cylinders for the specified proportions
9. Split tensile strength of concrete cylinders
10. Compression test on concrete cubes & cylinders – Determination of Modulus of Elasticity
11. Flexural test on plain concrete beams

Internal assessment:

Lab practical and record	= 25
Test	= 20
Regularity	= 5
Total marks	= 50