KAKATIYA UNIVERSITY
BACHELOR OF TECHNOLOGY First Year
Structure of Curriculum-Common to All Branches

Semester-I (First Year)

Branch/Course Common to all branches of UG Engineering & Technology

Sl. No.	Category/ Code	Course Title	Internal Marks	External Marks	Total marks	Lecture	Tutorial	Practical	No of Credits
1	Basic Sciences Course /BSC 101	Physics	30	70	175	3	1	-	5.5
		Lab.	25	30		-	-	3	
2	Basic Sciences Course /BSC 103	Mathematics-I	30	70	100	3	1	0	4
3	Engineering Science Courses/ESC101	Basic Electrical Engineering	30	70	175	3	1	-	5
		Lab.	25	50				2	
4	Engineering Science Courses/ESC102	Engineering Graphics & Design	30	70	175	1	0	4	3
		Lab.	25	50					
5	Engineering Science Courses	Engineering Mechanics	30	70	100	3	1	0	4
		Total Credits							21.5

In order to balance the load of the some of the subjects which are made in groups (Physics/Chemistry, Engineering Graphics & Design/ Workshop and Manufacturing Practices, Programming for Problem Solving/Engineering Mechanics), the half of the branches of B.Tech course offer one subject of group in odd semester and other half of the branches of B.Tech course offer another subject of same group in odd semester. In the even semester the subjects of the group will be exchanged

MANDATORY INDUCTION PROGRAM

BEFORE BEGINNING OF FIRST SEMESTER

3 Weeks Duration
- Physical Activity
- Creative Arts
- Universal Human Values
- Literay
- Proficiency Modules
- Lectures by Eminent People
- Visits to Local Areas
- Familiarization to Dept./Branch & Innovations

PHYSICS
(Theory)

Course code	BSC101				
Category	Basic Science Course				
Course title	**Physics**				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	1	-	4	External Marks = 70

Detailed contents:

UNIT-I
SCALARS AND VECTORS
Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates.*(8 lectures)*

UNIT II
POTENTIAL ENERGY FUNCTION
Potential energy function; $F = -$ Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler's problem; Application: Satellite manocurves.*(7 lectures)*

SIMPLE HARMONIC MOTION
Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance.*(6 lectures)*

UNIT- III
RIGID BODY
Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.*(5 lectures)*

UNIT-IV
ELECTROSTATICS IN VACUUM
Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Faraday's cage and coffee-ringeffect.Boundary conditions of electric field and electrostatic potential,method of images,energy of a charge distribution and its expression in terms of electric field *(8 lectures)*

MAGNETOSTATICS

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.*(6 lectures)*

UNIT-V
FARADAY'S LAWS

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law.*(3 lectures)*

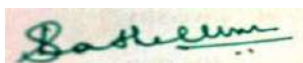## DISPLACEMENT CURRENT, MAGNETIC FIELD DUE TO TIME DEPENDENT ELECTRIC FIELD AND MAXWELL'S EQUATIONS

Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time-dependent electric field; calculating magnetic field due to changing electric fields in quasi-static approximation. Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. *(5 lectures)*

Suggested Text Books
  (i)   Introduction to Mechanics — MK Verma
  (ii)   Introduction to Electrodynamics---David Griffiths
  (iii)   Engineering Mechanics, 2nd ed. — MK Harbola

Suggested Reference Books:
  (i)   Halliday and Resnick, Physics
  (ii)   W. Saslow, Electricity, magnetism and light
  (iii)   An Introduction to Mechanics — D Kleppner& R Kolenkow
  (iv)   Principles of Mechanics — JL Synge & BA Griffiths
  (v)   Mechanics — JP Den Hartog
  (vi)   Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
  (vii)   Mechanical Vibrations — JP Den Hartog
  (viii) Theory of Vibrations with Applications — WT Thomson

Dr. C.J. Sreelatha
Chairperson Board of Studies in Physics,KU,Wgl
Date:

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – I
(Common to all branches)

PHYSICS
(Lab.)

Course code	BSC101				
Category	Basic Science Course				
Course title	**Physics-Practical**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Internal marks = 25
	-	**-**	**3**	**1.5**	External Marks = 50

APPLIED PHYSICS LAB

Choice of experiments from the following:

1. Coupled oscillators.

2. Experiment on moment of inertia measurement.

3. Experiments with gyroscope.

4. Resonance phenomena in mechanical oscillators.

5. LC circuit and CR circuit.

6. Resonance phenomena in LCR circuits.

7. Magnetic'field from Helmholtz coil.

8. Measurement of Lorentz force in a vacuum tube.

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – I
(Common to all branches)

MATHEMATICS -1
MAXIMUM HOURS:48

Unit 1: Sequences and Series

Sequences , series, general properties of series , series of positive terms, comparison test, integral test, ratio test, Cauchy's root test, D' Alembert's ratio test. Fourier series, Euler's formula, condition for Fourier expansion, Even and odd functions.

(Sections 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 10.1, 10.2, 10.3, 10.6 of Text Book)

Unit 2: Calculus

Fundamental theorems (without proofs) Rolle's Theorem (algebraic and geometrical interpretation, geometrical proof), Legrange's mean value theorem, Cauchy's mean value theorem, Taylors theorem, Maclaurin's series. Asymptote's parallel to axis, curve tracing (simple curves only), radius of curvature for cartesian curves.

(Sections 4.3, 4.10, 4.11, 4.16, 4.17, 9.7 of Text Book)

Unit 3: Multivariable Differential Calculus

Functions of two or more variables, partial derivatives, total derivatives, change of variables, Jacobians, Taylor's theorem (without proof), errors and approximations, maxima and minimum of functions of two variable. Scalar and vector point functions, gradient, divergence, curl, physical interpretation.

(Sections 5.1, 5.2, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11, 8.5, 8.6 of Text Book)

Unit 4: Multivariable Integral Calculus

Double integrals, change of order of integration , triple integrals, change of variables, beta and gamma function, line integrals, surface integrals, volume integrals, Greens, Gauss and Stokes theorems (without proof) irrotational fields, solenoidal fields.

(7.1, 7.2, 7.5, 7.7, 7.14, 7.15, 7.16, 8.11, 8.12, 8.13, 8.14, 8.15, 8.16, 8.18 of Text Book)

Unit 5: Differential Equations

Differential equations of first order, formation of differential equations. variable separable form, Bernouli's equation, exact equations, physical applications (Newton's law of cooling, rate of decay) linear differential equations, applications of linear differential equations (simple harmonic motion, oscillating electric circuits). (Sections 11.1, 11.3, 11.4, 11.6, 11.10, 11.11, 12.6, 12,8, 14.1, 14.2, 14.5 of Text Book)

Text Book: B.S. Grewal et.al, Higher Engineering Mathematics, 43rd Edition, Khanna Publicationns.

Reference: Erwin Kreyszig, Aadvanced Engineering Mathematics, 8th Edition, John Wiley & Sons.

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – I
(Common to all branches)

BASIC ELECTRICAL ENGINEERING

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks:30
3	1	0	4	External Marks:70

UNIT – I   (7+3)

DC circuits: Introduction, network elements (R, L and C), electric power, electrical energy, Ohm's law, Kirchhoff's laws, resistances in series-voltage divider rule; resistances in parallel-current divider rule, series & parallel circuits, mesh analysis and nodal analysis.

DC network theorems: Introduction, superposition theorem, Thevenin's theorem, Norton's theorem and maximum power transfer theorem. Time-domain analysis of first-order RL and RC circuits.

UNIT – II   (7+3)

1-ϕ AC circuits: Phasor representation of sinusoidal quantities, average and R.M.S values of sinusoidal wave form, Form Factor, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), series resonance.

3-ϕ AC circuits: Production of 3-ϕ voltages, voltage & current relationships of line and phase values for balanced star and delta connections.

UNIT – III   (7+3)

Transformers : Magnetic materials, BH characteristics, Construction, principle of operation & applications of   1-ϕ transformer, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, Auto-transformer and 3-ϕ transformer connections.

Three Phase Induction motor: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Significance of torque-slip characteristic, starting and speed control of induction motor and Applications.

Single-phase induction motor: Construction and principle of operation, Capacitor start & capacitor run motor, applications.

UNIT – IV (7+3)

DC Generators : Constructional features, operating principle, EMF equation, types of DC Generators, magnetization characteristics of DC shunt generator and Applications.

DC Motors: Principle of Operation, Torque Equations, Operating Characteristics of DC Motor, Speed Control Methods and Applications.

Synchronous Generators : Construction and principle of operation of Synchronous generators.

UNIT –V (6+2)

Power Converters : DC-DC buck and boost converters, duty ratio control. Single-phase voltage source inverters and sinusoidal modulation.

Electrical Installaiton: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Text Books:

1. B.L.Thereja, A.K.Thereja, "Electrical Technology Vol. I & II", *S.Chand & Company Ltd,* edn , 2005.
2. Edward Hughes, "Electrical & Electronics Technology", *Pearson Education,* 10$^/$e., 2010.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", *Tata McGraw Hill*, edn , 2010.

Reference Books:
1. K. Uma Rao, "Basic Electrical Engineering", *Pearson Education,* edn, 2011.
2. Chakravarthy A, Sudhipanath and Chandan Kumar, "Basic Electrical Engineering", *Tata McGraw Hill Ltd*, edn, 2009.

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – I
(Common to all branches)

BASIC ELECTRICAL ENGINEERING LAB

Class: I/IV B.Tech., I Semester   **Branch: Common to all**

Teaching Scheme				Examination Scheme
L	**T**	**P**	**C**	**Internal Marks:25**
0	**0**	**2**	**1**	**External Marks:50**

1.   Verification of KVL, KCL

2.   Transient response of R-L, R-C, R-L-C circuits with DC excitation

3.   Verification of Thevenin's Theorem

4.   Verification of Norton's Theorem

5.   Verification of Maximum Power Transfer Theorem

6.   Determination of internal resistance and internal inductance of choke coil

7.   Resonance in RLC series circuit

8.   Speed control of DC Shunt motor

9.   Open Circuit and Short Circuit Test on single phase Transformer.

10.   Performance characteristics of 3 phase squirrel cage induction motor

11.   Demonstration of components of LT switchgear

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – I
(Common to all branches)

ENGINEERING GRAPHICS

Teaching Scheme				Examination Scheme
L	T	P	c	Internal Evaluation -30
1	0	4	3	External Evaluation -70

UNIT – I
Introduction to Engineering Drawing: Principles of Engineering Graphics and their ignificance, Usage of Drawing Instruments, Lettering. Conic Sections including the Rectangular Hyperbola – General method only Cycloid,Epicycloid and Hypocycloid, Scales – Plain, Diagonal and vernier.

UNIT- II
Orthographic Projections: Principles of Orthographic Projections – Conventions, Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III
Projections of Regular Solids – Auxiliary Views - Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere.

UNIT – IV
Isometric Projections: Principles of Isometric Projection – Isometric Scale , Isometric Views ,Conventions , Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions.

UNIT – V
Development of Surfaces: Right Regular Solids – Prism, Cylinder, Pyramid and Cone.
Introduction to CAD: (For Internal Evaluation Weightage only)
Introduction to Auto CAD Commands, Draw Tools,Modify Tools, Text, Dimension Properties, DIMENSION, PROPERTIES tool bar, Standard Tool bar, LAYERS.

TEXTBOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:
1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing / M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

Note: Syllabus must be complete in 48 theory hours, however theory hours may be converted in to equal practical hours as per credits

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – I
(Common to all branches)

ENGINEERING MECHANICS

Teaching Scheme :					Examination Scheme :		
L	**T**	**P**	**C**		Internal Evaluation :		30 marks
3	1	-	4		End Semester Exam :		70 marks

Course Learning Objectives (LOs):

LO1: develop concept of force, reactions, principles of force and their application on engineering structures and machines

LO2: introduce various kinds of statically determinate pin jointed structures and methods of analysing the trusses

LO3: understand the importance of geometric centre, cross sectional areas of plane lamina and moment of inertia

LO4: understand the behavior of particles in motion subjected to system of forces.

UNIT – I (6+2)

Laws of Mechanics: Parallelogram law of forces, triangle law of forces, Newton's law of gravitation, law of superposition and transmissibility of forces.

Force Systems: Types of forces, co-planar, concurrent and parallel forces, moment and couple, free body diagram, resultant of force systems, resolution of forces, composition of forces, equilibrium equations of forces, Lami's theorem, Varignon's theorem, moment equilibrium equations, types of supports, beams and loadings, statically determinate structures, resultant and equilibrium of general force system.

UNIT –II (8+2)

Friction: Introduction, classification, laws of friction, coefficient of friction, angle of friction, ladder friction and wedge friction.

Plane Trusses: Rigid truss, stability and determinacy conditions, basic assumptions for a perfect truss, analysis of trusses by method of joints and method of sections of a cantilever and simply supported statically determinate pin-jointed trusses.

UNIT– III (8+2)

Centroid: Centroid of one dimensional figures, centroid of simple figures from first principles, centroid of composite sections.

Moment of Inertia: Moment of inertia of plane sections from first principles, theorems of moment of inertia – parallel axis theorem and perpendicular axis theorem, moment of inertia of standard sections and composite sections.

UNIT - IV (8+2)

Kinematics: Introduction to dynamics, rectilinear motion of a particle – displacement, velocity and acceleration, motion with uniform acceleration and motion with variable acceleration, curvilinear motion- rectangular components, components, acceleration of normal and tangential acceleration, projectile motion.

UNIT - V (8+2)

Kinetics: Rectilinear motion-equations of rectilinear motion, equations of dynamic equilibrium, D'Alembert's principle, curvilinear motion-equations of motion in rectangular components, tangential and normal components, equations of dynamic equilibrium, applications of work-energy, impulse –momentum principles of rectilinear motion and curvilinear motion.

Text Books:
- Tayal A.K., "Engineering Mechanics: Statics and Dynamics", *Umesh Publishers,* New Delhi, 14th edn., 2014.

Reference Books:

- Timoshenko S., Young D.H., Rao J.V., and Sukumar Pati, "Engineering Mechanics in SI units", *McGraw Hill Education Pvt. Ltd.,* New Delhi, 5th edn., 2013.

- Bhavikatti S.S., "Engineering Mechanics", *New Age International,* New Delhi, 4th edn., 2013 (reprint).

- Basudeb Bhattacharyya, "Engineering Mechanics", *Oxford University Press*, 9th edn., 2013.

- Vijay HYPERLINK "https://www.alibris.com/search/books/author/K-Vijay-Kumar-Reddy?aid=6776440" HYPERLINK "https://www.alibris.com/search/books/author/K-Vijay-Kumar-Reddy?aid=6776440" HYPERLINK "https://www.alibris.com/search/books/author/K-Vijay-Kumar-Reddy?aid=6776440" HYPERLINK "https://www.alibris.com/search/books/author/K-Vijay-Kumar-Reddy?aid=6776440" HYPERLINK "https://www.alibris.com/search/books/author/K-Vijay-Kumar-Reddy?aid=6776440" HYPERLINK "https://www.alibris.com/search/books/author/K-Vijay-Kumar-Reddy?aid=6776440" HYPERLINK "https://www.alibris.com/search/books/author/K-Vijay-Kumar-Reddy?aid=6776440" Kumar Reddy K., Suresh Kumar J. "Singer's Engineering Mechanics Statics and Dynamics" *BS Publications / BSP Books*, 3rd edn. (SI Units), 8th Reprint, 2014

KAKATIYA UNIVERSITY
BACHELOR OF TECHNOLOGY
FIRST YEAR SYLLABUS
Structure of Curriculum-Common to All Branches

Semester –II (First Year)

Branch/Course: Common to all branches of UG Engineering & Technology

Sl. No.	Category/ Code	Course Title	Internal Marks	External Marks	Total Marks	Lecture	Tutorial	Practical	No of Credits
1	Basic Sciences Course /BSC 102	Chemistry	30	70	175	3	1	-	5.5
		Lab.	25	50		-	-	3	
2	Basic Sciences Course /BSC 104	Mathematics-II	30	70	100	3	1	0	4
3	Engineering Science Courses/ESC103	Programming for Problem Solving	30	70	175	3	0	-	5
		Lab.	25	50				4	
4	Engineering Science Courses/ESC104	Workshop and Manufacturing Practices	30	70	175	1	0	-	3
		Lab.	25	50		-	-	4	
5	Humanities and Social Sciences including Management courses/HSMC101	English	30	70	175	2	0	-	3
		Lab.	25	50				2	
		Total Credits							20.5

In order to balance the load of the some of the subjects which are made in groups (Physics/Chemistry, Engineering Graphics & Design/ Workshop and Manufacturing Practices, Programming for Problem Solving/Engineering Mechanics), the half of the branches of B.Tech course offer one subject of group in odd semester and other half of the branches of B.Tech course offer another subject of same group in odd semester. In the even semester the subjects of the group will be exchanged

MANDATORY INDUCTION PROGRAM

BEFORE BEGINNING OF FIRST SEMESTER
<u>3 Weeks Duration</u>
- Physical Activity
- Creative Arts
- Universal Human Values
- Literay
- Proficiency Modules
- Lectures by Eminent People
- Visits to Local Areas
- Familiarization to Dept./Branch & Innovations

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – II
(Common to all branches)

CHEMISTRY
(Theory)

Class: **B.Tech. I Year**   *Internal Marks*: **30**
Lectures: **3 Hrs/Week**   *External Marks*: **70**

UNIT-I
1. ELECTROCHEMISTRY

(08 Hrs)

Electrode potential, standard electrode potential, Nernst equation (No derivation); Electro chemical series. Types of electrodes - Hydrogen, Quinhydrone, Calomel, and Ion selective electrode (Glass electrode); Galvanic cell, EMF; Determination of pH using Quinhydrone and Glass electrodes; Potentiometric titrations (Acid-base and Redox). Numerical problems.
Batteries: Primary and secondary batteries - Zinc-Carbon battery & Lead-acid battery.

UNIT-II
1. **CORROSION**   **(07Hrs)**

Introduction – causes and effects of corrosion. Dry and wet corrosion. Electrochemical theory of corrosion. Galvanic and differential aeration corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic protection. Surface coatings – metallic coatings – methods of application.

2. **WATER ANALYSIS AND TREATMENT**   **(07Hrs)**

Hardness of water - Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness. Determination of hardness of water using EDTA method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Brief review of methods of softening of water - Zeolite process and Ion-exchange process. Desalination of water- Reverse osmosis.

UNIT-III
1 **Organic reactions, synthesis of a drug molecule & Stereochemistry**   **(11 Hrs)**

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N^1, S_N^2 reactions. *Electrophilic and Nucleophilic addition reactions*: Addition of HBr to propene. Markownikoff's and anti-Markownikoff's additions; Grignard additions on carbonyl compounds; *Elimination reactions*: Dehydrohalogenation of alkylhalides. Saytzeff rule. *Oxidation reactions*: Oxidation of alcohols using $KMnO_4$ and chromic acid. *Reduction reactions*: reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$. Hydroboration of olefins. *Synthesis and applications of commonly used drug molecules*: Aspirin and Paracetamol.
Stereochemistry: Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation analysis of n- Butane.

UNIT-IV

1. **Molecular structure and Theories of Bonding**:   **(08 Hrs)**

   Atomic and Molecular orbitals: Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules. Molecular orbital energy level diagrams (MOED) of N_2, O_2 and F_2 molecules.

   Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

UNIT-V

2 **Spectroscopic techniques and applications:**   **(07Hrs)**

   Interaction of radiation with matter, spectrum of electromagnetic radiation, Principles of spectroscopy, selection rules and applications of Electronic spectroscopy, Vibrational and Rotational spectroscopy of diatomic molecules. Applications. Numerical problems.

TEXT BOOKS:

1. Text Book of Physical Chemistry by *PL Soni and OP Dharmarha*, Sulthan Chand & Sons.
2. Engineering Chemistry by *PC Jain & M Jain*, Dhanapathi Rai publishing Co.
3. Text Book of Engineering Chemistry by *Shashi Chawla*, Dhanapathi Rai publishing Co.

REFERENCE BOOKS:

1. Principles of Physical Chemistry by *Maron and Prutton*.
2. Applied Chemistry- A Text Book of Engineers & Technologists by *HD Gesser.*
3. Chemistry in Engineering & Technology by *Kuriacose and Rajaram.*
4. Text Book of Engineering Chemistry by *CP Murthy, Agarwal and A Naidu.*
5. A Text Book of Engineering Chemistry by *SS Dara.*
6. Engineering Chemistry by *RP Mani, KN Mishra and B Ramadevi.*
7. Engineering Chemistry by *OP Agarwal.*
8. Fundamentals of Molecular Spectroscopy, by C.N. Banwell

Details about Question Paper of External Examination (Model)

Time: **3 Hrs**   Marks: **70**

The question paper consists of <u>TWO</u> sections. (section-A & section-B)

SECTION-A   **(10X01=10 Marks)**

Attempt **all** Questions. Each Question carries 01 Mark.

Q I: About **10** short answer type Questions from all the units. (02 Questions from each unit)

SECTION-B   **(05X12=60 Marks)**

Attempt any **five** (**05**) Questions. Each Question carries 12 Marks.

Q II to **Q VIII**: Should be given **one** question from each unit and set to **07** Questions.

KAKATIYA UNIVERSITY
B. Tech. First Year
SEMESTER – II
(Common to all branches)

CHEMISTRY LABORATORY
(Common to all branches)
(Credits: 1.5)

Class: **B.Tech. I Year**   *Internal Marks*: **25**
Practical: **3 Hrs/week**   *External Marks*: **50**

LIST OF EXPERIMENTS:

1. Determination of Hardness (Total, Temparary and Permanent) of water using EDTA method.
2. Determination of chloride content of water by Argentometry.
3. Determination of rate constant of acid catalysed hydrolysis of methyl acetate.
4. Colorimetric analysis-verification of Lambert-Beer's law using $KMnO_4$ solution.
5. Conductometric titration of HCl with NaOH
6. Conductometric titration of CH_3COOH with NaOH
7. Potentiometric titration of HCl with NaOH
8. Potentiometric titration of Fe^{2+} with $KMnO_4$
9. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal.
10. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
11. Determination of surface tension of a given liquid using stalagmometer.
12. Synthesis of Urea-Formaldehyde resin polymer / Synthesis of Aspirin.

TEXT BOOKS:

1. *Vogel's* Inorganic Quantitative analysis (2007).
2. College Practical Chemistry by *VK Ahluwalia* (2007)
3. Senior Practical Physical Chemistry by *BD Khosla, A Gulati and VC Garg* (2001)
4. Practical Physical Chemistry by *B Vishwanathan, PS Raghavan*.
5. Text book on Experiments and calculations in Engineering chemistry – *S.S. Dara*
6. *Vogel*'s text book of practical organic chemistry 5th edition

MATHEMATICS -2

(MAXIMUM HOURS: 48)

Unit 1: Integral Transforms

Laplace Transforms: Laplace transforms of elementary functions, properties, transform of derivatives, transform of integrals, multiplication by t, division by t, evaluation of integrals, inverse transforms, convolution theorem, and application to differential equations.

(21.1, 21.2, 21.3, 21.7, 21.8, 21.9, 21.10, 21.11, 21.12, 21.13, 21.14, 21.15 of Text Book)

Unit 2: Linear Algebra

Rank of a matrix, solution of linear system of equations, consistency of linear system of equations, linear independence vectors and linear dependence vectors, Eigen values and Eigen vectors, Caley Hamilton theorem, reduction to diagonal form, complex matrices, Hermition matrix and conjugate matrix.

(Sections 2.7(1), 2.9, 2.10, 2.12, 2.13, 2.14, 2.15, 2.16, 2.19 of Text Book)

Unit 3: Partial Differential Equations

Formation of partial differential equations, linear equations of first order, non-linear equations of first order, Charpit's method, homogenous equations with constant coefficients , applications (one dimensional wave equation, one dimensional heat flow, two dimensional heat flow).

(Sections 17.1, 17.2, 17.3, 17.5, 17.6, 17.7, 17.8, 18.1, 18.3, 18.4, 18.5, 18.6 of Text Book)

Unit 4: Complex Variable - Differentiation

Limit of complex functions, derivative of a complex function, analytic function, Cauchy-Reimann equations, Harmonic functions, applications to flow problems, some standard transformations.

(Sections 20.1, 20.2, 20.3, 20.4, 20.5, 20.6, 20.7, 20.8 of Text Book)

Unit 5: Complex Variables - Integration

Complex integration, Cauchy's theorem, Cauchy's integral formula, Caucly's inequality, Liouvile's theorem, Taylors series, Laurent's series, Singularities of function, residues, residue theorem, evaluation of real definite integrals (integration of trigonometric functions around unit circle, integral of functions around a semi-circle).

(Sections 20.12, 20.13, 20.14, 20.15(2,3), 20.16, 20.17, 20.18, 20.20(a, b) of Text Book)

Text Book: B.S. Grewal et.al. Higher Engineering Mathematics, 43rd Edition, Khanna Publicationns.

Reference: Erwin Kreyszig, Aadvanced Engineering Mathematics, 8th Edition , John Wiley & Sons.

Programming for Problem Solving

Teaching Scheme				Examination Scheme
L	**T**	**P**	**C**	**Internal marks: 30**
3	-	4	5	**External marks:70**

UNIT-I: (6+2)

Introduction:
Block Diagram of Computer, Number system (Binary, Octal and Hexa decimal), Input-Output devices.
Operating system definition goals and services, compliers and interpreter, Problem solving steps, Algorithms, Flow chart, Types of programming languages, Introduction to C –language.

Unit-II: (7+3)

Fundamentals of C-language:
Token of C-languages: Identifiers, key words, Constants, Data types, Declaration and initialization statements, compound statements, Operators, Expressions and evaluation, Type conversion, Input-output statements, Structure of C-program.

Unit-III: (7+3)

Control structures/statements:
Decision statements: if, if-else, if-else-if, nested-if and switch-case
Iterative statements: while, do-while and for
Unconditional branching statements: break, continue, goto and exit .

Unit-IV: (7+3)

Arrays and Pointers:
Arrays: Definition of Arrays, 1-Dimensional arrays, 2-Dimensional arrays and multi dimensional arrays, Strings, String handling functions.
Pointers: Definition and declaration of pointer, operation on pointers, pointer and arrays, pointer to functions

Unit-V: (7+3)

Structure-Union: Definition and syntax of structure, union, Comparison between union & structure, nested structures, array of structures, pointer to structures.
Functions: Definition, function prototype, library and user define functions, types of functions, storage classes, parameter passing methods (call by value and call by address), recursion and macros.
Files: Introduction, File modes, Input and out operations on files.

TEXT BOOKS:

1. Let Us C, 14th Edition, Yashavant P. Kanetkar, BPB Publications, ISBN 13: 9788183331630.
   Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.

2. C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, ISBN 0-13-110362-8

TEXT/REFERENCE BOOKS:
1. Programming in ANSI C, SIXTH edition, E.Balaguru Swamy, Tata McGraw Hill Pvt Ltd, ISBN-10: 1259004619.
2. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
3. Programming in C. Second Edition, Reema Thareja, ISBN: 9780199456147, Oxford University Press.

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – II
(Common to all branches)

PROGRAMMING FOR PROBLEM SOLVING LAB USING C

Teaching Scheme
  L T P C

-     - 4 2

Examination Scheme
Internal Marks: 25

External Marks: 50

LIST OF EXPERIMENTS

1. Programs using input output functions
2. Programs for declaration statement, initialization statement, data type conversions
3. Programs using all operators in C
4. Programs using conditional control structures; if, if-else, nested if, if else if ladder and switch
5. Programs using loop control structures: while, do-while, for,
6. Programs using unconditional statements : break, continue, goto
7. Programs on one dimensional array and two dimensional arrays
8. Programs using functions: different types, parameter passing using call-by-value, call-by-reference
9. Programs using recursion
10. Programs using strings and sharing handling functions
11. Programs using pointers, pointers to arrays, pointer to functions
12. Programs using structures and unions

ENGINEERING WORKSHOP

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry –

1. Study of Carpentry Tools, Equipment and different joints.

2. Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

II. Fitting –

1. Preparation of square-Fit as per the given specifications.

2. Preparation of Dovetail Fit as per the given specifications.

3. Preparation of Semi-circular as per the given specifications.

III. Foundry –

1. Introduction to foundry, Patterns, pattern allowances, ingredients of moulding sand and
   melting furnaces. Foundry tools and their purposes

2. Demo of mould preparation

3. Practice – Preparation of mould by using split pattern.

IV. Welding Practice –

1. Introduction, Study of Tools and welding Equipment (Gas and Arc welding)

2. Selection of welding electrode and current, Bead practice.

3. Practice of Butt Joint, Lap Joint. VI. House-wiring – (Parallel & Series, Two-way Switch
and Tube Light)

V. Plumbing:

1. Practice of Internal threading, external threading, pipe bending, pipe fitting.

2. Pipes with coupling for same diameter and with reducer for different diameters.

3. Practice of T-fitting, Y-fitting, Gate valves fitting.

KAKATIYA UNIVERSITY
B.Tech. First Year
SEMESTER – II
(Common to all branches)

English

Course Code	HSMC 101				
Category	Humanities and Social Sciences Including Management Courses				
Course Title	**English**				
Scheme and Credits	L	T	P	Credits	Semester-II
	2	0	2	3	
Exam Pattern	Internal 30 Marks and External: 70 Marks				
Course Completion	Max 48 Hours				

Unit 1. Vocabulary Building

1.1 The concept of Word Formation

1.2 Root words from foreign languages and their use in English

1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.

1.4 Synonyms, antonyms, and standard abbreviations.

Unit 2. Basic Writing Skills

2.1 Sentence Structures

2.2 Use of phrases and clauses in sentences

2.3 Importance of proper punctuation

2.4 Creating coherence

2.5 Organizing principles of paragraphs in documents

2.6 Techniques for writing precisely

Unit 3. Identifying Common Errors in Writing

3.1 Subject-verb agreement

3.2 Noun-pronoun agreement

3.3 Misplaced modifiers

3.4 Articles

3.5 Prepositions

3.6 Redundancies

3.7 Clichés

Unit 4. Nature and Style of sensible Writing

4.1 Describing

4.2 Defining

4.3 Classifying

4.4 Providing examples or evidence

4.5 Writing introduction and conclusion

Unit 5. Writing Practices

5.1 Comprehension

5.2 Précis Writing

5.3 Essay Writing

PRACTICALS/LAB: Oral Communication
(This unit involves interactive practice sessions in Language Lab)
- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Prescribed Text Book
Language and Life: A Skills Approach, Orient Blackswan 2018

Suggested Readings:
(i) Practical English Usage. Michael Swan. OUP. 1995.
(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
(iii) On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
(v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (Civil)

III – SEMESTER

SCHEME OF INSTRUCTION FOR B.E. (CIVIL)

Sl. No.	Course Code	Course Title	Scheme of Instruction			
			L	T	P	C
1	BS 301MT	Mathematics-III	3	0	0	3
2	ES 301CE	Surveying and Geomatics	2	1	0	3
3	PC 301CE	Introduction to Solid Mechanics	3	0	0	3
4	PC 302CE	Introduction to Fluid Mechanics	3	0	0	3
5	PC 303CE	Material Testing and Evaluation	3	0	0	3
6	ES401ME	Elements of Mechanical Engineering	3	1	0	4
7	MC 302CE	Environmental Sciences	2	0	0	0
8	ES 351CE	Surveying laboratory	0	0	2	1
9	PC 351CE	Fluid Mechanics-I laboratory	0	0	2	1
		Total credits				21

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
BSC-105
MATHEMATICS - III
STATISTICS, PROBABILITY, AND NUMERICAL TECHNIQUES

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

Module1: Statistical Methods
Introduction, Collection of Data, Graphical Representation, Measures of Dispersion, Moments, Skewness, Kurtosis, Correlation, Coefficient of Correlation, Lines of Regression.
(Sections 25.1, 25.2, 25.3, 25.6, 25.9, 25.10, 25.11, 25.12, 25.13, 25.14 of Text Book)

Module2: Probability & Distributions
Probability, Addition Law of Probability, Independent Events, Baye's Theorem , Random Variable, Continuous Probability Distribution, Expectation, Moment Generating Function, Binomial Distribution , Poisson Distribution, Normal Distribution, Exponential Distribution.
(Sections26.1,26.4,26.5,26.6,26.7,26.9,26.10,26.11,26.14,26.15,26.16,26.19(6) of Text Book)

Module3: Numerical Techniques-I
Solution of Algebraic and Transcendental Equations, Principle of Least Squares, Method of Least Squares, Fitting of Other Curves, Finite Differences, Forward Differences, Backward Differences. (Sections 28.2, 24.4, 24.5, 24.6, 30.2, 30.2(1), 30.2(2) Of Text Book)

Module4: Numerical Techniques-II
Central Differences, Other Difference Operators, Newton's Interpolation Formulae, Gauss's Forward Interpolation Formula, Interpolation with Unequal Intervals, Numerical Differentiation. Sections 29.7, 29.4, 29.6, 29.7(1), 29.9, 30.1.of Text Book)

Module5: Numerical Techniques-III
Numerical Integration, Trapezoidal Rule, Simpson's one –third Rule, Simpson's three-eight Rule, Weddle's Rule, Solution of Simultaneous Linear Equations (Iterative Methods)
(Sections 30.4, 30.6, 30.7, 30.8, 30.10, 28.5 of Text Book)

Text Book:
 B.S Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publications.

References
1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons
2. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand &Sons
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt. Ltd.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
ES-301CE
SURVEYING AND GEOMATICS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
2	1	0	3	External Marks: 70

Unit – I:
Introduction to Surveying: Principles, Linear, methods, Leveling: Plane table surveying, Principles of levelling- reducing levels; differential, reciprocal leveling, Digital and Auto Level, contouring: Characteristics, uses; areas and volumes.
*Triangulation and Tri-lateration***:** Theodolite survey: Instruments, Measurement of Horizontal and vertical angle; - methods -triangulation - network- Signals. Baseline - choices - instruments and accessories - corrections - Satellite station - reduction to centre - Indivisibility of height and distances - Trigonometric leveling.

Unit – II:
Curves Elements of simple and compound curves – Method of setting out- Transition curve — Elements of transition curve and Vertical curves.

Unit – III:
Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, , Surveying with GPS.

Unit – IV:
Photogrammetric Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, flight planning; Stereoscopy, ground control extension for photographic mapping- photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

Unit –V:
Remote Sensing: Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation;

Text and Reference books

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.

5. Anji Reddy, M., Remote Sensing and Geographical Information System, B.S. Publications, 2001
6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

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Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
PC-301CE
INTRODUCTION TO SOLID MECHANICS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

Unit – I:
Simple Stresses and Strains- Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience– Gradual, sudden, impact and shock loadings – simple applications.

Unit – II:
Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain

Unit – III:
Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without over hangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Unit – IV:
Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.
Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

Unit – V:
Direct and Bending: Basic concept , Eccentric loading, limit of eccentricity-Core of sections-rectangular and circular, solid and hollow sections-wind pressure on chimneys and water pressure on dams.
Thin Cylinders - Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder.
Thick Cylinders: Lame's equations, stresses under internal and external fluid pressures-Compound cylinders- Shrink fit pressure.

Text and Reference books:

1. Timoshenko, S. and Young, D. H., ‒Elements of Strength of Materials‖, DVNC, New York, USA.
2. Kazmi, S. M. A., ‒Solid Mechanics‖ TMH, Delhi, India.
3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson,Prentice Hall, 2004
4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd edn. New York, NY: McGraw Hill, 1979
5. Laboratory Manual of Testing Materials - William Kendrick Hall
6. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DE wolf – TMH 2002.
7. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi

Faculty of Engineering & Technology
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Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
PC-302CE
INTRODUCTION TO FLUID MECHANICS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

Unit – I:
Fluid Properties: Basic concepts: Specific weight, specific volume, specific mass, gravity, viscosity, bulk modulus, vapour pressure, capillarity and surface tension, viscosity-Newton's law of viscosity, Newtonian and Non-Newtonian fluids, classification of fluids-ideal and real.

Unit – II:
Fluid Kinematics: Fundamentals of fluid flow-description of flow pattern, stream lines, path lines, streak lines, stream tubes, classification of fluids, steady and unsteady flows, laminar and turbulent flows, uniform and non-unsteady flows, rotational and irrotational flows, laminar and turbulent flows, uniform and non- uniform flow, one, two and three dimensional flows, stream function, and velocity potential function, flow net-significance and use.

Unit – III:
Fluid Statics: Fluid pressure at a point, variation of pressure in a fluid, measurement of pressure - simple and differential manometers.
Fluid Dynamics: Convective and local acceleration, concept of continuity, three-dimensional continuity equation, body forces and surface forces, body force potential, Euler's equation of motion for 3-D flow, Bernoulli's equation by integration of Euler's equation, significance of Bernoulli's equation and its limitations, applications of Bernoulli's equation- venturimeter, pitot tube. Impulse-momentum equation and its applications- forces on a pipe bend.

Unit – IV:
Flow Through Pipes: Introduction, types of flows-laminar and turbulent, Reynolds experiment, Darcy-Weisbach equation, and steady laminar flow through circular pipes-Hagen-Poiseuille's equation, hydro-dynamically smooth and rough boundaries- criteria and resistance to flow of fluid in smooth and rough boundaries, variation of friction factor.

Unit – V:
Compressible Flow: Compressibility of liquids and gases, differential form of continuity equation, Bernoulli's energy equation for isothermal and adiabatic conditions, velocity of pressure wave, wave velocity for adiabatic and isothermal conditions, Mach Number and Mach cone, stagnation pressure and temperature.

Text and Reference books

1. K. Subramanya, _Theory and Applications of Fluid Mechanics', Tata McGraw-Hill

Publishing Company Ltd., New Delhi, 1993

2. Vijay Gupta and Santosh K. Gupta, ‗*Fluid Mechanics and its applications*', Wiley Eastern Ltd., New Delhi,1984

3. K.L. Kumar, ‗*Engineering Fluid Mechanics*', Eurasia Publishing House Pvt Ltd., New Delhi, 2009

4. Valentine, H.R., ‗*Applied Hydrodynamics*', Butterworths & Co Ltd., London, 1959

5. P.N. Modi and S.M.Seth, ‗*Hydraulics and Fluid Mechanics*', Standard Book House, New Delhi, 2013

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
PC-303CE
MATERIAL TESTING AND EVALUATION

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

Unit – I:
Introduction: Uses of stones as building materials, classification, characteristics, dressing and polishing of stones, methods of quarrying and construction.
Bricks: Methods of manufacturing bricks. Classification and methods of construction.
Timber: Timber as a building material and its uses. Methods of seasoning and preservation laminates and their uses, defects in Timber.
Cement: Introduction to cement, different grades, IS specifications and OPC and PPC Cements (blended cements).
Mortar and Sand: Characteristics of good mortar making sand, availability of sand ant its classification, bulking of sand, manufacturing methods of mortar. Different types of mortars-preparation, setting and curing.

Unit – II:
Coarse and fine Aggregate: Characteristics of good coarse and fine aggregates for manufacture of concrete. Significance and application of coarse and fine aggregate for the production of good quality concrete.
Concrete: Introduction to Nominal mix and Design mix

Unit – III:
Type of joints in Concrete - Construction, expansion, contraction, and isolation joints.
Cracks in Buildings- Type of cracks in buildings, principal causes-moisture movement, thermal variations, elastic deformation, creep, chemical reaction.
Smart building Materials: Energy conservation in buildings- use of recycled materials, regional materials and industrial waste products as means of sustainable development. Green Building Materials

Unit – IV:
Plastering and Pointing: Different types of plasters and plastering process, defects in plastering.
Paints, Varnish and Distemper: Constituents, characteristics of good paints, bases, vehicles, thinners and coloring pigments. Painting of different types of surfaces varnish and its types, application. Distemper, dry and oil bound, and application of distemper.

Unit – V:
Form work- Types of Form work, types of materials used in form work
Scaffoldings- Types of Scaffoldings, Scaffolding Erection & dismantling, Scaffolding Inspection

Fire protection in structures- Classification of fire, general causes of fire, detection of fire, methods for fire control, Analysis for structural components for fire resistance (wood, steel, concrete and masonry).
Damp Proof Course-Causes of dampness, effects of dampness, methods of damp proofing

Text and Reference books

1. VN. Vazirani, and S.P. Chandola, *Engineering Materials*, Khanna Publishers 1993.
2. Sushil Kumar, Building Construction, Standard Publilshers 1992.
3. S.P. Arora and S.P. Bindra, *Text book on Building Construction*, Dhanpath Raj Publications, 1999.
4. M.S.Shetty, *Concrete Technology*, S.Chand Publishers,2012.
5. Gurucharan singh, *Building materials and construction*, Standard book house

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

Elements of Mechanical Engineering

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks: 70

UNIT- I

Statements of zeroth law, 1st, 2nd and 3rd Laws of thermodynamics with their applications. Representation of thermodynamic processes on p-V and T-s plots. Ideal gas equation. Relations for internal energy and entropy changes, heat and work transfers for closed systems. Steady flow energy equation for an open systems-derivation and applications in turbines, compressors, nozzles and diffusers. Relations for enthalpy changes, heat and work transfers for open systems.

UNIT-II

Power Cycles: Concept of air standard cycles- Carnot cycle, Otto, Diesel, Joule cycles with applications. Representation of Cycles on P-V and T-s plots. Calculation of Cycle efficiencies.
IC Engines: Classification of IC Engines. Mechanical components of IC Engines. Working Principles of four stroke and two stroke cycle engines. Differences between petrol and diesel engines. Calculation of engine parameters -IP, BP, Specific fuel consumption, mechanical and thermal efficiencies.

UNIT-III

Working principles of reciprocating air compressors-single and double acting, single stage and two stage. Effect of clearance. Conditions for maximum efficiency. Isentropic and isothermal efficiencies. Problems on work input, power required and efficiencies of single and two stage compressors. Methods for improving efficiency –use of intercooler and after cooler.
Refrigeration: Working of vapour compression refrigeration system and window Air conditioners. COP calculation. Common refrigerants in use, environmental impacts of refrigerants.

UNIT-IV

Belt drives: Velocity ratio, effect of slip. Length of open and cross belts. Ratio of tensions, centrifugal tension and its effect on power transmission. **Gear drives**: Nomenclature and types of gears. Problems on simple and compound gear trains. **Governors**: Working of Watt, Porter and Hartnell governors. Effect and power of governor. Stability of governor and isochronism. Balancing of several masses in one plane and in several planes.

UNIT- V

Production Techniques: Principles of Arc, Gas and Resistance welding, soldering and Brazing, working mechanism of Lathe, milling and drilling machines by simple sketches. Working principle of NC machines. Basic principles of USM, EDM, LBM and ECM. Principles of sand casting and die casting. Plastics and their moulding methods.

Text and Reference Books

1. R.K. Rajput, "*Thermal Engineering*", Laxmi Publications, New Delhi, Eighth Edition, 2010.
2. P.K. Nag, *"Basic and Applied Thermodynamics"*, Tata Mc-Graw Hill, Eigth Reprint, 2006.
3. Thomas Bevan, "*Theory of Machines*", College Book Store (CBS) Publishers, 3rd Edn., 1986.
4. Hajra Choudary, "*Elements of Workshop Technology-Vel. I and 2*, Asian Publishers, 6th Edn., 1993.
5. P. N. Rao, "*Manufacturing Technology*", Vol. I &2, Tata McGraw- Hill, 2nd Edn., 2009.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
MC 210
ENVIRONMENTAL SCIENCES

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
2	0	0	0	External Marks: 70

UNIT–I (8)

Introduction to Environmental Science: Environment and society, major environmental issues: Ozone layer depletion, Acid rains, global climate change etc, sustainable development, Environmental impact assessment, environmental management

Natural Resources Utilization and its Impacts: Energy, minerals, water and land resources, Resource consumption, population dynamics, urbanization..

UNIT–II (8)

Ecology and Biodiversity: Energy flow in ecosystem, food chain, nutrient cycles, eutrofication value of biodiversity, biodiversity at global, national and local levels, threats for biodiversity, conservation of biodiversity.

UNIT–III (8)

Water Pollution: Sources, types of pollutants and their effects, water quality issues, contaminanttransport, self-purification capacity of streams and water bodies, water quality standards, principles of water and wastewater treatment.

UNIT–IV (8)

Air Pollution: Sources, classification and their effects, Air quality standards, dispersion of pollutants, control of air pollution, automobile pollution and its control.

UNIT–V (8)

Solid Waste Management: Sources and characteristics of solid waste, effects, Collection and transfer system, disposal methods.

Text Books:
1. M. Chandrasekhar, Environmental science, Hi Tech Publishers, 2009.
2. P.N. Modi (2006), Water supply Engineering – Environmental Engineering (Vol. I) – Standard Book House.
3. Gerard Kiely, Environmental Engineering, McGraw Hill Education Pvt Ltd, Special Indian Edition, 2007.

References:
1. W P Cunningham, M A Cunningham, Principles of Environmental Science, Inquiry and Applications, Tata McGraw Hill, Eighth Edition, 2016.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
ES351CE
SURVEYING LABORATORY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 25
0	0	2	1	External Marks: 50

List of Experiments:

1. Applications of traversing to locate a building and field objects by taking perpendicular and oblique offsets; and recording in the field book.
2. To determine the area of the given site by cross staff survey
3. Closed traverse by chain and compass, plotting and adjustment by graphical method
4. Plane tabling: Radiation and intersection methods
5. Introduction to leveling: Fly leveling using dumpy level
6. Measurement of horizontal angles by repetition and reiteration methods using Vernier Theodolite.
7. Measurement of vertical angle: Application to simple problems of height and distance by measuring angle of elevation and depression
8. Single plane method: Determination of R.L. of an elevated Object using two Instrument Stations which are placed in a same vertical plane- when base of the Object inaccessible.
9. Two plane method: Determination of R.L. of an elevated Object using two Instrument Stations which are not placed in the same vertical plane- when base of the Object inaccessible.
10. Setting out of a simple circular curve by linear method
11. Setting out of a simple circular curve by angular method
12. Setting out of a transition curve by linear method
13. Introduction to Total station and applications: To determine difference in elevation of any two given points. The introduction includes, setting up of the Total station over a station, input values, field measurements, downloading of the data in to a computer.
14. Total station and applications: Application to simple problems of height and distance by measuring angle of elevation and depression and determination of **R.L** of the target object.
15. Total station and applications: Determination of area enclosed in a closed traverse having minimum 5 stations. Plot the measured values by using a software package.
16. Geographic Position System (GPS),Geographical Information system(GIS) and their applications: Determination of Latitude and Longitude of any four stations and computation of the area. Check trust worthiness of the measured results.

Suggested Reading:

1. B.C. Punmia, *Surveying, Vol. I and Vol. II*, Laxmi Publications, 1994.
2. Arora, K.R., *Surveying, Vol. I, II and III*, Standard Book House., 1995.
3. T.M. Lillesand and R.W. Kiefer, *Remote Sensing and Image Interpretation*, John Wiley & Sons, 1994.
4. R. Srinivasa Kumar, *A Text Book of Highway Engineering*, Universities Press, Hyderabad, 2011.
5. M. Chandra, *Advanced Surveying*, New Age International Publishers New Delhi, 2000.

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KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CIVIL) III SEMESTER
PC351CE
FLUID MECHANICS – I LABORATORY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 25
0	0	2	1	External Marks: 50

List of Experiments:

1. Determination of C_d and C_v of an orifice

2. Calibration of a mouth piece

3. Determination of C_d of a mouth piece for unsteady flow in a hemi-spherical tank

4. Calibration of a rectangular notch

5. Calibration of a triangular notch

6. Calibration of a broad crested weir

7. Verification of Bernoulli's principle

8. Determination of types of flows

9. Determination of major and minor losses in the pipes

10. Calibration of a Venturi meter

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (Civil)

IV – SEMESTER

SCHEME OF INSTRUCTION FOR B.E. (CIVIL)

Sl. No.	Course Code	Course Title	Scheme of Instruction				Credits
			L	T	Dr	P	
1	HS 301MC	Managerial Economics and Accountancy	3+1*	-	-	-	3
2	PC 401CE	Mechanics of Materials	2	1	-	-	3
3	PC 402CE	Structural Engineering	2	1	-	-	3
4	PC 403CE	Hydraulic Engineering	2	1	-	-	3
5	PC 404CE	Hydrology and Water Management	2	1	-	-	3
6	PC 405CE	Construction Engineering and Management	2	1	-	-	3
7	PC 401BS	Engineering Geology	2	0	-	-	2
8	PC 451CE	Material Testing Laboratory	-	-	-	2	1
9	PC 452CE	Fluid Mechanics-II Laboratory	-	-	-	2	1
10	PC 453BS	Engineering Geology Laboratory	-	-	-	2	1
11	ES 461CE	Survey Camp	-	-	-	-	1
		Total	**15**	**05**		**06**	**24**

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (Civil) IV – SEMESTER,
HS 301MC (CM 355UE)
MANAGERIAL ECONOMICS AND ACCOUNTANCY

Unit – I
Meaning and Nature of Managerial Economics: Managerial Economics and its usefulness to Engineers, Fundamental Concepts of Managerial Economics-Scarcity, Marginalism, Equimarginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

Unit – II
Consumer Behavior: Law of Demand, Determinants, Types of Demand; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply and Concept of Equilibrium. (Theory questions and small numerical problem can be asked)

Unit – III
Theory of Production and Markets: Production Function, Law of Variable Proportion, ISO quants, Economics of Scale, Cost of Production (Types and their measurement), Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price - Output determination under Perfect Competition and Monopoly (theory and problems can be asked)

Unit – IV
 Capital Management: Significance, determination and estimation of fixed and working capital requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems. (Theory questions and numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked)

Unit – V
Book-keeping: Principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance, concept and preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios.
(Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios)

Text and Reference books

1. Mehta P.L., *Managerial Economics* —Analysis, Problems and Cases , Sulthan Chand & Sons Educational Publishers, 2011
2. Maheswari S.N., *Introduction to Accountancy* , Vikas Publishing House, 2005
3. Pandey I.M., *Financial Management* , Vikas Publishing House, 2009

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Department of Civil Engineering

B. Tech. (CIVIL) IV SEMESTER
PC-401CE
MECHANICS OF MATERIALS

Unit – I
Deflection: Slope and deflection by double integration method for cantilever, simply supported beams and overhanging beams carrying one, two point loads, u.d.l. and uniformly varying load over entire span. Moment area and conjugate beam method
Propped cantilevers: Cantilever beams on elastic and rigid props for point loads and UDL only. Calculation of reactions, B.M. and S.F. diagrams, and deflections.
Fixed Beams: Determination of shear force, ·)ending moment slope and deflection in fixed beams with and without sinking of supports for (i) point loads (ii) u.d.l. (iii)uniformly varying load over entire span.
Continuous Beams: Determination of moments in continuous beams with and without sinking of supports by theorem of three moments, S.F. and B.M. diagrams.

Unit – II
Column analogy method: Application to fixed beams- analogous column- stiffness and carryover factors
Strain energy: Strain energy and resilience in statically determinate bars subjected to gradually applied, suddenly applied, impact and shock loads. Resilience of beams. Deflections from resilience. Castigliano Theorem - I and its application to beams- Reciprocal theorem. Static indeterminacy and kinematic indeterminacy of structures.

Unit – III
Strain energy method: Deflections of statically determinate trusses and frames using unit load method.
Redundant trusses and frames: Analysis of plane trusses with one degree of redundancy (internal ⁄ external) and plane frames with one degree of redundancy, Lack of fit and temperature effect.

Unit – IV
Torsion and Springs- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs.
Columns and Struts: Euler's theory for long columns- different end conditions- equivalent length- Rankine's theory. Eccentrically loaded columns- Secant and Perry's formulae.

Unit – V
Unsymmetrical bending of beams: Location of neural axis, maximum stresses for rectangular section .Symmetric channel section.
Shear Centre: Shear stress, shear flow, locating shear center for angle section channel section and T- section, with one axis of symmetry.

Text and Reference Books

1. D.S. Prakash Rao, *Strength of Materials* - A practical Approach, Universities Press, 1999.
2. S.B. Junarkar, *Mechanics of Structures* (Vol. 1 &2), Charotar Publishing House Anand, 1992.
3. R.K. Rajput, *Strength of Materials*, S. Chand & Co., 2003.
4. B.C. Punmia, *Strength of Materials and Theory of Structures*, Laxmi Publishers, Delhi, 2000.
5. G.H. Ryder, *Strength of Materials*, Third Edition in SI units, Macmillan Indian Limited, Delhi, 2002.
6. A. Pytel and F. L. Singer, *Strength of Materials*, Harper & Row, Fourth Edition, New York, 1987.
7. R.K. Bansal, A Text book of Strength of materials, Lakshmi Publications, New Delhi, 2010.
8. Dr. Sadhu singh, *Strength of Materials*, Khanna Publishers, Delhi, 2006.
9. S.M.A Kazimi, *Solid mechanics*, Tata Mc- raw-Hill Publications Ltd. New Delhi, 2009.
10. B.C. Punmia, Ashok kumar Jain, Arunkumar Jain, *Theory of structures*, Lakshmi publications (P) Ltd, New Delhi, 2007.

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<u>**B. Tech. (CIVIL) IV SEMESTER**</u>
<u>**PC-402CE**</u>
<u>**STRUCTURAL ENGINEERING**</u>

Unit – I
Materials and Structural Design Criteria Development of design philosophies-Working stress method, Ultimate load method, and Limit state method - Concepts, Characteristics loads and strengths, Partial safety factors, Stress-strain relationship for concrete and steel, stress block parameters.
Working stress method: Design of RCC beams - Balanced, under-reinforced and over reinforced sections - Rectangular, T and L sections, Design of singly and. doubly reinforced rectangular, T and L sections.

Unit – II
Introduction to the analysis and design
Limit state of collapse in flexure: Assumptions, Design for flexure - Singly and doubly reinforced rectangular, T and L sections.
Limit state of collapse in shear and torsion: Design for shear and torsion. Limit states of serviceability: Check for deflection and cracking.

Unit – III
Design of Structural Elements
Design of slabs (Limit state method): Design of one way and two way slabs - Simply supported and continuous slabs subjected to uniformly distributed loads, Detailing of reinforcement, Check for serviceability of slabs.
Design of stair cases (Limit state method): Types of stairs, Effective span, Distribution of loading on stairs, Design and detailing of dog-legged stair cases.

Unit – IV
Design of columns (Limit state method): Assumptions, Design of axially loaded circular, square and rectangular columns, Design of columns with uni-axial and bi-axial bending interaction diagrams
Design of footings (Limit state method): Design of isolated footings of uniform depth and sloped footings, Deign of square, rectangular and circular footings as per IS code, Design of combined rectangular slab footing, Combined rectangular beam and slab footing for two columns

Unit – V
System Design Concepts; Special Topics that may be Covered as Part of the
Design Project Discussions; *Introduction* - Types of bridges, materials of construction, codes of practice (Railway and Highway bridges), aesthetics, loading standards (IRC, RDSO, AASHTO), *Concrete Bridges* - Materials and infrastructure requirements, precast systems and materials used for precast and cast in-situ bridges. Bridge deck and approach slabs, design of bridge deck systems, slab-beam systems design philosophies.

Text and Reference books:

1. Nilson, A. H. *Design of Concrete Structures.* 13th edition. McGraw Hill, 2004
2. Punmia B.C., Jain A.K. and Jain A.K., RCC Designs, Laxmi Publications, 2006.
3. Krishna Raju N. and Pranesh R.N., Reinforced Concrete Design, New Age International Pvt. Ltd., 003.
4. Varghese P.C; Limit State Design of Reinforced Concrete, Prentice Hall of India Pvt. Ltd." 2002.
5. Varghese P.C; Design of Reinforced Concrete Foundations, PHI Learning Pvt. Ltd., 2009.
6. D.S. Prakash Rao, Design Principles and Detailing of Concrete Structures, .Tata Mcfiraw Hill Publishing Co. Ltd., 1995.
7. Nawy, E. G. *Prestressed Concrete: A Fundamental Approach*, Prentice Hall, NJ, (2003).

Note: All relevant latest IS codes necessary for this course may be referred (i.e. IS 456-2000)

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B. Tech. (CIVIL) IV SEMESTER
PC-403CE
HYDRAULIC ENGINEERING

Unit – I
Steady uniform flow through open channels: Descriptions and definitions, difference between pipe flow and channel flow, velocity and pressure distributions in a channel cross-section, energy and momentum correction coefficients, friction to flow in open channels, uniform flow, Manning and Chezy formulae, most efficient channel sections, specific energy, concept and applications of critical depth. Gradually varied flow: Significance of Froude number, dynamic equation of gradually varied flow, classification of gradually varied flow profiles

Unit – II
Boundary layer: Definition, laminar and turbulent boundary layers, boundary layer thickness, displacement thickness, momentum thickness, and energy thickness, hydro-dynamically smooth and rough boundaries, and boundary layer separation.
Drag and Lift: fundamental concepts of drag and lift forces, drag on a sphere, cylinder, flat plate, and aerofoil.

Unit – III
Dimension analysis and model studies: Dimensional analysis and a tool in experimental hydraulics, Buckingham's Pie theorem, applications, geometric, kinematic and dynamic similarity, similarity laws, significance of Reynolds, Froude and Mach similarity laws, different types of models and their scale ratios.

Unit – IV
Hydraulic turbines: Classification, specific speed, velocity triangles, power developed, efficiencies, principles of design of impulse and reaction turbines, turbine laws and constants, characteristic curves, selection of turbines.

Unit – V
Centrifugal pumps: Components, work done and efficiency, minimum starting speed, Euler head equation, specific speed and characteristic curves of centrifugal pump, pumps in series and parallel.

Text and Reference Books

1. K. Som, and Biswas, G, ‚Fluid Mechanics and Fluid Machines', Tata McGraw-Hill Publishing Co., New Delhi, 1998
2. Yuan, S. W., ‚Foundation of Fluid Mechanics', Prentice-Hall India Pvt. Ltd., New Delhi, 1976
3. C.S.P. Ojha, R.Berndtsson, P.N. Chandramouli, ‚Fluid Mechanics and Machinery', Oxford University Press, New Delhi, 2010
4. A.K.Mohanty, ‚Fluid Mechanics', Prentice-Hall India Pvt. Ltd., New Delhi,1994.
5. Subrahmanya , K, Fluid Mechanics and Hydraulic Machines Tata McGraw-Hill Publishing Co., New Delhi, 2001

Faculty of Engineering & Technology
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B. Tech. (CIVIL) IV SEMESTER
PC-403CE
HYDROLOGY AND WATER MANAGEMENT

Unit – I
General: Definition, relation to engineering design, hydrological cycle, importance of hydrology and its application in engineering.
Rainfall: Definition, types of rainfall, measurement of rain fall, types of raingauges, network design, presentation of precipitation data, mean aerial rainfall; thiessen polygon, isohyetal methods., depth- area- duration curve, dependable rainfall.
Infiltration: Evaporation, transpiration-definitions and processes.

Unit – II
Runoff: Definition, runoff process, factors affecting runoff, determination of runoff, importance of stream gauging, runoff formulae and runoff tables, dependable yield of a basin.
Floods: Definition, causes, importance of flood studies, flood peak and flood hydrograph, methods of computing flood peak, empirical methods, rational formula, unit hydrograph method, flood frequency studies, Weibul's and Gumble's extreme value methods.

Unit – III
Ground water: Types of aquifers, aquifer parameters, specific yield, storage coefficient, coefficients of permeability and transmissivity, Darcy's law, types of well, steady radial flow to wells in confined and unconfined aquifers, yield of open wells, safe yield, constant level pumping test and recuperation test.

Unit – IV
Statistics in Hydrology: Introduction, Statistical parameters; central tendency parameters, dispersion characteristics, skewness., probability distribution; discrete and continuous distribution., frequency analysis; log pearson type III distribution., regression and correlation; standard forms of bivariate equations., multivariate linear regression and correlation., analysis of time series., selection of a design return period, determination of permissible risk.

Unit – V
Irrigation: Definition, necessity of irrigation, types of irrigation, advantages and ill-effects of irrigation.
Soil-water-plant relationship: Vertical distribution of soil moisture, soil moisture tension, soil moisture stress, soil moisture constants, plant water relationship, moisture stress and plant response, consumptive use, crop factor, duty, factors affecting duty, types of crops and their water requirements, crop rotation.

Text and Reference Books:

1. K. Subramanya, *Engineering Hydrology*, Tata McGraw Hill Publishing Co.Ltd. 1996.
2. H.M. Raghunath, *Hydrology – Principles, Analysis and Design*, New Age International Publishers, 1996.

3. Michael, A.M, *Irrigation Theory & Practice*, Vikas Publishing House, New Delhi, 1978
4. Ray K.Linsley, Jr, Max A. Kohler, Joseph L.H.Paulhus, *Hydrology for Engineers*, McGraw-Hill Book Company, 1980
5. Ven Te Chow, Hand book of Applied Hydrology, McGraw-Hill Book Company, New York, 1964

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Department of Civil Engineering

B. Tech. (CIVIL) IV SEMESTER
PC-405CE
CONSTRUCTION ENGINEERING AND MANAGEMENT

Unit – I
Basics of Construction- Unique features of construction, Construction project planning- Stages of project planning, Sequence of events in general Civil Engineering construction projects, Construction Schedule, work break-down structure. Development of management techniques, Bar charts, Gantt charts, CPM and Network analysis examples.

Unit – II
PERT techniques, Introduction to cost analysis, Cost reduction in construction management. Cost time analysis, Crashing the Network, Resource Leveling and smoothing.

Unit – III
Development of Operations Research (OR), Quantitative Analysis and Decision Making, need for linear programming, standard form of Linear programming, Graphical Method. An algebraic overview of Simplex Method, solving minimization and maximization problems, Dual method, case studies.

Unit – IV
Safety Engineering, Safety program, Direct and Indirect loss due to accident, Classification of Construction accidents and causes, Location hazards and their elimination, Safety in demolition of buildings, Safety in storage and handling of materials and equipments

Unit – V
Contracts Management – Basics, Importance of contracts; Types of Contracts, parties to a contract; Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials.

Text and Reference Books

1. Robert L. Peurifoy and William B. Ledbetter, Construction Planning, equipment, and methods, McGraw-Hili International Editions, New Delhi, 1985
2. FrankHarris and Ronald Mc.Caffer,modern construction Management.Blookwell science L1d,2001.
3. Mahesh Varma, Construction Equipment and its Planning and Application, Metropolitan Book Company Pvt Ltd., New Delhi, 1994.
4. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.
5. H.N.Ahuja, Construction performance control by networks, John willey & sons, New York, 1976.

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B. Tech. (CIVIL) IV SEMESTER
PC-401 BS
ENGINEERING GEOLOGY

Unit – I
Rocks: Distinguishing features of igneous, sedimentary and metamorphic rocks Geological description and Indian occurrence of Granite, Basalt, Dolerite, Gabbro, Laterite, Sandstone Shale, Limestone Slate, Gneiss, Quartzite, Marble, Khondalite and chamockite.
Geological Structures: Folds, Fractures joints and faults - Fundamental types, mechanism origin and classifications of structures; Field identification and Engineering analysis of structures

Unit – II
Rock Weathering: Processes and end - products of weathering; susceptibility of rocks tc weathering, Assessment of the degree of weathering and its classification.
Geology of Soils: Formation, geological classification, description and Engineering use of soils Types of Indian soils.
Hydrogeology: Hydrologic cycle, water table, aquifers, occurrence of ground water in various lithological formations, ground water movement, springs, ground water exploration and ground water provinces of India.

Unit – III
Geomorphology: Evolution, characteristics features and Engineering, considerations of fluviatile, Aeolian, glacial and marine land forms.
Rock Mechanics: Engineering properties- of rocks Stress - Strain behaviour of rocks under uniaxial compression.
Site Investigation: Aerial Photographs, Electrical: Resistivity and Seismic refraction methods.
Unit – IV
Rock as a Construction Material: Geological considerations III the selection of Concrete aggregate, Highway and Runway aggregates, building stones, Decorative stones, Roofing and facing stones. Building stones of India.
Geology of Dams and Reservoirs: Types of Dams, Problems associated with Dam foundations and reservoirs, Engineering Geological investigations for a masonry dam site, Analysis of dam failure; Engineering Geology of major Dam sites of India.

Unit – V
Tunnels: Stand - up time of different rocks, Engineering Geological investigations of tunnels in rock, problems in tunneling, pay line and over break, logging of tunnels and geology of some well known Indian tunnels.
Geological Hazards: Geological aspects of Earthquakes, Tsunamis and Landslides; Disaster prevention, mitigation and management.

Text and Reference Books

1. F.G. Bell, Engineering Geology, Elsivier - 2007.
2. Dimitri P. Krynine and William R. Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distributors, First Edition, 1998.
3. B.P.Attewel and I.W. Fanner, Principles of Engineering Geology, Chapman and Hall 1976.
4. Officers of the Geological Survey of India, "Engineering Geology Case Histories" Miscellaneous Pub. No. 29, 1975.

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B. Tech. (CIVIL) IV SEMESTER
PC-451 CE
MATERIAL TESTING LABORATORY

Cycle - I

1. Tension –I Uni-Axial tension test on a specimen of ductile material

2. Tension II Stress-Strain characteristics of a ductile material

3. Brinell's hardness test

4. Compressive strength test on bricks

5. Bending test on simply supported beam of timber

Cycle - II

6. Torsion test on a specimen of ductile material

7. Compression test on close coiled helical spring

8. Bending test on simply supported beam of steel

9. Bending test on fixed beam of steel

10. Izod impact test

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Department of Civil Engineering

B. Tech. (CIVIL) IV SEMESTER
PC-452CE
FLUID MACHANICS-II LABORATORY

List of Experiments

1. Determination of roughness coefficient in an open channel

2. Determination of a vane coefficient

3. Study of universal characteristic curves of a Pelton wheel

4. Study of universal characteristic curves of a Francis turbine

5. Determination of super elevation in an open channel

6. Determination of basic characteristics of a hydraulic jump

7. Verification of Froude's Model law in an open channel

8. Determination of critical slope of an open channel

9. Study of main characteristic curves of a Centrifugal pump

10. Study of universal characteristic curves of a Kaplan turbine

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B. Tech. (CIVIL) IV SEMESTER
PC-453CE
ENGINEERING GEOLOGY LABORATORY

1. Identification and description of physical properties of Minerals

2. Identification and description of geological and geotechnical characteristics of rocks; IS Code: 1123 (1975)   .

3. Determination of apparent specific gravity, porosity and water absorption of different rocks; IS Code: 1124 (1974)   ,

4. a) Study of structural models (folds, faults and unconformities) and

   b) Measurement of strike and dip of planar features by clinometers compass.

5. Vertical electrical sounding (VES) - a field experiment to determine depth to water table and bedrock.

6. Seismic refraction survey to determine depth to bedrock (demonstration only).

7. a) Determination of unconfined compressive strength of intact rocks.

   b) Study of topographic maps.

8. Stereoscopic examination of aerial photographs pertaining to landforms, vegetation and water bodies.

9. Study of geological maps of Andhra Pradesh, Teleangana and India with reference to occurrence of building stones.

10. Study of (a) Geotechnical Map of India and (b) Geomorphological Map of India.

11. Study of Hydro geological Maps of Andhra Pradesh and India.

12. Study of Foundation Geological Maps and sections pertaining to the major dam sites of India.

Note: At least 10 experiments are to be conducted

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B. Tech. (CIVIL) IV SEMESTER
ES-461CE
SURVEY CAMP

The students will be given basic training of handling various survey instruments including the Total stations. The students are given certain tasks on all the instruments and equipments to solve the real practical problems in the vicinity of campus which enables them to learn and apply to the real life survey problem

Faculty of Engineering & Technology

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Department of Civil Engineering

SCHEME OF INSTRUCTION FOR B.Tech. (CIVIL ENGG) - V SEMESTER

S.No.	Course Code	Course Title	Scheme of Instruction			Lecture hrs/ week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
Theory Subjects									
1	HS 3101LA	Professional Practice, Building Laws & Ethics	3	-	-	3	30	70	3
2	HS3102 LA	Law and Engineering	2	-	-	2	30	70	2
3	PC 3103CE	Soil Mechanics	3	-	-	3	30	70	3
4	PC 3104CE	Water Resource Engineering	3	-	-	3	30	70	3
5	PC 3105CE	Theory of Structures	3	-	-	3	30	70	3
6	PC 3106CE	Concrete Technology	3	-	-	3	30	70	3
7	MC3107CE	Disaster Management	2	-	-	2	30	70	2
Practicals									
8	PC 3108CE	Soil Mechanics Lab	-	-	2	2	25	50	1
9	PC 3109CE	Concrete Technology Lab	-	-	2	2	25	50	1
			21	**02**	**04**	**26**	290	660	**21**

HS 3101 LA PROFESSIONAL PRACTICE BUILDING LAW & ETHICS.

Instruction: 3 periods per week   *Duration of Semester End Examination: 3 hours*
Credits : 3   *CIE: 30 marks*   *SEE: 70 marks*

Unit – 1 : Practices of Building Bye –laws – l: Definitions -   General Definitions – Jurisdiction and   Applicability   of the building bye laws And   building   documentation procedures -   Development and part construction In case of Part construction and Change of use / occupancy - Reconstruction Existing approved general building. Guidelines and byelaws for obtaining permissions for Residential and Commercial spaces

Unit – 2 : Practices of Building Bye - laws – ll: General   building   requirements   and services   -   Requirements of spaces for various areas in the residential buildings, Special requirements for low income houses, Other requirements including Fire, Open spaces, height limitations, Lighting and Ventilation. Building Services like plumbing, sanitation etc.   Model Building Bye-laws (latest)

Unit - 3: Infrastructure and Real Estate   Engineering byelaws : Real Estate Scope - classification of real estate activities and peculiarities; Factors affecting real estate market; Role of Government in real estate market; Statutory provisions, Laws, rules, and regulation, land use controls in property development, registration And licensing requirements –Real   estate development - Functions of real development like project formulation, feasibility studies, developing, costing and financing, managing including planning, Scheduling and monitoring of real estate projects,

Unit - 4: Contact law and conflict issues: Contracts and   management   of   Contracts - Types of engineering contracts- procurement philosophy - Definition and essentials of a Contract - Clauses for contracts – Types of engineering contracts and its formulation -Preparation of tender documents – Issues related to tendering process – Awarding Contract -   Provisions of Contract law, Indian Contract Act,1872 Laws related to construction industry -   Labour and Industrial laws – Payment of Wages Act- Contract labour Workmen's Compensation Act – Insurance and Industrial dispute Act.

Unit – 5 : Disputes and their resolutions Mechanisms : Concept of ADR– Negotiation – Mediation - Conciliation - Arbitration –Ombudsman –   Arbitration Agreement - Essentials - Rule of severability - Interim measures ordered by arbitral tribunal. Conduct of Arbitral Proceedings. Making   of   Arbitral   Award   and   termination   of   proceedings   -   Rules applicable to substance of dispute – Settlement - Form and contents of arbitral award - Termination proceeding.

Suggested Reading :-
1. Model   Building Byelaws, Town and Country Planning Organization,   Ministry   of Urban   Development., 2016, Available: http://www.indiaenvironmentportal.org.in/files/file/MO DEL%20BUILDING%20BYE%20LAWS-2016.pdf
2. "Codes of Practice and Standard Specifications" of AP PWD, CPWD, MES etc.,
3. B.J. Vasavada, "Engineering Contracts and Arbitration", 2nd Edition, Jubilee Publications, 1996.
4. G.T. Gajaria"Laws relating to Building and Engineer's Contracts", 1 st Edition, M.M. Tripathi Private Limited, Mumbai, 1985.
5. O.P. Malothra, The law and practice of Arbitration ALTERNATIVE AND DISPUTE RESOLUTION _ Law on contracts, methods on alternative dispute resolution. The arbitration and conciliation act 1996.

HS 3102 LA LAW AND ENGINEERING

Instruction: 3 periods per week   *Duration of Semester End Examination: 3 hours*
Credits : 2   *CIE: 30 marks   SEE: 70 marks*

Unit-I: The Legal System - Meaning, nature and definition of jurisprudence - Schools of jurisprudence- Analytical, Historical, Philosophical and Sociological Schools of jurisprudence - Meaning and Definition of   Law - The Nature and functions of Law - Sources of Law - Legal and Historical sources – Precedent/Case Law as Source of Law - Definition of Precedent, Kinds of Precedent - Legislation as Source of Law- Definition of Legislation - Classification of Legislation – Supreme and Subordinate Legislation – Court System and Hierarchy of Judiciary in India - Concept of Alternative Dispute Resolution System (ADR) – History and Reasons for the growth of ADR –Important forms of ADR – Mediation - Negotiation – Arbitration - Definition of Arbitration and   Essentials - Online Dispute Resolution (ODR)**.**

Unit-II: Society and Constitutional law - Social Change: Definition, nature and characteristics of Social change – Social Transformation - Factors of Social Change - Law and social Change - State, Law and Society, their inter-relationship and interdependence - Identification of Goals of Social Changes in Indian Constitution - Constitution-Meaning and Significance - Nature and Salient Features of Indian Constitution - Preamble to Indian Constitution – Fundamental Rights - Right to Equality(Art.14-18) – Freedoms and Restrictions under Art.19 - Right to Life and Personal Liberty - Directive Principles of State Policy – Significance – Nature – Classification.

Unit-III: Contract law - Definition and essentials of a Valid Contract - Meaning and Definition of Consideration - Capacity of the parties to enter into contract - Concepts of Free Consent - Lawful Object - Illegal agreements - Void and Voidable contracts - Discharge of Contracts - Remedies for breach of contract - Kinds of damages - Contract of sale of Goods – Formation of contract of sale - Sale and Agreement to Sell -Conditions and Warranties - Express and implied Conditions and Warranties - Caveat Emptor - Rights and duties of seller and buyer before and after sale – Rights of Unpaid Seller - Remedies of breach.

Unit-IV: Business Organizations - Corporate Personality - General Principles of Company Law – Companies Act, 2013 - Nature and Definition of Company - Characteristics of a Company - Different kinds of Company - Private Company and Public Company – Registration & Incorporation of Company –Advantages and Disadvantages of Incorporation - Lifting of the Corporate Veil – Company distinguished from Partnership and   Limited Liability Partnership -   Shares & Stock - Kinds of shares – Share Capital - Directors – Different kinds of Directors - Appointment, position , qualifications and disqualifications - Powers of Directors - Rights and Duties of Directors – Corporate Governance and Role of Directors – Meetings of Company - Winding up of Companies-Modes of Winding up of Companies.

Unit-V: Meaning, Definition and Concept of Environment - Types of Environment - Concept of Pollution – Sources of Pollution, Types of Pollution, and Effects of Pollution – Ozone Depletion – Global Warming – Climate Change - The Environment Protection Act of 1986 - Main Aims and Objectives of the Act - Meaning, Nature, Classification and significance of Intellectual Property - The main forms of Intellectual Property - Patents - Concept of Patent - Kinds of Patents - The Patents Act, 1970 - Rights and obligations of a patentee - The notion of 'abuse' of patent rights - Infringement of patent rights and remedies available - Meaning, Definition and Nature of Cyber crimes - Information Technology Act, 2000 - Specific Cyber

crimes - Cyber Stalking – Hacking   - Child Pornography - Phishing – Cyber Crimes and Issues of Privacy - Investigation and Jurisdiction over Cyber crimes.

References:

1. Salmond: Jurisprudence, Universal Publishers.
2. Mahajan V.D.: Legal Theory and Jurisprudence, Eastern Book Company, Lucknow.
3. M.P.Jain, Indian Constitutional Law, Wadhwa & Co, Nagpur
4. H.M.Seervai, Constitutional Law of India (in 3 Volumes), N.M.Tripathi, Bombay
5. J.N.Pandey, Constitutional Law of India, Central Law Agency, Allahabad
6. Anson: Law of Contract, Clarendon Press, Oxford, 1998.
7. Avtar Singh: Law of Contract , Eastern Book Company, Lucknow, 1998.
8. P.S.Atiyah: Sale of Goods Act,   Universal Book Traders, Delhi.
9. Acharya N.K.: Law relating to Arbitration and ADR,   Asia Law House, Hyderabad
10. Tripathi S.C.: Arbitration, Conciliation and ADR, Central Law Agency,   Allahabad.
11. Avatar Singh: Arbitration and Conciliation, Eastern Law Book House, Lucknow
12. V.K. Krishna Iyer: Environment Pollution and Law
13. Paras Diwan : Environmental Law and   Policy in India,1991
14. Dr. N. Maheshwara Swamy, Environmental Law, Asia Law House, Hyderabad.
15. Avtar Sing : Company Law, Eastern Book Company.
16. Ramaiah: Company Law, Wadhwa & Co.
17. P. Narayanan: Patent Law, Eastern Law House, 1995.
18. Roy Chowdhary, S.K. & Other: Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
19. Dr. G.B. Reddy, Intellectual Property Rights and the Law   Gogia Law Agency.
20. Dr Jyoti Rattan, Dr Vijay Rattan, Cyber Laws & Information Technology, 2019, Bharat Law House, New Delhi

PC 3103 CE SOIL MECHANICS

Instruction: 3 periods per week   *Duration of Semester End Examination: 3 hours*
Credits : 3   *CIE: 30 marks, SEE: 70 marks*

UNIT–I: Introduction : History of soil mechanics- Importance of soil engineering-important soil deposits of India. Three phase soil system, volumetric relationships and weight-volume relationships.   Determination of Index Properties: Water content, Specific gravity, Grain size distribution by sieve and hydrometer analysis, Relative density, Atterberg limits and indices.

UNIT- II: Soil Classification: Classification of soil systems – Particle size classification, Textural classification, AASHTO classification, Unified soil classification and Indian soil classification- Field identification of soils.

Soil Water: Capillarity in soils, Permeability of soils, Darcy's law, Determination of permeability of soils, Permeability of stratified soils, Field permeability determination, Seepage velocity, Absolute coefficient of permeability, Factors affecting permeability- Effective stress principle- Effective stress under different field conditions. Seepage pressure-Quick sand condition

UNIT - III: Compaction Process: Compaction Mechanism; factors affecting compaction. Laboratory determination of compaction characteristics - standard and modified Proctor tests - IS Light and Heavy compaction tests; Field surface compaction: compaction equipment, procedure, quality control.

Consolidation Process: Spring analogy - Void ratio and effective stress (e Vs log p) relationship - Terazaghi's theory of one dimensional consolidation - Assumptions and derivation of GDE - Computation of magnitude of settlement (using C_c, m_v) and rate of settlement (c_v , Tv,   d).

UNIT - IV : Shear Strength: Significance of Shear strength in soils - Mohr - Coulomb equation - shear parameters - Laboratory tests for determination of shear strength - Direct shear test, Tri-axial compression test, Un-confined compression test, Vane shear test, Factors affecting shear strength of cohesion-less and cohesive soils.

UNIT - V : Earth Pressure: States of earth pressure - Active, passive, at rest condition; Rankine's theory: computation of active and passive earth pressure in c-less and cohesive soils; Coulomb's Wedge theory: Rehbhan's graphical solution: stability of earth retaining gravity wall.
.
Slope stability: Definition and classification of slopes -types of slope failure - Factors of safety with respect to cohesion, angle of shearing resistance, Height - Analysis of stability of slope using Swedish slip circle method and Taylor's stability number.

Suggested Reading:

1. Lambe, T.W. and Whitman, R.V., "*Soil Mechanics – SI Version* ", John Wiley & Sons Inc., NY, 2011.
2. Alam Singh, *Soil Engineering in Theory and Practice*, Asia Publishing House,1981.
3. Venkataramaiah, C., "*Geotechnical Engineering",* New Age Publishers, 2006.
4. Murthy, V.N.S., "*Soil Mechanics and Foundation Engineering*". Dhanpat Rai & Sons, 2006.
5. Arora, K.R., "*Soil Mechanics and Foundation Engineering*", Standard Publishers Distributors, revised and enlarged sixth edition, 2007.
6. Das, B. M., *"Advanced Soil Mechanics"*, Taylor and Francis. 7th   Edition (2008).
7. IS:2720 (Relevant Parts), "Laboratory Tests on Soils", Bureau of Indian Standarads.
8. IS:1498-1970, "Classification and Identification of Soils for General and Engineering purposes", Bureau of Indian Standarads.

PC 3104 CE WATER RESOURCES ENGINEERING

Instruction: 3 periods per week   *Duration of Semester End Examination: 3 hours*
Credits : 3   *CIE: 30 marks,   SEE: 70 marks*

UNIT - I

Water Resources Projects: Single and multipurpose projects, general principles of irrigation water rates, components of water allocation systems, riparian rights, groundwater rights, environmental and water quality management aspects of reservoir system operations.

Storage works: Purpose, selection of site, zones of storage, computation of storage capacity, fixation of different levels of reservoirs (LWL, FRL, MWL), evaporation reduction techniques.

UNIT - II
Dams: Classification of dams, selection of site for a dam, physical factors governing the selection of types of a dam.

Gravity dams : Forces acting on a gravity dam, modes of failure and criteria for structural stability of gravity dams, principal and shear stresses, gravity method of stability analysis, elementary and practical profiles of a gravity dam, high and low gravity dams, functions, and types of galleries in gravity dams, foundation treatment for gravity dams.

UNIT - III
Earth dams: Types of earth dams, causes of failure of earth dams, criteria for the safe design of an earth dam, computation of seepage from flow net, phreatic line in an earth dam (for homogeneous sections with and without filter cases), design of earth dams to suit available materials, embankment and foundation seepage control measures.

UNIT - IV
Tank irrigation:Types, site selection, causes for the failure of tank weirs, design of tank weirs, and general specifications for the construction of tank weirs.
Spillways:Different types of spillways, energy dissipation below spillways, different types of spillway crest gates, stilling basin appurtenances (descriptive details only).

UNIT - V
Hydropower structures - Storage power plant, Runoff River plant, Pumped storage plant, Water conveyance systems, Tunnels and Penstocks, Gates, Surge tanks, Power house layout

Suggested Readings:

1. Wurbs, R A. and James, W.P.,*Water Resources Engineering*, Prentice-Hall ofIndia, New Delhi, 2002.
2. U.S. Bureau of Reclamation, *Design manual for concrete gravity dams*, Denver, 1976
3. U. S. Army Corps of Engineers, *Engineering and Design*, CECW-ED Publication, 1995
4. Punmia B.C. and Pande Lal B.B., *Irrigation and Water Power Engineering,* Lakshmi Publishers, 1993.
5. Garg *S.K., Irrigation Engineering and Hydraulic Structures,* Standard Book House, 2010
6. M.M. Dandekar and K.N. Sharma, "*Water Power Engineering* 2nd Edition, Vikas Publishing House, Noida, U.P. 2013
7. R.K. Sharma and T.K. Sharma "*A Text book of Water Power Engineering*, S. Chand   and Company Pvt. Ltd, New Delhi, 2016

PC 3105 CE THEORY OF STRUCTURES

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits: 3   CIE: 30 marks,   SEE: 70 *marks*

UNIT - I
Slope deflection method: Analysis and Application of the method to continuous beams with and without sinking of supports, single bay - portal frames (Degree of freedom not exceeding three)

UNIT - II
Moment distribution method: Application of the method to continuous beams with and without sinking of supports, portal frames (static indeterminacy not exceeding three)

UNIT - III
Kani's Method: Application of the method to continuous beams with and without support sinking, portal frames (static indeterminacy not exceeding three)

UNIT - IV
Approximate method of Analysis.
Multi-storeyed building frames: Analysis and design for vertical loads by substitute frame method - Analysis and design of Portal frames by portal method, cantilever method and factor method.

UNIT - V
Elastic theory of arches: Eddy's theorem, three hinged parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading, influence lines for horizontal thrust, bending moment, normal thrust and radial shear.

Two hinged arches: parabolic and segmental, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading.

References:
1. D.S. Prakash Rao, *Structural Analysis - A Unified Approach*, University Press, 1996
2. B.C. Punmia and A.K. Jain, *Theory of structures*, Laxmi Publications, New Delhi, 2004.
3. Pandit, G .S., S. P. Gupta and R. Gupta, *Theory of Structures*, Vol.l, Tata McGraw Hill, New   Delhi, 1999.
4. S.B. Junarkar, *Mechanics of Structures* (Vol. 1 &2), Charotar Publishing House Anand, 1992.
5. C.S.Reddy, *Basic Structural Analysis*, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
6. *Analysis of Structur*es – Vol. I & II   by Bhavikathi, Vikas publications.
7. *Analysis of structures* – Vol. I & II by Vazirani & Ratwani – Khanna publications.

PC 3106 CE CONCRETE TECHNOLOGY

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT-I
Constituents of Concrete:
Cement: Types of cements and their composition- manufacture of portland cement -hydration of cement and hydration product, Structure of hydrated cement- heat of hydration, Gel theories, Tests on physical properties of cements.

Aggregate: Classification of aggregates, particle shape and texture, bond strength of aggregates and its influence on strength of concrete, porosity, absorption and moisture content and their int1uence, soundness of aggregate, alkali aggregate reaction, sieve analysis and grading of aggregate, tests on properties of aggregates.

Properties of Fresh Concrete: Mixing and batching, workability, factors effecting workability, various test procedures, segregation and bleeding, vibration of concrete, types of vibrators and their influence on composition, analysis of fresh concrete.

UNIT - II
Properties of Hardened Concrete: Strength of concrete, water-cement ratio, Gel space ratio, effective water in the mix, short term and long term properties of concrete, test and procedure, influence of various parameters on strength of concrete, relationship between various mechanical strengths of concrete, curing of concrete, maturity concept, influence of temperature on strength of concrete, stress-strain curves for concrete, durability of concrete.

Strength of Concrete - Shrinkage and temperature effects - creep of concrete - permeability of concrete - durability of concrete - Corrosion - Causes and effects - remedial measures- Thermal properties of concrete - Micro cracking of concrete.

UNIT - III
Mix Design of Concrete: A basic consideration, process of mix design, factors influencing mix proportions-mix design by ACI method and IS code method, design of high strength concrete, quality control, various methods of mix design, IS code method, British and ACI methods.

UNIT - IV
Admixtures used in Concrete: Classification of admixtures. Chemical and mineral admixtures. Influence of various admixtures on properties of concrete. Admixtures used in preparation of self compacting concrete. Applications, concept of ready mix concrete, fly ash concrete-properties and proportion of fly ash, applications, silica fume, rice husk ash concrete.

UNIT - V

Special Concrete: High strength concrete, ferrocement mass concrete, light weight concrete, high density concrete, poly-polymer modified concrete, pre-stressed concrete, self-consolidating concrete, cellular concrete, nano concrete, recycled aggregate concrete, geo polymer concrete, their specialties and applications, Fibre reinforced concrete: Need for fibre reinforced concrete (FRC), Mechanism of FRC, types of Fibres, Fibre shotcrete.

Suggested Reading:

1. Mehta, P. K. and Paulo, J. M. M. "*Concrete Microstructure-properties and Material*." McGraw- Hill Publishers,1997.
2. Neville, A.M. and Brooks, J.J. "*Concrete Technology*" Pearson Education Ltd., India, Neww Delhi,2003.
3. Shetty, M.S. "*Concrete Technology, Theory & Practice*." S.Chand and Co. Pvt., Ltd,2004.
4. Krishna Raju, N. "*Design of concrete mix*." CBS Publishers,1985.
5. Gambhir, M.L. "*Concrete Technology*." Tata McGraw Hill, 2004.
6. Santha Kumar, A. R. (2007). "*Concrete Technology*." Oxford University press, New Delhi.
7. Remedios, A. P. (2008). "*Concrete Mix Design hand book*." Himalya Publishing House, Hyderabad.

MC 3107 CE DISASTER MANAGEMENT

Instruction: 2 periods per week   Duration of Semester End Examination: 3 hours
Credits: 2   CIE: 30 marks, SEE: 70 marks

UNIT I: INTRODUCTION TO DISASTER
- Understanding the Concepts, Definitions and Terminologies used in the field of Disaster Management (i.e. Hazard, Risk, Vulnerability, Resilience, and Capacity Building).
- Differential impacts of Disasters in terms of Gender, Age, Social Status, Location, Prosperity, Disabilities.
- Disaster- Development Nexus.

UNIT II: TYPES of HAZARDS AND EMERGING TRENDS
- Classification, Causes, Consequences and Controls of
    - I) Geophysical hazards-Earthquakes, Landslides, Tsunami
    - II) Weather related hazards- Meteorological (Cyclones, Storm-surge and Lighting) Hydrological (Floods, Droughts, Avalanches) Climatological (Wildfire, Cold & Heat Waves)
    - III) Biological hazards-Epidemic & Pandemics,
    - IV) Technological hazards-Chemical, Industrial, Nuclear
    - V) Man-made hazards-Structural Failure, Fire, Transportation accidents, Terrorism and Wars
- Emerging Disasters- Urban Areas, Climate Change.
- Regional and Global Trends-loss of life & Property in various hazards

UNIT III: DISASTER MANAGEMENT CYCLE AND INTERNATIONAL FRAMEWORK
- Disaster Management Cycle
  Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity   Development; Awareness
  During Disaster – Evacuation – Disaster Communication – Search and Rescue– Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –
  Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment
- Paradigm Shift in Disaster Management: International Decade for Natural Disaster Reduction; Yokohama Strategy; Hyogo Framework of Action

UNIT IV: DISASTER RISK MANAGEMENT IN INDIA
- Disaster Profile of India – Mega Disasters of India and Lessons Learnt
- Disaster Management Act 2005 – Institutional and Financial Mechanism
- National Policy on Disaster Management,
- National Guidelines and Plans on Disaster Management;
- Role of Government (local, state and national),Non-Government and Inter-governmental Agencies

UNIT V: TECHNOLOGICAL APPROACHES TO DISASTER RISK REDUCTION

- Geo-informatics in Disaster Management (RS, GIS, GPS and RS)
- Disaster Communication System (Early Warning and Its Dissemination)
- Land Use Planning and Development Regulations
- Disaster Safe Designs and Constructions
- Structural and Non Structural Mitigation of Disasters
- Science &Technology Institutions for Disaster Management in India

Suggested Books/ Material/ References

- Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
- Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
- An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR,New Delhi
- World Disasters Report, 2009. International Federation of Red Cross and Red Crescent,Switzerland
- Disasters in India Studies of grim reality, AnuKapur& others, 2005, 283 pages, RawatPublishers, Jaipur
- 10 Disaster Management Act 2005, Publisher by Govt. of India
- Publications of National Disaster Management Authority (NDMA) on Various Templatesand Guidelines for Disaster Management
- National Disaster Management Policy, 2009, GoI

PC 3108 CE SOIL MECHANICS LABORATORY

Instruction: 2 periods per week   Duration of Semester End Examination: 3 hours
Credits :1   CIE: 25 marks, SEE: 50 marks

I.DETERMINATION OF INDEX PROPERTIES:

Determination of
1. Specific Gravity of soil solids using
   a. Density bottle   method
   b. Pycnometer method
2. Water content using
   a. Oven drying method
   b. Pycnometer method
3. Liquid and Plastic limit
4. Sieve Analysis
5. Classification of Soils as per IS:1498-1970
6. Field Density using Sand Replacement Method

II. DETERMINA TION OF ENGINEERING PROPERTIES:

Determination of
7. Compaction Characteristics using
   a. IS Light Compaction Test
   b. IS Heavy Compaction Test
   c. Compare and find the effect of Compaction Effort on Compaction mechanism
8. Co-efficient of Permeability by
   a. Constant Head Permeameter test
   b. Variable Head Permeameter test
9. Shear strength parameters by
   a. Direct Shear Test
   b. Unconfined Compression Test
   c. Vane Shear Test
10. California Bearing Ratio (CBR) value

III.DEMONSTRATION OF TEST PROCEDURE:
11. Consolidometer test
12. Tri-axial compression Test
13. Laboratory Plate Load Test
14. Reverse Osmosis Test
15. Quick Sand Model
16. Cyclic Tri-axial Test Facility

Suggested Reading :
1. IS:2720 (Relevant Parts), "Laboratory Tests on Soils", Bureau of Indian Standarads.
2. Lambe, T.W., "*Soil Testing for Engineers*", Wiley Eastern Ltd., New Delhi, 1969.

PC 3109 CE CONCRETE TECHNOLOGY LABORATORY

Instruction: 2 periods per week   *Duration of Semester End Examination: 3 hours*
Credits :1   *CIE: 25 marks, SEE: 50 marks*

1. (a) Determination of Specific gravity of cement
   (b) Determination of unit weight /bulk density of cement

2. Determination of normal consistency of cement

3. (a) Determination of initial setting time of cement
   (b) Determination of final setting time of cement

4. (a) Preparation of mortar cubes for compressive strength
   (b) Tests on mortar cubes for compressive strength

5. Fineness of cement by sieving and by air permeability method

6. (a) Determination of specific gravity of fine aggregate
   (b) Determination of bulk density of fine aggregate

7. (a) Determination of specific gravity of coarse aggregate
   (b) Determination of bulk density of coarse aggregate

8. Tests on bulking of sand
   (a) Laboratory method (b) Field method

9. Determination of fineness modulus of fine aggregate
10. Determination of fineness modulus of coarse aggregate

11. Tests on workability of concrete
    (a) Slump (b) Compaction factor

12. Tests on hardened concrete
    (a) Compressive strength (b) Flexural strength
13. Non-destructive testing of concrete structures demonstration of rebound hammer, UPV System, profometer corrosion meter and IR camera.

Suggested Reading

1. Mehta, P. K. and Paulo, J. M. M. "*Concrete Microstructure-properties and Material*." McGraw- Hill Publishers,1997.
2. Neville, A.M. and Brooks, J.J. "*Concrete Technology*" Pearson Education Ltd., India, Neww Delhi,2003.
3. Shetty, M.S. "*Concrete Technology, Theory & Practice*." S.Chand and Co. Pvt., Ltd,2004.
4. Krishna Raju, N. "*Design of concrete mix*." CBS Publishers,1985.
5. Gambhir, M.L. "*Concrete Technology*." Tata McGraw Hill, 2004.
6. Santha Kumar, A. R. (2007). "*Concrete Technology*." Oxford University press, New Delhi.
7. Remedios, A. P. (2008). "*Concrete Mix Design hand book*." Himalya Publishing House, Hyderabad.

Faculty of Engineering & Technology
Department of Civil Engineering
KAKATIYA UNIVERSITY, WARANGAL-506009

SCHEME OF INSTRUCTION FOR B.Tech. (CIVIL ENGG) - VI SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Lecture rehrs/ week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
Theory of Subjects									
1	PC 3201 CE	Environmental Engineering	3	-	-	3	30	70	3
2	PC 3202 CE	Design of Steel Structures	3	-	-	3	30	70	3
3	PC 3203 CE	Foundation Engineering	3	-	--	3	30	70	3
3	PC 3204CE	Transportation Engg	3	-	-	3	30	70	3
2	PE - I*	Professional Elective – I	3	-	-	3	30	70	3
5	PE – II**	Professional Elective – II	3	-	-	3	30	70	3
6	PE – III***	Professional Elective-III	3	-	-	3	30	70	3
7	PE3211 CE	Green Building Technology	3	-	-	3	30	70	3
Practicals									
8	PC 3213 CE	Environmental Engg lab	-	-	2	2	25	50	1
10	PC 3214 CE	Transportation Engg Lab	-	-	2	2	25	50	1
11	PW3215 CE	Summer Internship	**6 Weeks**						
			24	**0**	**04**	**28**	**285**	**690**	**26**

(PE-I) PROFESSIONAL ELECTIVE-I*			(PE-II) PROFESSIONAL ELECTIVE-II**		
1	PE 3205 CE	Design of Irrigation Structures	1	PE 3208 CE	Advanced Design Of Concrete Structures
2	PE 3206 CE	Air & Noise Pollution and Control	2	PE 3209 CE	Ground Improvement Techniques
3	PE 3207 CE	Pavement Construction And Management	3	PE 3210 CE	Finite Element Method
(PE-III) PROFESSIONAL ELECTIVE-III***					
1	PE 3211 CE	Structural Analysis			
2	PE 3212 CE	Pre-Stressed Concrete			
3	PE 3213 CE	Geographic Information System			

PC 3201 CE   ENVIRONMENTAL ENGINEERING

Instruction: 3 periods per week   *Duration of Semester End Examination: 3 hours*
Credits : 3   *CIE: 30 marks, SEE: 70 marks*

UNIT-I
Water Supply: Need for planned water supply schemes, water demand for industrial and agricultural water requirements, sources of water, water quality requirements for different beneficial uses, population forecast, water treatment through aeration, coagulation flocculation, and sedimentation.

UNIT – II
Water Treatment: Filtration, Disinfection, and Softening, methods of layout of distribution pipes, design of distribution by Hardy Cross method for simple net works, various types of pipes and valves used in water supply systems.

UNIT – III
Sewage: Domestic and storm water, Quantity of Sewage, Sewage flow variations. *Conveyance of sewage*: Sewers shapes, design of sewerage systems, operation and maintenance of sewers, sewage pumping, sewer appurtenances

UNIT-IV
River cleaning plans: Self purification of streams, BOD and COD concepts, wastewater treatment, aerobic and anaerobic treatment system, suspended and attached growth systems, quality requirements of recycled water for various purposes. Principles of Septic Tank

UNIT-V
Advanced WWT concepts: Theory and design concepts of Activated Sludge process, Mechanically Aerated Lagoons, Sequencing Batch Reactor (SBR), waste stabilization ponds, basic concepts of bio-remediation.

Suggested Reading:
1. Fair, G. M. and Geyer, J. C. *Water and Wastewater Engineering, vol. I and II*, John Wiley & Sons, Inc., New York, 1954
2. Hammer, M.J. and Hammer, M.J. Jr., *Water and Wastewater Technology*, Prentice-Hall of India Pvt. Ltd., New Delhi, 1998
3. Metcalf & Eddy, *Wastewater Engineering, treatment, disposal, and reuse*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1995
4. Norris, Robert, *Handbook of Bioremediation,* CRC Press, 1993.

PC 3202CE DESIGN OF STEEL STRUCTURES

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT - I

Materials and Specifications: Chemical composition of steel, types of Structural Steel, Residual stresses, Stress Concentration.

Basis of Structural Design: Codes and Specifications, Design Philosophies, working Stress Method, Limit State Method.

Loading and Load Combinations: Characteristic Loads, Dead Loads, Imposed Loads, Earthquake Loads, Wind Loads and Load Combinations. Partial safety factors for materials and loads.

Bolted Connections (Limit state method): Bolted Connections, Behavior of Bolted Joints, Design Strength of Ordinary Black Bolts, Design Strength of High Strength Friction Grip Bolts, Pin Connections, Simple Connections and Eccentric Connections.

Welded Connections (Limit State Method): Advantages of Welding, Types of Welds and Joints, Simple Connections and Eccentric Connections.

UNIT - II

Design of Tension Members (Limit State Method): Types of Tension Members, Design of Strands, Slenderness Ratio, Modes of Failure, Factors Effecting Strength of Tension Members, Design of Tension Members (Angles, Other sections and Rods), Lug Angles, TensionMember Splice.

UNIT - III

Design of Compression Members (Limit state method): Introduction, Possible Failure Modes, Behavior of Compression Members, Elastic Buckling of Slender Compression Members, Behavior of Real Compression Members, Sections of Compression Members, Effective Length, Design of Compression Members with Single Section and Built-up Sections (Symmetric in both directions), Lacing and Battening, Column Splices. Design of Column Bases (Limit state method): Design of Slab Base and Gusseted Base for Columns.

UNIT - IV

Design of Beams (Limit state method): Types of Beams, Section Classification, Lateral Stability of Beams, Buckling of Real Beams, Behaviour of Beams in Bending, Design of Laterally Supported and Unsupported Beams, Design of Compound Beams, Shear Strength of Beams, Maximum Deflection, Web Buckling and Web Crippling, Biaxial Bending and Unsymmetrical Bending.

UNIT - V

Design of Roof Trusses (Limit state method): Types of Trusses, End Bearings, Spacing of Trusses and Purl ins, Estimation of Loads with different Roof Coverings, Self-weight of Truss, Wind Effects, Design of Purlins for Dead Load, Imposed Load and Wind Loads. Detailed Design of Roof Trusses including Joints and Supports (only Angular Trusses).

References:

1. Subramanian. N, *Design of Steel Structures*, Oxford University Press, 2008.
2. Duggal S.K., *Design of Steel Structures*, Tata McGraw Hill Publishing, 2009.
3. Shiyekar M.R., *Limit State Design in Structural Steel*, PHI Learning Pvt. Ltd., 2010.
4. Bhavikatti, S.S., "*Design of Steel Structures*", I.K. International Publishing House Pvt. Ltd. 2010.
5. *IS-800-2007, BIS Publication*

PC 3203 CE FOUNDATION ENGINEERING

Instruction: 3 periods per week | Duration of Semester End Examination: 3 hours
Credits : 3 | CIE: 30 marks, SEE: 70 marks

UNIT - I
Stress distribution in Soils: Boussinesq's theory – Computation of increment in vertical stress due to application of a point load (its distribution on horizontal, vertical planes), uniformly distributed circular and rectangular areas –Pressure bulb – Significant depth - Construction and use of Newmark's chart – Westergaard's theory – Validity of elastic theories – Contact pressure distribution.

UNIT - II
Introduction to Foundations: Functional requirements – types – differentiation of shallow and deep foundations – suitability

Safe Bearing Capacity of Shallow foundations: Definitions - (a) Based on theories –Types of shear failures - Terazaghi's theory for safe bearing capacity of shallow foundations – Effect of type of shear failure / shape of the footing / water table – Provisions of IS : 6403-1981 (b) Based on field tests : Plate load test / Standard Penetration test.

Allowable bearing Capacity of Shallow foundations: Settlement Analysis – Total settlement – Elastic settlement – Consolidation settlement (ultimate & after any given period – correction for construction period) – Permissible uniform & differential settlements – Proportioning of footings.

UNIT - III
Pile Foundations: Necessity – types based on load transfer mechanism / material / method of installation / functional use – Estimation of vertical load carrying capacity of a single pile – static formulae / Dynamic formulae / Pile load tests – Cyclic pile load test for separation of total capacity in to bearing and friction components – Pile groups – necessity – efficiency of Pile groups - estimation of group capacity – Settlement analysis of individual and group of Piles - Negative Skin friction – Concept of Piled raft foundation.

UNIT – IV
Caissons: Necessity – types – Essential components of open (well) / box (floating) / Pneumatic caissons - suitability – Sinking of caissons – correction for tilt & shift – Scour analysis – Fixing depth of Caisson – Provisions of IS:3955 and IRC:78.

Machine foundations: differentiation with static foundations – vibration characteristics (frequency / amplitude/ resonance) – types of machines and machine foundations – additional design requirements

Geotechnical Investigations: Necessity – Principles of exploration - objectives – Soil profile – collection of disturbed & undisturbed soil samples – samplers & quality of samples - methods – Trial pit / Bore hole method – Log of bore hole details

UNIT – V

(A) Foundation construction related aspects :

Timbered / braced excavations: Necessity - methods – suitability – distribution of pressure – reaction of struts.

Dewatering: Necessity – methods – sumps (ditches) / well point system (single /multi-stage) / deep well system / electro-osmonsis method – merits & demerits – suitability

Coffer dams: necessity – types – suitability

(B) Foundation repair related aspects

Grouting : Uniqueness – Aspects – Grout Materials – Groutability ratio – Classification of grout materials – Application of grouting in enhancement of bearing capacity and stability of foundations.

Underpinning: Necessity – methods (pin / pile) - suitability

(C) Introduction to Ground Improvement Techniques – Improvement of Cohesionless and Cohesive grounds –Classification –Functions – Application of **Geosynthetics**.

Suggested Reading :
1. Bowles, E. (2012). "*Foundation analysis and Design*", McGraw-Hill Publications.
2. Das, B.M. (2012). "*Principles of Foundation Engineering*", Sengrece Publications.
3. Arora, K.R. (2012). "*Soil Mechanics & Foundation Engineering*" Standard Publications.
4. Verghese, P.C. (2012). "*Foundation Engineering*", PHI Publications.
5. Purushotham Raj, N (2016), "Ground Improvement Techniques", Laxmi Publications.
6. Relevant Indian Standards

PC 3204 CE TRANSPORTATION ENGINEERING

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT-I
Highway development and planning-Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation.
Geometric design of highways- Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems

UNIT-II
Traffic Engineering & control- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; Type of road markings & Signs; design of design of signals, capacity analysis and design of rotary intersections, parking facilities; accident studies; highway lighting; problems.

UNIT-III
Pavement materials- Materials used in Highway Construction; desirable properties, tests, requirements for different types of pavements: Soils, Stone aggregates, bituminous binders, bituminous paving mixes, introduction to Marshall Mix method; Portland cement, types of and cement concrete: desirable properties, tests on cement and hardened concrete, requirements for different types of pavements. Problems.

UNIT IV
Flexible Pavements-Types of pavements and factors affecting design of flexible pavement, performance; stresses in flexible pavements; design of flexible pavements as per IRC:37-2018; Surface and Sub-surface drainage systems, Thickness design problems. Distresses in flexible pavement, causes and performance indicators.

UNIT-V
Rigid pavements- components and functions; factors affecting design stresses in rigid pavements; types of joints, design of concrete pavements as per IRC:58-2015; Design of dowel bars and tie bars, Distresses, causes and performance of CC pavements. Design problems.

Suggested Reading:
1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
2. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley
3. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.
4. R. Srinivasa Kumar, 'Transportation Engineering', Universities Press, 2020
5. IRC: 37 (2018), 'Guidelines for the design of flexible pavements', Indian Roads Congress, New Delhi
6. IRC: 58 (2015), 'Guidelines for the design of plain jointed rigid pavements', Indian Roads Congress, New Delhi

PROFESSIONAL ELECTIVE-I

PE 3205 CE DESIGN OF IRRIGATION STRUCTURES

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT-I
Weirs: Components of diversion head works, types of weirs – fixation of still level of head sluice, scouring sluice and crest level of weir, afflux and top level of flood banks, design of vertical drop and sloping glacis weir, design for surface flow and sub - surface flow, length, level and thickness of downstream apron, upstream and downstream cutoffs, protection works.

UNIT – II
Seepage forces: Causes of failure of structures on permeable foundations, piping, rupture of floor, undermining, remedial measures, computation of uplift forces by Bligh's theory, Khoshla's theory, analytical method, and significance of exit gradient.

UNIT-III
*Canals:*Alignment, classification of alluvium canals and their functions, Regime concept of Kennedy's and Lacey's theories, design of canals based on Kennedy's and Lacey's method, use of Garrett's diagrams for the design of canals, lining of canals, methods of lining and design of lined canals.

UNIT- IV
Canal falls: Definition, location, types of falls, design principles of trapezoidal notch fall, vertical drop fall, glacis fall.
Regulators and modules: Head regulator and cross regulators, canal escapes, canal outlets and modules-proportionality, sensibility and flexibility.

UNIT- V
Cross drainage works: Definition, classification, design principles of aqueducts, syphon aqueducts, canal syphons, super passages, inlets and outlets-selection of cross drainage works.

Suggested Reading:
1. B.C. Punmia and Pande B.B. Lal, *Irrigation and Water Power Engineering*, Standard Book House, 1991.
2. S.K. Garg, *Irrigation and Hydraulic Structures*, Khanna Publishers, 1993.
3. Modi P.N., *Irrigation and Water Resources and Water PowerEngineering,* Standard Book House, 1983.
4. S. K. Sharma "*Irrigation Engineering & Hydraulic Structures*" S. Chand Publishers, New Delhi 2016
5. Punmia, B.C., Pande B. and Lal, B, Ashok Kumar Jain & Arun Kumar Jain., *'Irrigation and Water Power Engineering'*, Laxmi Publishers, 2003

PROFESSIONAL ELECTIVE-I

PE 3206 CE AIR&NOISE POLLUTION and CONTROL

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT-I
Sources and Effects of Air Pollutants: Sources, classification, combustion processes and pollutant emission, effects on health, vegetation, materials and atmosphere, reactions of pollutants in the atmosphere and their effects – Smoke, smog

UNIT – II
Sampling and Analysis: Air sampling and pollution measurement methods, principles and instruments, Ambient air quality and emission standards, Air pollution indices. Indoor Air Quality Management: Sources, types and control of indoor air pollutants

UNIT – III
Air Quality Models: micrometeorological processes, wind rose, dispersion, coefficients and stability classes, Gaussian and dispersion model, stack height computation, regional air quality models, source inventories and significance

UNIT-IV
Concepts of Pollution Control: Particulate emission control - settling chambers, cyclone separation, Wet collectors, scrubbing, fabric filters, electrostatic precipitators, selection criteria for equipment, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods.

UNIT-V
Noise pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes.

Suggested Reading:
1. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata McGraw Hill, New Delhi, 1996
2. Anjaneyulu, D., Air Pollution and Control Technologies, Allied Publishers, Mumbai, 2002
3. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
4. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.
5. B.C. Punmia. Arun Kumar Jain & Ashok Kumar Jain "Waste Water Engineering (Including Air Pollution)" M/S Laxmi Publishers, 2011
6. M. Anji Reddy, "Environmental Impact Assessment Theory and Practice" BS Publications, Hyderabad, 2017

PROFESSIONAL ELECTIVE-I

PE 3207 CE PAVEMENT CONSTRUCTION AND MANAGEMENT

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT-1
Flexible Pavement Construction: Earthwork, compaction and construction of embankments, specifications of materials, construction methods and field control checks for various types of flexible pavement materials in subbase, base, binder and surface course layers and their choice

UNIT-II
Cement Concrete Pavement Layers: Specifications and method of cement concrete pavement construction; Construction of interlocking block pavements, Quality control tests; Construction of various types of joints;

UNIT-III
Soil Stabilized Pavement Layers: Principles of gradation/proportioning of soilaggregate mixes and compaction; Design factors, mix design, construction control and quality control checks for mechanical, soil-cement, soil-bitumen and soil-lime stabilization methods. Use of additives, Numerical problems on mix design and applications

UNIT-IV
Pavement Evaluation - Pavement Distress - Functional and structural condition of pavements, Pavement distress survey, Functional condition evaluation of pavements-Roughness, Skid Resistance. Structural evaluation of pavements - nondestructive testing, Benkelman beam and Falling Weight Deflectometer, Pavement strengthening based on deflection as per IRC, Maintenance and rehabilitation techniques

UNIT-V
Pavement Management Systems - Pavement Management Systems- Components, structure, data requirements, Project level and Network level needs, Pavement performance, prediction – concepts, modelling techniques– AASTHO, CRRI and HDM models, Budget forecasting for maintenance and rehabilitation, Ranking and optimization methodologies, life cycle costing,

Suggested Reading
1. 'Highway Engineering', Paul H.Wright, Karen K.Dixon, John Wiley& Sons,.7th edition.2004.
2. 'The Asphalt Handbook', MS-4, Asphalt Institute, Maryland, 1989

PROFESSIONAL ELECTIVE-II

PE 3208 CE ADVANCED DESIGN OF CONCRETE STRUCTURES

Instruction: 3 periods per week Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT - I
Introduction to Columns and footings, Definition, IS codes. Elastic design and detailing of combined rectangular footings.

UNIT - II
Design of Ribbed slabs and Flat slabs: Introduction to ribbed and flat slabs**,** Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements. Flat slabs: IS specifications and general notes on flat slabs Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears – Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip.

UNIT - III
Retaining Walls- Different types of Retaining Walls. Proportioning the retaining walls Determining the Lateral earth pressure on Retaining walls. Perform the Stability checks: overturning, sliding, bearing capacity, and settlement .Elastic design and detailing of retaining walls-cantilever and counter fort types.

UNIT - IV
Types of water tanks, Definition, IS codes. Elastic design and detailing of rectangular and circular, ground and over head tanks including Intz tanks. Design of staging.

UNIT - III
Bridges: Introduction to Bridges, Classification of Bridges, Recent advances in Bridge Engineering, IRC loading – impact factor – effective width method and Pigeaud's method. Elastic design and detailing of (i) R.C. Slab bridges and (ii) T-beam bridges for IRC loadings.

Suggested Reading:
1. Krishna Raju, N. (2009). "Structural Design and Drawing (third Edition)." Universities press.
2. Punmia, B. C., Jain, A.K and Jain, A. K. (2006). "RCC designs (Reinforced concrete structures). Laxmi publications (10th edition).
3. Phatak,(1990). "Bridge Engineering." Satya Prakashan Publishers.
4. Johnson D. Victor. (2006). "Essentials of Bridge Engineering." Oxford &IBH Publishers, Pvt.Ltd., New Delhi.
5. **Note:** All latest relevant IS codes necessary for teaching this course may be introduced and referred in detail by the Faculty Concerned
6. IS : 456 : 2000, Code of Practice for Plane and Reinforced Cement Concrete,
7. SP 16, SP 34.
8. IS 3370 Part I to Part IV

PROFESSIONAL ELECTIVE-II

PE 3209 CE GROUND IMPROVEMENT TECHNIQUES

Instruction: 3 periods per week Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT - I
Introduction : Objectives and necessity of Ground Improvement – Formation of Rock and soils – Alteration of ground after its formation – Reclaimed soils – , Types and distribution of Soils in India - marine, black cotton soils (expansive), lateritic, alluvial, desert, peaty Soils etc - Ground improvement potential – Geotechnical processes.

UNIT - II
Surface Compaction methods : Compaction Mechanism - moisture density relationship – Factors affecting compaction – Laboratory evaluation of Compaction Characteristics – Field Surface Compaction Methods – Compaction procedure – Specification – Quality Control aspects.

In-situ Densification of Cohesionless Soils : Necessity for Deep compaction – Vibration methods – Vibro-compaction methods (Blasting, Vibratory probe, Dynamic compaction / heavy tamping), Vibro-displacement Methods (Displacement Piles, Sand Compaction Piles), vibro-replacement cum displacement methods (Vibro-floatation, Stone Columns).

UNIT - III
In-situ Densification of Cohesive Soils:
Drainage methods – Methods of dewatering systems - selection of pumps and accessories
Pre-compression methods – Concept & benefit of pre-compression -consolidation of Clayey soils – Pre-loading technique – consolidation acceleration methods - consolidation aided with vertical drains – Sand Drains - Pre-fabricated vertical drains, Consolidation by Electro-osmosis and vacuum compression methods - Compression monitoring.

UNIT - IV
Grouting: Aspects of grouting – Types of grout materials – Classification based on Groutability Ratio - grouting procedure – Applications of grouting in ground improvement.
Soil Stabilisation: Types and suitability of stabilization methods - Mechanical, Cementing methods – Aggregants and dispersants – Stabilization procedure – quality control in Soil Stablization.

UNIT - V
Geo-Synthetics: Classification of Geosynthetics – Functions and applications – Concept of design by function.
Reinforced Soil Walls – Components of a RSW – Types of facia – Types of Reinforcement & factors influencing the selection - Design of RSW – construction procedure - Gabions.

Suggested Reading:

1. H.R. Hausmann, (2013), *Principles of Ground Modification,* Mc-Graw Hill Publications.
2. P.Nicholson, (2015), *Soil Improvement and Ground Modification Methods,* Butterworth-Heinemann Ltd.
3. Purushotham Raj, (2016), *Ground Improvement Techniques*, Laxmi Publications.
4. R.M.Koerner, (2012), *Designing with Geosynthetics Vol-1&2*, Prentice Hall Inc.
5. Indrarathna, Chu, Cholachat, (2015), *Ground Improvement Case Histories*, Butterworth-Heinemann Publications.

PROFESSIONAL ELECTIVE-II

PE 3210 CE FINITE ELEMENT METHOD

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT - I
Introduction to FEM: Types of Problems – Types of Materials – Elastic / Inelastic situations – Types of forces: Body forces / Surface Traction / Point loads – Deformable bodies – Types of Deformations – Homogeneous / Non homogeneous Problems – Equations of equilibrium for elastic 2-D / 3-D continua - Equilibrium equations for 2-D / 3-D boundary elements – Boundary conditions – Strain-displacement relation for 2-D / 3-D – Stress-strain relation for 2-D / 3-D – Plane stress / Plane strain problems.
Virtual Work Formulation: Application to problems of plane trusses with static indeterminacy not exceeding three.
Finite Difference Method with Central Differences: Solving ODE's and PDE's with central differences. Application to beam and plate bending problems of simple geometry.

UNIT - II
Variational Formulation : Finite Element Formulation - Stationarity of Functional – Given the Functional or Differential equation – Number of elements limited to two.
1-D Elements: Strain-displacement relation matrix / stiffness matrix / Minimum Potential Energy Approach / Rayleigh-Ritz Method / introduction to natural coordinates / stiffness matrix of second order bar element / Axial bar subjected to point loads, body forces and surface traction forces / Problems with kinematic indeterminacy not exceeding two.
2-D Triangular Elements: Displacement models / criterion for convergence / geometric invariance / conforming and non conforming elements - 3-node triangular elements (CST) / determination of strain-displacement matrix / area coordinates-shape functions / determination of element stiffness and load matrices, assembling global stiffness and load matrices / Problems with kinematic indeterminacy not exceeding three.
2nd Order triangular elements: Shape functions – degradation technique / strain-displacement matrix / Expression for stiffness matrix / Load matrices due to body forces and surface traction.

UNIT - III
Iso-parametric elements:
Quadrilateral elements: Construction of shape functions using natural coordinates/Strain-displacement matrices/Load matrices for body force and surface traction/Expressions for stiffness matrix,load matrices for 4-noded quadrilateral elements/ Gauss Quadrature of numerical integration / Problems with rectangular elements, kinematic indeterminacy not exceeding three.
2nd Order Quadrilateral elements: - Determination of shape functions for 2nd order quadrilateral elements and for elements of with serendipity / Strain-displacement matrices / Load matrices for body force and surface traction.

UNIT - IV
Method of Weighted Residuals:
Galerkin's Method of Weighted Residuals: Application to problems of mathematics / structural engineering, number of trial functions not exceeding two.
Galerkin's Finite Element Method: Weak form of Trial Function - Application to problems of mathematics / structural engineering, number of elements limited to two.

UNIT - V
Axi-symmetric Problems: Strain-displacement relationship/stress-strain relationship / determination of stiffness matrix for 3-noded ring element and load matrices for body force and surface traction/ Problems with kinematic indeterminacy not exceeding three for 3-noded ring elements only.
Tetrahedron elements: Volume coordinates, Strain-displacement matrix, stiffness matrix, load matrices due to body force and surface traction/ introduction to Hexahedron (brick) elements.
Introduction to MSC Nastran: Illustration on different modules of Nastran / Structural engineering applications of the package/Creation of a simple 1-D model, 2-D model and a 3-D model/ analysis and post processing of the results.

Suggested Reading:

1. Cook, R. D. (1981). "Concepts and Application of Finite Element Analysis", John Wiley and Sons.
2. Zienkiewicz, O. C. And Taylor, R. L, (1989). "The Finite Element Method", Vol.1, McGraw Hill Company Limited, London.
3. Reddy, J. N, (1993). "An Introduction to the Finite Element Method", McGraw Hill, New York.
4. Chandrupatla, T. R. And Belegundu, A. D, (2001). "Introduction to Finite Elements in Engineering", Prentice Hall of India, New Delhi.
5. Seshu. P, (2003). "Finite Element Analysis", Prentice Hall of India Private Limited, New Delhi.
6. David V. Hutton, (2005). "Fundamentals of Finite Element Analysis", Tata McGraw-Hill Publishing Company Limited, New Delhi.

PROFESSIONAL ELECTIVE-III

PE 3211 CE STRUCTURAL ANALYSIS

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits : 3   CIE: 30 marks, SEE: 70 marks

UNIT - I
Moving loads: Influence line for support reaction, bending moment and shear force at any location for simple beams. Determination of maximum bending moment and shear force for moving load systems on simply supported girders.
Maximum bending moment and shear force Diagrams: for simply supported girders traversed by (l) single point load, (2) two point loads, (3) uniformly distributed-load longer/shorter than span, enveloping parabola and EUDLL.

UNIT - II
Moving loads on trusses / **girders:** Influence lines for forces in members of statically determinate plane framed structures under moving loads for Warren girder, Pratt truss, and Curved flange truss.
Suspension bridges: Stresses in suspended loaded cables, length of cable, simple suspension bridge with 3-hinged stiffening girders for static load, Influence lines for horizontal and vertical components of tension in the cable, tension in the cable, bending moment and shear force.

UNIT - III
Flexibility Matrix Method: Determination of Static and kinematic indeterminacy - Equilibrium and compatibility conditions-Principles of superposition, Application of Flexibility Matrix Method to continuous beams, plane trusses, plane frames and ortho grid structures (Static indeterminacy not exceeding three) - Effect of temperature, Lack of fit and Pre-stressing forces

UNIT - IV
Stiffness Matrix Method: Application of Stiffness Matrix Method to continuous beams, plane trusses, plane frames and ortho grid structures (Degree of freedom not exceeding three). Construction of stiffness matrix for frames - Direct Method.

UNIT - V
Direct Element Method: Development of stiffness matrices for bar, truss and beam elements. Application of direct element method to problems of axially loaded bars, continuous beams, plane trusses and plane frames to obtain joint displacements and member end forces. Developing shear force and bending moment diagrams. Introduction to software package STAAD Pro.

Suggested Reading:

1. S.B. Junarkar and Shah, *"Mechanics of structures"*, Charotar Pub, House, 2001
2. D.S. Prakash Rao, "*Structural Analysis - a Unified Approach"*, University Press, 1991
3. B.C. Punmia and A.K. Jain, "*Theory of structures"*, Laxmi Publications, New Delhi, 2004
4. Pandit, G .S., S. P. Gupta and R. Gupta, *"Theory of Structures," Vol. I* , Tata McGraw Hill, New Delhi, 1999.
5. J. M. Gere & William Weaver, "*Matrix Analysis of Framed Structures"*, 2nd Ed., D Van Nostand, New Jersey, 1980.

PROFESSIONAL ELECTIVE-III

PE 3212 CE PRESTRESSED CONCRETE

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits: 3   CIE: 30 marks, SEE: 70 marks

UNIT - I
Introduction to prestressed concrete: Historical development, principles of prestressed concrete. Definition, classification and systems of prestressing. Materials for prestressed concrete.
Loss of prestress: Losses of prestress in pre-tensioned and post-tensioned members.

UNIT - II
Analysis of prestress: Basic assumptions, analysis of prestress, resultant stress, pressure line, kern points, cable profiles, load balancing concept, stress diagrams for prestress, dead load and live load.

UNIT - III
Simply supported and continuous beams: concordant cable profile, analysis of continuous prestressed concrete beams.
Design of sections: Flexural strength design of rectangular, I and T sections using IS code provisions.

UNIT - IV
Design for shear: Basic concept of shear design, shear failure, flexural shear failure, shear compression failure, shear tension failure, shear strength of beams (a) unfrocked in flexure and (b) cracked in flexure.

UNIT - V
Deflections: Necessity of deflection estimation, limitations of deflections. Deflections of pre-stressed concrete beams with uniformly distributed and point loads.
End Block: Types of end blocks and Importance of end block, Analysis and design of end block by Guyon method and IS method for not more than two cables.

Suggested Reading:
1. T.Y. Lin and N.H. Burns, *Design of prestressed concrete structure*, Jon Wildy and sons, 1982.
2. A.H. Nilson, *Design of prestressed concrete*, John Wiley and Sons, 1982.
3. N. Krishna Raju, *Design of prestressed concrete structure*, Tata McGraw Hill Book Co., 1996.
4. G.S. Pandit and S.P. Gupta, *Prestressed Concrete*, CBS Publishers, 1995.

PROFESSIONAL ELECTIVE-III

PE 3213 CE GEOGRAPHIC INFORMATION SYSTEMS

Instruction: 3 periods per week   Duration of Semester End Examination: 3 hours
Credits: 3   CIE: 30 marks, SEE: 70 marks

UNIT I
Introduction: Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems.
Projections and Coordinate Systems: Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT II
Data Acquisition and Data Management: data types, spatial, non spatial (attribute) data, data structure and database management, data format, vector and raster data representation, object structural model filters and files data in computer, key board entry, manual digitizing, scanner, aerial photographic data, remotely sensed data, digital data, cartographic database, digital elevation data, data compression, data storage and maintenance, data quality and standards, precision, accuracy, error and data uncertainty.
Data Processing: Geometric errors and corrections, types of systematic and non systematic errors, radiometric errors and corrections, internal and external errors.

UNIT III
Data Modeling: Spatial data analysis, data retrieval query, simple analysis, recode overlay, vector data model, raster data model, digital elevation model, cost and path analysis, knowledge based system.
GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non spatial data

UNIT IV
Applications of GIS: Environmental and natural resource management, soil and water resources, agriculture, land use planning, geology and municipal applications, urban planning and project management, GIS for decision making under uncertainty, software scenario functions, standard GIS packages, introduction to Global Positioning Systems (GPS) and its applications.

UNIT V
Introduction to Remote Sensing: General background of remote sensing technology, objectives and limitations of remote sensing, electro-magnetic radiation, characteristics, interaction with earth surface and atmosphere, remote sensing platforms and sensors, satellite characteristics, digital image processing, IRS series and high resolution satellites, software scenario functions, remote sensing applications to watershed modeling, environmental modeling, urban planning and management.

Suggested Readings:

1. Burrough, P. A., and McDonnell R. A. (1998), 'Principles of Geographical Information Systems', Oxford University Press, New York
2. Choudhury S., Chakrabarti, D., and Choudhury S. (2009), 'An Introduction to Geographic Information Technology', I.K. International Publishing House (P) Ltd, New Delhi
3. Kang-tsung Chang. (2006), 'Introduction to Geographical information Systems',Tata McGraw-Hill Publishing Company Ltd., Third Edition, New Delhi
4. Lilysand T.M., and Kiefer R.W. (2002), 'Remote Sensing and Image Interpretation', John Wiley and Sons, Fourth Edition, New York
5. Sabins F.F. Jr. (1978), 'Remote Sensing Principles and Interpretations', W.H. Freeman and Company, San Francisco
6. Tor Bernhardsen. (2002), 'Geographical Information System', Wiley India (P) Ltd., Third Edition, New Delhi
7. Hoffman-Wellenhof, B, et al. (1997), 'GPS Theory and Practice',Fourth Edition, Springer Wein, New York.

PC3211CE GREEN BUILDING TECHNOLOGY

Instruction : 3 periods per week   Duration of Semester End Examination   3 hours
Credit 3   SEE 70marks CIE 30marks

UNIT-I
Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT-II
Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

UNIT-III
Climate, solar radiation and their influences - Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT-IV
End-use, energy utilization and requirements - Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer.

UNIT-V
Energy management options - Energy audit and energy targeting - Technological options for energy management.

Suggested Readings:
1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
2. Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila.
3. Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences and Reflections,
4. Prentice Hall of India, New Delhi.
5. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.

LABORATORY COURSES

PC 3213 CE ENVIRONMENTAL ENGINEERING LABORATORY

Instruction: 2 periods per week   Duration of Semester End Examination: 3 hours
Credits : 1,   CIE: 25 marks, SEE: 50 marks

<u>LIST OF EXPERIMENTS</u>

1. a) Determination of total dissolved solids

   b) Determination of total suspended solids

   c) Determination of fluorides

2. Determination of total hardness

3. Determination of alkalinity

4. Determination of chlorides

5. Determination of sulphates

6. Determination of MPN

7. Determination of residual chlorine

8. Determination of optimum alum dosage

9. Determination of BOD

10. Determination of COD

LABORATORY COURSES

PC3214CE TRANSPORTATION ENGINEERING LABORATORY

Instruction : 2 hrs per week   **Duration of Semester End Examination : 3 Hrs**

Credits : 1   **CIE : 25 marks, SEE : 50 marks**

A) **Tests on Bitumen:**
1) Penetration test
2) Ductility test
3) Softening point test
4) Specific Gravity test
5) Viscosity test,
6) Flash and Fire point test

B) **Tests on Aggregate:**
1) Aggregate Crushing test,
2) Los Angles Abrasion test,
3) Aggregate Impact test,
4) Shape test,
5) Specific gravity and Water Absorption,
6) Soundness

C) **Experiments on Traffic:**
1) Traffic Volume study
2) Spot speed study
3) Speed and delay study
4) Origin & Destination study

D) **Miscellaneous Tests (Demo):**
1) Marshall Stability,
2) Bitumen Extraction
3) Stripping test
4) DCP test

Suggested Reading:
1. Khanna SK and Justo CEG, 'Highway material testing' (Lab manual), Nem Chand & Bros
2. Relevant IS and IRC Codes of practice
3. Relevant ASTM and AASHTO codes of practice

SUMMER INTERNSHIP

Objectives:

- To give an experience to the students in solving real life practical problems with all its constraints.
- To give an opportunity to integrate different aspects of learning with reference to real life problems.
- To enhance the confidence of the students while communicating with industry engineers and give an opportunity for useful interaction with them and familiarize with work culture and ethics of the industry
.

Summer Internship is introduced as part of the curricula for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Industry / R & D Organization / National Laboratory for a period of 6 weeks. This will be during the summer vacation following the completion of the VI semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide.

After the completion of the project, students will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the department.

*Students have to undergo summer internship of 6 Weeks duration at the end of VI semester

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Department of Civil Engineering

B. Tech. (Civil Engineering) VII SEMESTER

S.No	Course Code	Course Title	Scheme of Instruction			Lecture Hrs/ week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
Theory									
1.	PC4101CE	Estimation Costing and Specification	3	1	-	4	30	70	4
2.	PEC IV*	Professional Elective -IV	3	-	-	3	30	70	3
3.	PEC V*	Professional Elective -V	3	-	-	3	30	70	3
4.	PEC VI*	Professional Elective -VI	3	-	-	3	30	70	3
5.	OE I	Open Elective -I	2	-	-	2	30	70	2
PRACTICALS									
6.	PW4115CE	PROJECT WORK PART A	-	-	4	-	25	50	2
7.	PC4116 CE	Computer Aided Building Lab	-	-	3	-	25	50	1.5
		Total	14	1	7	15	200	450	18.5

* (PE-IV) **PROFESSIONAL ELECTIVE COURSE -IV**	
PE4102 CE	Analysis and Design of Bridges
PE4103 CE	Applied Hydrology
PE4104 CE	Road Safety Engineering

* (PE-V) **PROFESSIONAL ELECTIVE COURSE -V**	
PE4105 CE	Retrofitting and Rehabilitation of Structures
PE4106 CE	Elements of Earth Quake Engineering
PE4107 CE	Finite Element Analysis

*(PE-VI) **PROFESSIONAL ELECTIVE COURSE -VI**	
PE4108 CE	Railway Infrastructure Planning and Design
PE4109CE	Ground Water Management
PE4110 CE	Intelligent Transportation System

* OE I **OPEN ELECTIVE I**	
OE4111 EC	Optimization Techniques
OE4112 EC	Fundamentals of IOT
OE4113 ME	Basic Material Science and Engineering
OE4114 HS	IPR and Patenting

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KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CE) VII SEMISTER
PC4101CEEstimation Costing and Specification
(Professional Core Course)

Course code	PC4101CE				
Category	Professional Core Course				
Course title	Estimation Costing and Specification				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	1	-	4	External Marks = 70

UNIT – I

Basic Principles and Specifications: General and detailed specifications of works, departmental procedures to the construction works, types of estimates, various types of contract, turnkey projects, essentials of contracts and conditions of contracts, schedule of rates, standard data, rate analysis, bill of quantities.

UNIT – II

Tenders and Documentation: Tenders, preparation of tenders, tender documentation, Tender notice, work order, earnest money deposit, and security money deposits, comparative statements, additional conditions mentioned by tender, and those implications. Measurement book and muster roll, advances in tender procedures. National/International bidding.BOT, BOOT and PPP projects. Role of IT in tenders and construction industry.

UNIT – III

Estimation of Buildings and Roads: Traditional residential buildings, advanced buildings (earth work, footings, columns, beams and slabs etc.) by long wall and short wall method and centre line method, bar bending schedules, estimation of reinforcement quantities.
Estimation of road works: Using levels (cross sections and longitudinal sections).

UNIT – IV

Estimation of Irrigation Structures: Pipe culvert, slab culvert, simple bridge, irrigation canal including earth work (cutting and banking), overhead water tank and aqueduct.

UNIT – V

Software's in estimation: Preparation of estimates using computer software/excel sheets/available software's, introduction to MS Project.

Suggested Readings:
1. Dutta, B.N. (2016). *Estimating and Costing in Civil Engineering: Theory and Practice*. UBS Publishers' Distributers Pvt. Ltd., New Delhi.
2. Chakraborthi, M. (2002). *Estimating, Costing and Specifications in Civil Engineering*. Chakraborthi, Kolkata.
3. Jagjit Singh. (1996). *Estimating and Costing in Civil Engineering*. Galgotia Publications, New Delhi

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B. Tech. (CE) VII SEMISTER
PE4102 CE Analysis and Design of Bridges
(Professional Elective Course)

Course code	PE4102 CE				
Category	Professional Elective Course				
Course title	Analysis and Design of Bridges				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT -I

Introduction - Introduction to bridge Engineering: Types of bridges, materials of construction, codes of practice (Railway and Highway bridges), aesthetics, loading standards (IRC, RDSO,AASHTO), recent developments, box girder bridges, historical bridges (in India and overseas),planning and layout of bridges, hydraulic design, geological and geotechnical considerations, Developments in road and urban infrastructure.

UNIT - II

Concrete Bridges - Materials requirements, precast systems and materials used for precast and cast in-situ bridges. Bridge deck and approach slabs, design of bridge deck systems, slab-beam systems design philosophies.

UNIT - III

Composite Bridges Importance of composite bridges, orthotropic decks, box girders, composite structures, concrete bridges, analysis and design of composite sections.

UNIT - IV

Sub-structures -Introduction to sub structures, design of Piers, columns and towers, analysis and design, shallow and deep foundations, caissons, abutments and retaining walls. Bridge components - Introduction, Expansion joints, design of joints, types and functions of bearings, design of elastomers bearing, railings, drainage system, lighting.

UNIT-V

Long Span Bridges - Introduction, design specifications, Design principles of continuous box girders, curved and skew bridges, cable stayed and suspension bridges, seismic resistant design, seismic isolation and damping devices. Construction Techniques - Cast in-situ, prefabricated, incremental launching, free cantilever construction, inspection, maintenance and rehabilitation, current design and construction practices. Innovative materials, construction techniques and methodologies.

Suggested Reading :
1. Wai-Fah Chen LianDuan, Bridge Engineering Handbook, CRC Press, USA,2000.
2. R. M. Barker, and J. A. Puckett, Design of Highway Bridges, John Wiley & Sons, New York, 1997.
3.P. P. Xanthakos, Theory and Design of Bridges, John Wiley & Sons, New York, 1994.

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Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
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B. Tech. (CE) VII SEMISTER
PE4103 CEApplied Hydrology
(Professional Elective Course)

Course code	PE4103 CE				
Category	Professional Elective Course				
Course title	Applied Hydrology				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT – I

Flood Characteristics and Forecasting: Measureable features of a flood (Elevation, discharge, volume, and duration), flood forecasting (unit hydrograph method, meteorological and snow data, and snow field air temperatures), operation of flood forecasting systems.

Space-Time Characteristics of Rainfall: Policy criteria for design flood of a major and minor reservoir, spillways, diversion dams and barrages, design flood criteria for dams and other hydraulic structures (CWC recommendations).

UNIT – II

Flood Routing: Mathematics of flood routing, various methods of flood routing, Hydrologic and Hydraulic routing.

UNIT – III

Flood Mitigation: Flood mitigation reservoirs (purpose, location, size and operation) levees and flood walls(location, maintenance and flood fighting), flood ways, channel improvement, evacuation and flood proofing, land management, flood plain management, estimating benefits of flood mitigation.

UNIT – IV

Flood Plain Adjustments and Regulations: Results of controlling floods, alternatives to controlling floods, range of possible adjustments, practical range of choice, critical characteristics of flood hazards, classification of flood plain land, and regulation of flood plain use, river training works (guide banks, approach and afflux embankments, spurs / groynes, artificial cut-offs, bank protection, pitched banks, and miscellaneous methods).

UNIT – V

Hydrologic Time Series Analysis: Independent and Auto-correlated data, structure of hydrologic time series, trend, jump, seasonality, stationary, Auto-covariance and Auto-correlation Function, Correlogaram Analysis, spectral Analysis, Analysis of Multi-Variant Hydrologic series.

Suggested Readings:
1. VenTe Chow (1964), *Hand Book of Applied Hydrology*, McGraw-Hill Publishers, New York.
2. Linsley, R. K. and Franzini A. W. (1992), *Water Resource Engineering*, McGraw-Hill Publishers, New York.
3. Varshney, R. S. (1979), *Engineering Hydrology*, Nem Chand Publishers, Roorkee.
4. Jaya Rami Reddy, P. (1987), *A. Text Book of Hydrology*, Lakshmi Publishers, New Delhi.
5. Daniel H. Hoggan (1989), *Computer Assisted Flood Plain Hydrology and Hydraulics*, McGraw-HillPublishers, New York.

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B. Tech. (CE) VII SEMISTER
PE4104 CE Road Safety Engineering
(Professional Elective Course)

Course code	PE4104 CE				
Category	Professional Elective Course				
Course title	Road Safety Engineering				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT – I

Road Accidents: Causes, scientific investigations and data collection, Analysis of individual accidents to arrive at real causes, statistical methods of analysis of accident data, Basic concepts of Road accident statistics, Safety performance function: The empirical Bayes method Identification of Hazards road location. Application of computer analysis of accident data.

UNIT – II

Safety in Road Design: Operating the road network for safety, highway operation and counter measures, road safety audit, principles-procedures and practice, code of good practice and checklists, vehicle design factors & Driver characteristics influencing road safety.

UNIT – III

Road Signs and Traffic Signals: Classification, Location of Signs, measures of sign effectiveness, Types of visual perception, sign regulations, sign visibility, sign variables, Text versus symbols. Road Marking: Role of Road markings, Classification, visibility. Traffic Signals: Need, Signal face. Illumination and location of Signals, Factors affecting signal design, pedestrians' safety, fixed and vehicle actuated signals. Design of signa1s, Area Traffic control. Delineators, Traffic Impact Attenuators, Road side rest areas, Safety Barriers, Traffic Aid Posts.

UNIT – IV

Traffic Management Techniques: Integrated safety improvement and Traffic Calming Schemes, Speed and load limit, Traffic lights, Safety cameras, Tests on driver and vehicles, pedestrian safety issues, Parking, Parking enforcement and its influence on Accidents. Travel Demand Management; Methods of Traffic management measures: Restriction of Turning Movements, One-way streets, Tidal Flow Operation Methods, Exclusive Bus Lanes and Closing Side-streets; Latest tools and techniques used for Road safety and traffic management. Road safety issues and various measures for road safety; Legislation, Enforcement, Education and Propaganda, Air quality, Noise and Energy Impacts; Cost of Road Accidents.

UNIT – V

Incident Management: Introduction, Characteristics of Traffic Incidents, Types of Incidents, Impacts, Incident management process, Incident traffic management; Applications of ITS: Motorist information, Equipment used; Planning effective Incident management program, Best practice in Incident management programs. National importance of survival of Transportation systems during and after all natural disasters especially cyclones, earthquakes, floods etc. and manmade disasters like sabotage, terrorism etc.

Suggested Readings:
1.Guidelines on Design and Installation of Road Traffic Signals, IRC:93.
2.Specification for Road Traffic Signals, IS: 7537-1974.
3.Principles and Practice of Highway Engineering by L.R. Kadiyali and N.B. Lal.
4.Hand Book of T.E. Myer Kutz, Editor McGraw Hill, 2004.

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B. Tech. (CE) VII SEMISTER
PE4105 CE Retrofitting and Rehabilitation of Structures
(Professional Elective Course)

Course code	PE4105 CE				
Category	Professional Elective Course				
Course title	Retrofitting and Rehabilitation of Structures				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT – I

Introduction to Building Maintenance: Definitions of repair, renovation, re-modeling, restoration, retrofitting and rehabilitation. Need for maintenance, types of maintenance, routine maintenance works in buildings.

Types of Defects and Damages in Structures: During pre-construction stage, construction stage and post construction stage. Cracks – Types, Causes and Characteristics

UNIT – II

Mechanisms of Deterioration of Structures & Their Prevention: Concrete Structures: Defects in fresh concrete - Early frost damage, plastic shrinkage, plastic settlement (subsidence), sub grade settlement, formwork movements. Deterioration in hardened concrete: (a) Physical causes - aggregate shrinkage, drying shrinkage, crazing (b) Chemical causes: acid attack, sulphate attack, chloride attack, carbonation, alkaliaggregate reaction, corrosion of reinforcement, (c) Thermal causes: Freeze-thaw, temperature variations, differential thermal expansions, humidity influences, (d) Structural causes: improper design loads, accidental overloads, creep

Steel Structures: Causes and types of deterioration, mechanism of corrosion, prevention of deterioration, influence of design details, design and fabrication errors, stresses due to erection.

UNIT – III

Condition Assessment and Non-destructive Testing & Evaluation: Definition, objectives and stages of condition assessment, Destructive and partially destructive tests. Non-destructive tests (NDTs). Classification of NDT procedures, Visual Inspection, Ultrasonic Testing methods (Impact echo, Pulse velocity, Pulse echo), Rebound hammer (IS 13311), Windsor probe test, Half-cell potential measurement, Electrical resistivity measurement, Carbonation depth measurements, Petrographic Analysis, Electromagnetic methods for Rebar detection, Ground Penetrating radar, Infrared thermography, Radiography, Radio isotope gauges, Remote viewing, Hammer sounding, Chain drag techniques.

UNIT – IV

Repair Materials and Techniques: Repair Methodology, Repair materials (cement-based, polymer-based, resin based, micro Crete, composites, etc.), compatibility considerations, Repair techniques: Using mortars,dry pack, epoxy bonded pack, pre-placed aggregate concrete, gunite, shotcrete, grouting, polymerimpregnation, resin injection, routing & sealing, stitching, surface patching, overlays & surface coatings, auto genius healing, gravity filling, drilling and plugging

UNIT – V

Retrofitting & Rehabilitation Procedures: Strengthening of Existing Structures – Overview, general procedures, Techniques: section enlargement, composite construction, post-tensioning, stress reduction, strengthening by reinforcement, methods of strengthening in beams, slabs, columns (plate bonding, RC jacketing, FRP methods, concrete overlays, etc.) strengthening of substructure (shoring, underpinning)

Suggested Readings:
1. Varghese P. C. (2015), *Maintenance, Repair & Rehabilitation & Minor Works of Buildings*, PHI Learning Pvt. Ltd, Delhi.
2. Modi P.I. and Patel C.N. (2016), *Repair and Rehabilitation of Concrete Structures*, PHI Learning Pvt. Ltd, Delhi.
3. Peter H. Emmons, (2001), *Concrete Repair and Maintenance Illustrated*, Galgotia Publications, New Delhi.
4. Johnson.S.M., (1980), *Deterioration, Maintenance and Repair of Structures*, Krieger Publishing, Melbourne, Florida.
5. Guha. P.K., (1998), *Maintenance and Repairs of Buildings*, New Central Book Agency Ltd., Kolkata.
6. SP: 25-1984, (1999), *Handbook on Causes and Prevention of Cracks in Buildings*, BIS, New Delhi.
7. Guide Book on *Non-destructive Testing of Concrete Structures*, Training course series No. 17, International Atomic Energy Agency, Vienna, 2002.
8. Hand book on *"Repair and Rehabilitation of RCC Buildings"*, Published by Director General, CPWD, Govt. of India, 2002

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B. Tech. (CE) VII SEMISTER
PE4106 CE Elements of Earth Quake Engineering
(Professional Elective Course)

Course code	PE4106 CE				
Category	Professional Elective Course				
Course title	Elements of Earth Quake Engineering				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT-I

Engineering Seismology: Causes of earthquakes, seismic waves, magnitudes, intensity and energy release, characteristics of strong earthquake ground motions, soils effects and liquefaction.

UNIT - II

Theory of Vibrations: Introduction, long and short period structure. Single, two and multi- degree of freedom systems. Concepts of damped and un-damped vibrations, response spectrum, response spectrum analysis.

UNIT - III

Structural Systems for Seisimic Design: Requirements of an efficient earth quake resistant Structural System, Seismic Response Control Concepts, Seismic Behavior of Masonry Structures Base Isolation, Damping Device Rehabilitation and retrofitting: seismic retrofitting, repair, rehabilitation and retrofitting

UNIT - IV

Computation of Seismic Forces on the Structures- Earthquake Resistant Design of RCC Structures as per IS code - Equivalent Lateral Force Procedure, Dynamic Analysis Procedure, Lateral drift and P-A Analysis, Load Combination, Provision for the analysis and design of frames with soft storey, Effect of soil -structure Interaction

UNIT - V

Design and Detailing of RCC Building Structures: Ductility in RCC Structures, Ductile Detailing of Column and flexural members subjected to combined bending and axial load as per IS code. Reinforced Concrete Shear Wall

Suggested Reading:

1. Chopra, A.K.(2004)."Dynamics of structures, Theory and application to earthquake Engineering."Pearson Education.
2. PankajAgarwal and Manish Shrihkande (2006)."Earthquake Resistance Design of Structures."Prentice Hall ofIndia.
3. Kramer, S. L. (2004). Geotechnical Earthquake Engineering, PearsonEducation.
4. Mario Paz. (1995). International Handbook of Earthquake Engineering: Codes, programs and examples, Springer Verlag.
5. D.S.PrakashRao. (2005). Design principles and detailing of concrete structures, Tata McGraw-hillpublishingcompany.
6. VinodHosur (2016) "Earthquake Resistance Design of Structures." Wiley India Pvt Ltd

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B. Tech. (CE) VII SEMISTER
PE4107 CE Finite Element Analysis
(Professional Elective Course)

Course code	PE4107 CE				
Category	Professional Elective Course				
Course title	Finite Element Analysis				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT – I
Introduction to Finite Method: Variational approach, Rayleigh-Ritz and Galerkin's methods. Stiffness matrix for two noded bar, truss, and beam elements, problems with three degrees of freedom.

UNIT – II
Stiffness Matrix: Two noded beam element with three degrees of freedom per node. Transformation, generation of stiffness matrix for frames. Strain-displacement and stress – strain relationship in an elastic continuum (linear problems).Equations of equilibrium, and boundary conditions. Plane stress and plane strain problems.

UNIT – III
Formulation of Finite Element Method: Using principle of virtual displacement. Determination of stiffness matrix for three noded triangular element (constant strain triangle), and four noded rectangular element for plane stress and plane strain problems. Convergence criteria for selection of displacement models. Discretisation of continuum. Assembly of global stiffness and load matrices. Displacement boundary conditions.

UNIT – IV
Isoparametric Finite Elements: Direct construction of shape functions for higher order elements using natural co-ordinate system. Shape functions for eight noded parabolic curved iso-parametric element. Determination of element stiffness matrix for four noded quadrilateral element. Use of Jacobian, and Gaussquadrature techniques. Load matrix for eight noded rectangular isoparametric element (for body forces and surface traction).

UNIT – V
Strain Displacement: Stress – strain relation for axisymmetric problems. Stiffness matrix for three noded ring element. Volume co-ordinates and stiffness matrix for four noded tetrahedron element. Exposure to FEM based software's.

Suggested Readings:
1. O.C. Zienkiewicz and R.L. Taylor*, The Finite Element Method*, Vol. I, McGraw Hill, 1989.
2. K.J. Bathe, *Finite Element Procedures*, Pearson Education, 2006.
3. S. M. Jalaludeen, *Finite Element Analysis*, Anuradha Publications, 2016.
4. S.S. Bhavakatti, *Finite Element Analysis*, New Age International Publishers, 2005.
5. C.S. Krishna Moorthy, *Finite Element Analysis*, McGraw Hill, 1991.
6. T.R. Chandrupatla, *Finite Element Analysis for Engineering and Technology*, Universities Press, 2004

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B. Tech. (CE) VII SEMISTER
PE4108 CE Railway Infrastructure Planning and Design
(Professional Elective Course)

Course code	PE4108 CE				
Category	Professional Elective Course				
Course title	Railway Infrastructure Planning and Design				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT-I
General Features and Alignment of Railway Lines: Development in Indian railways, modes of transport, organization of Indian railways, finances and their control commission of railway safety, long term planning process, classification of railway lines, general features of Indian railways, impartment statistics. Alignment of railway lines, railway track gauge, engineering surveys.

UNIT-II
Rails, Sleepers, Track and Track Stresses: Requirements of good track, Maintenance of permanent way, track as an elastic structure, coning of wheels, tilting of rails. Functions of creep, creep adjuster, measures to reduce creep. Sleepers; functions and requirements, sleeper density and spacing of sleepers, types of sleepers, Rails: types, requirements for an ideal rail section, rail manufacture, rail wear, defects in rails and rail flaw detection. Creep: causes, effects of creep, measurement trough, cast iron, concrete etc.

UNIT-III
Geometric Design of Track; Necessity of Geometric design, design of track, curves and super elevation, transition curve, reverse curve, extra clearance of curves, widening of gauge on curves, vertical curves, cutting rails on curves, check rails on curves.

UNIT-IV
Sub grade Formation and Ballast; Slope of formation, execution of earthwork in embankments and cuttings, blanketing Material, Failure of railway embankment, site investigations. Ballast: functions, types, sizes of ballast, requirement of good ballast, design of ballast section, collection and transportation of ballast, methods of measurement, laboratory tests for physical properties of ballast. Track dt.

UNIT-V
Points and Crossings, Signaling and Interlocking: Important terms, Crossings, number and angle of crossing, reconditioning of worn out crossings, Switches, turnouts, layout of turnout, trends in turnout design on Indian Railways, inspection and maintenance of points and crossings. Level crossing: Classification, types, dimensions, accidents and remedial measures, maintenance and inspection. Signaling and interlocking: Objectives, types, signaling systems, systems for controlling train movement, interlocking, modern signaling installations.

Suggested Reading
1. Chandra, S.and Agarwal.M.M. "Railway Engineering". Oxford University Press, New Delhi, 2007.
2. Rangwala, K. S. "Principles of Railway Engineering". Charotar publishing House, India, 1991
3. Mundrey J.S. "Railway Track Engineering". McGraw Hill Education (India) Private Limited, 2009.
4. Clifford F. Bonnett.. "Practical Railway Engineering" (2nd Edition), Imperial College
Press, 2005.

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B. Tech. (CE) VII SEMISTER
PE4109 CE Ground Water Management
(Professional Elective Course)

Course code	PE4109 CE				
Category	Professional Elective Course				
Course title	Ground Water Management				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT – I

Introduction: Ground water in hydrologic cycle, Distribution of subsurface water, ground water potential in India and A.P, occurrence of Ground water in hydro geologic formations, components of groundwater studies, Darcy's law and its validity. Geophysical methods in groundwater Exploration: surface geophysical methods; Electrical resistivity method, seismic method, magnetic method, determination of aquifer thickness.

UNIT – II

Governing Equations of Groundwater Flow in Aquifers: 3-D Ground water flow equations in Cartesianand polar coordinates. Equations for steady radial flow into a well in case of confined and unconfinedaquifers, Equations for effect of uniform recharge in a fully penetrating unconfined aquifer, well flow nearaquifer boundaries. Equations for unsteady radial flow into a well in case of confined aquifer, determination of S and T by Thei's graphical method, Cooper- Jacob's and Chow's method.

UNIT – III

Sources and Types of Groundwater Contamination: Introduction underground storage tanks, landfills, surface impoundments, waste disposal of injection wells, radioactive contaminants, classification of organic compounds, inorganic compounds in ground water. Mechanism of salt water intrusion, Ghyben-Herzbergrelation, slope and shape of the interface, prevention and control of seawater intrusion, case studies involvingsea water intrusion.

UNIT – IV

Contaminant Transport: Introduction, advection process, diffusion and dispersion process, mass transport equation governing flow and transport equations, analytical methods, tests for dispersivity. **Non-Aqueous Phase Liquids (NAPL'S):** Types general processes transport; fate of NAPL'S in subsurface.

UNIT – V

Models in Groundwater Analysis: Major applications of ground water models, sand models, viscous fluid models, membrane models, thermal models, Electric-Analog models, numerical modeling of ground water systems.

Suggested Readings:
1. Rastogi, A.K. (2007). *Numerical Groundwater Hydrology*. Penram International Publishing (India) Pvt Ltd.
2. Ven-Te-Chow. (1964). *Hand Book of Applied Hydrology*. McGraw Hill Company, New York.
3. Todd, D.K. (1980). *Groundwater Hydrology*. John Wiley and Sons, New York.
4. Karanth, K. R. (1987). *Groundwater Assessment, Development and Management*.Tata McGraw-Hill publishing company New Delhi.
5. Raghunath H.M (1982). *Ground Water*. Wiley Eastern Ltd, New Delhi

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B. Tech. (CE) VII SEMISTER
PE4110 CE Intelligent Transportation System
(Professional Elective Course)

Course code	PE4110 CE				
Category	Professional Elective Course				
Course title	Intelligent Transportation System				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT – I

Fundamentals of Intelligent Transportation System (ITS): Basics of ITS s, The historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.

UNIT – II

Data Requirements for ITS: Importance of telecommunications in the ITS system. Information Management, Traffic management Centres (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centres; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques - Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, data collection using videos.

UNIT – III

Functional Areas of ITS: Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems(AVCS), Advanced Public Transportation System (APTS), Advanced Rural Transportation Systems(ARTS). ITS User Needs and Services – Travel and Traffic Management, Public Transportation management, Electronic Payment, Commercial Vehicle Operations, Emergency management, Advances Vehicle safety systems, information Management.

UNIT – IV

ITS Architecture: Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and Safety, and ITS Security ITS as a technology deployment program, research, development and business models/modules, ITS Planning.

UNIT – V

ITS Applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road –pricing; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation in situations Automated Highway Systems- Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the world – Overviews of ITS implementation in developed countries, IRS in developing countries.

Suggested Readings:

1. Joseph, S.S. (2008). "*Perspectives on Intelligent Transportation Systems*", Springer publishers, USA.

2. Chowdhury, M. A., Sadek, A. and Boston, M.A. (2003). "*Fundamentals of Intelligent Transportation Systems Planning",* Artech House, -USA.

3. Kan Paul and Chen Jhon Miles (2007). "*Intelligent Transportation Systems",* Hand Book 2000: Recommendations for World Road Association (PIARC).

4. USDT. (2007), "*National ITS Architecture Documentation*", U.S. Department of Transportation, USA

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B. Tech. (CE) VII SEMISTER
OE4111 EC Optimization Techniques
Open Elective

Course code	OE4111 EC				
Category	Open Elective				
Course title	Optimization Techniques				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

Unit-I

Introduction: Statement of an optimization problem, Classification of optimization problems, Overview of various optimization Techniques, Properties of vectors, norms, positive semi-definite matrices.

Unit-II

Classical optimization techniques: Single variable optimization, Multivariable optimization, Convexity and concavity of functions of one and two variables, convex optimization problems, the simplex optimization technique, Test Functions.

Unit-III

Unconstrained optimization: General properties of minimization algorithms, Line search, the gradient method, Newton's method, least square Algorithm. Constrained optimization: Active constraints versus inactive constraints, transformations

Unit-IV

Genetic algorithm (GA): Fundamentals of Genetic algorithm, History, Basic concepts, working principle, Applications of GA.

Unit-V

Swarm intelligence: Basic particle swarm optimization, initialization techniques, Theoretical investigations and parameter selection, Design of PSO algorithm using computational statistics, Application of PSO.

Suggested Readings:

1. Richard W Daniels, An Introduction to Numerical Methods and Optimization Techniques, Elsevier North Holland Inc,
2. S Rajasekharan, G.A Vijaya Lakshmi Pai, Neural Networks, Fuzzy logic, and Genetic algorithms, Synthesis and Applications, Prentice hall of India, 2007
3. Rao, S.S., *"Engineering Optimization: Theory and Practice",* John Wiley & Sons, Inc., 2009
4. Taha, H.A., *"Operations Research, Pearson Education India",* New Delhi, India, 2008.
5. Randy L. Haupt and Sue Ellen Haupt, *"Practical genetic algorithms"* second edition, a John Wiley & sons, inc., publication -2004.

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Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CE) VII SEMISTER
OE4112EC Fundamentals of IOT
(Open Elective Course)

Course code	OE4112 EC				
Category	Open Elective Course				
Course title	Fundamentals of IOT				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

UNIT- I
Introduction to Internet of Things: IoT vision, Strategic research and innovation directions, IOT Applications, Related future technologies, Infrastructure, Networks and communications, Processes, Data Management, Security, Device level energy issues.

UNIT- II
Internet Principles and communication technology: Internet Communications: An Overview – IP, TCP, IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols – HTTP, HTTPS, Cost Vs Ease of Production, Prototypes and Production, Open-Source Vs Closed Source.

UNIT- III
Prototyping for IoT: Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping Hardware platforms – Arduino, Raspberry Pi.

UNIT- IV
Cloud computing and Data Analytics: Introduction to Cloud storage models -SAAS, PAAS, and IAAS. Communication APIs, Amazon web services for IOT.

UNIT- V
IoT Product Manufacturing - From prototype to reality: Business model for IoT product manufacturing, Business models canvas, Funding an IoT Startup.

Suggested Readings:
1. *"Internet of Things"* - Converging Technologies for smart environments and Integrated Ecosystems, River Publishers.
1. Adrian McEwen, Hakim Cassimally, *"Designing the Internet of Things",* Wiley India Publishers
2. Daneil W lewies, *"Fundamentals of embedded software: where C meets assembly",* Pearson.
3. ArshdeepBahga*, "Internet of things -A hands on Approach"* Universities press.

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KAKATIYA UNIVERSITY, WARANGAL-506 009
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B. Tech. (CE) VII SEMISTER
OE4113ME Basic Material Science and Engineering
(Open Elective Course)

Course code	OE4113 ME				
Category	Open Elective Course				
Course title	Basic Material Science and Engineering				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

UNIT-I

Introduction: Importance of Material Science, Level of structures, structure property relationship, Defects in materials,

UNIT-II

The Iron carbon systems: Definition of phase, phase diagram, Iron Carbon Phase diagram, Concept of Steel and Cast Iron. Phases in Fe-C system.

UNIT-III

Steels: Effect of alloying elements on steel. Properties of plain carbon steels, stainless steel and tool steels

UNIT-IV

Cast irons: Properties and applications of Ductile irons, Malleable irons, Grey Cast Iron, Spheroidal Cast iron

UNIT-V

Non Ferrous Metals: Aluminum Alloys limited to designation and properties, Copper alloys limited to basic brasses and bronzes their properties

Suggested Readings:
1. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007
2. Introduction to Physical Metallurgy – SH Avner, TATA Mc GRAW HILL ,1997
3. C. Suryanarayana, Experimental Techniques in Mechanics and Materials, John Wiley, John Wiley, NJ, USA, 2006

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KAKATIYA UNIVERSITY, WARANGAL-506 009
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B. Tech. (CE) VII SEMISTER
OE4114HSIPR and Patenting
(Open Elective Course)

Course code	OE4114HS				
Category	Open Elective Course				
Course title	IPR and Patenting				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

UNIT-I

Introduction to intellectual property Act and Law-the evolutionary past-the IPR tool kit- legal tasks in intellectual property law-ethical obligations in Para legal tasks in intellectual property law

UNIT-II

Introduction to trade mark – Trade mark registration process-Post registration procedures-Trademark maintenance – transfer of rights-inter party's proceeding – Infringement-Dilution ownership of trade mark-likelihood of confusion – trademark claims- trademark litigations

UNIT-III

Introduction to copy rights- principles of copyright – subjects matter of copy right- rights afforded by copyright law- copyright ownership transfer and duration – right to prepare derivative works right of distribution- right to perform the work publicity- copyright formalities and registrations

UNIT-IV

Introduction to patent law- Rights and limitations- Rights under patent law- patent requirements ownership – transfer- patent application process- patent infringement- patent litigation

UNIT-V

Introduction to transactional law- creating wealth and managing risk – employment relationship in the Internet and technologic cal sector-contact for internet and technological sector

Suggested Readings:
1. KompalBansal and PraishitBansal, "*Fundamentals of IPR for Engineers*", 1st Edition, BS Publications, 2012.
2. Prabhuddha Ganguli, "*Intellectual Property Rights*", 1st Edition, TMH, 2012.
3. R Radha Krishnan & S Balasubramanian, "*Intellectual Property Rights*", 1st Edition, Excel Books, 2012.
4. M Ashok Kumar & mohd Iqbal Ali, "*Intellectual Property Rights*", 2nd Edition, Serial publications, 2011.

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KAKATIYA UNIVERSITY, WARANGAL-506 009
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B. Tech. (CE) VII SEMISTER
PW4115CEPROJECT WORK PART A
(Project Work)

Course code	PW4115CE				
Category	Project Work				
Course title	PROJECT WORK PART A				
Scheme and Credits	L	T	P	Credits	Internal marks = 25
	-	-	4	2	External Marks = 50

The aim of project work is to develop solutions to realistic problems applying the knowledge and skills obtained in different courses, new technologies and current industry practices. This requires students to understand current problems in their domain and methodologies to solve these problems. To get awareness on current problems and solution techniques, the first 4 weeks of VII semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R&D institutions. After completion of these seminars each group has to formalize the project proposal based on their own ideas or as suggested by the project guide. Seminar schedule will be prepared by the coordinator for all the students from the 5th week to the last week of the semester which should be strictly adhered to.

Each group will be required to:
1. Submit a one-page synopsis before the seminar for display on notice board.
2. Give a 30 minutes' presentation followed by 10 minutes' discussion.
3. Submit a technical write-up on the talk.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

The seminar presentation should include the following components of the project:

- Problem definition and specification
- Literature survey
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of bar (activity) charts
- Presentation- oral and written.

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B. Tech. (CE) VII SEMISTER
PC4116CEComputer Aided Building Lab
(Professional Core Course)

Course code	PC4116CE				
Category	Professional Core Course				
Course title	Computer Aided Building Lab				
Scheme and Credits	L	T	P	Credits	Internal marks = 25
	-	-	3	1.5	External Marks = 50

1. Types of Buildings, Functional Planning, Building by–laws and Regulations, Orientation of Buildings.
2. Principles of Planning – Planning of space.
3. Development of plan, Section and Elevation.
4. Planning of Residential Buildings-Minimum requirements.
5. Planning of Public Buildings – Minimum space requirements for Bank, Post Office, School, and Dispensary etc.
6. Various types of doors, windows and ventilators.
7. Details of a Staircase.
8. Pitched Roof Construction – King Post Truss and Queen Post Truss.

MANUAL & COMPUTER AIDED DRAWINGS
1. Conventional signs.
2. Development of plan from line diagram.
3. Plan, Section and Elevation of Residential Building with Unrestricted Plinth Area.
4. Plan, Section and Elevation of Residential Building with Restricted Plinth Area.
5. Drawing of various types of Doors, Windows and Ventilators.
6. Plan of School Building and Dispensary.
7. Plan of Bank and Post Office.
8. Plan of an Industrial Structure.
9. Section and Elevation of a Staircase
10. Plan of Dream House.
11. Plan of Duplex Building.
12. Plan of a Residential Building with split level.

Suggested Readings
1. National Building Code of India, 1983 – Bureau of Indian Standards, New Delhi.
2. Shah, Kale and Patki, Building Drawing, Tata McGraw hill Book Company Limited, New Delhi.
3. Y.N.RajaRao, Y. Subramanyam, *Planning and Designing of Residential Buildings,* Standard Publishers Distributors, New Delhi.

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B. Tech. (CIVIL) VIII SEMESTER

S. No	Course Code	Course Title	Scheme of Instruction			Lecture Hrs/ week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
Theory									
1.	PEC VII*	Professional Elective -VII	3	-	-	3	30	70	3
2.	PC4204 CE	Computer Aided Design and Drafting Lab	-	-	3	-	25	50	1.5
3.	PW4205 CE	PROJECT WORK PART B	-	-	12	-	50	100	6
4.	OE II*	Open Elective	2	-	-	2	30	70	2
5.	MC	Mandatory Non Credit course	2	-	-	2	30	-	-
		Total	07	-	15	07	165	290	12.5

* OE II **OPEN ELECTIVE COURSE –II**	
OE4201EE	Non-Conventional Energy Sources
OE 4204CS	Information Security
OE4205EC	Nano Technology
OE4206HS	Startup Entrepreneurship
OE4207ME	Metallurgy Of Alloy Steels

* (PE-VII) **PROFESSIONAL ELECTIVE COURSE –VII**	
PE4201 CE	Advanced Concrete Technology
PE4202 CE	Introduction to Environment Impact Assessment
PE4203 CE	Watershed Management

* (HS MC) **Mandatory Non Credit Course**	
MC 42a HS	Yoga Practice
MC 42b HS	NSS

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B. Tech. (CE) VIII SEMISTER
PE4201CEAdvanced Concrete Technology
(Professional Elective Course)

Course code	PE4201 CE				
Category	Professional Elective Course				
Course title	Advanced Concrete Technology				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT-I

Introduction to micro structure of concrete- Hydrated Cement Paste-calcium silicate hydrate and calcium hydroxide, Aggregate Phase, Voids, Water-capillary water, adsorbed water, interlayer water, Interfacial Zone- significance, Relationship between microstructure and properties of concrete.

UNIT-II

Durability of concrete- Durability concept, factors affecting, reinforcement corrosion,; fire resistance, frost damage, sulfate attack, chloride attack, creep and shrinkage, deterioration of concrete, alkali silica reaction, concrete in sea water, quality control, acceptance criteria as per BIS code Durability aspects of special concrete- High strength concrete, Self compacting concrete, Geopolymer concrete, Self curing concrete.

UNIT III

Mix design of conventional concrete, High strength concrete, Self compacting concrete using IS method; DOE method, ACI method, Mix design of Geopolymer concrete, Self compacting concrete, Self curing concrete, Fiber reinforced concrete, Polymer concrete.

UNIT IV

Special processes and technology for particular types of structure - Sprayed concrete; underwater concrete, mass concrete; slip form construction, Prefabrication techniques, Precast concrete and its ingredients, MIVAN shuttering, 3 D Printing in construction

UNIT V

Non-destructive testing of concrete: Need and importance of NDT tests, different type of tests- Rebound hammer, Ultrasonic pulse velocity, core cutting , Infrared thermography camera, Ground penetrating radar, corrosion analyser, bar locating instruments, etc.- Test procedures and analysis of NDT tests.

Suggested Reading
1. John Newman, Ban SengChoo, Advanced Concrete Technology Constituent materials- volume 1, -Amsterdam- London , Elsevier, Butterworth-Heinemann, 2003, London.
2. P. Kumar Mehta, Paulo J.M. Monteiro, Concrete, Microstructure, properties, materials, Tata McGraw Hill, 2006
3. J. Prasad, C. G. K. Nair, Non-Destructive Test and Evaluation of Materials, McGraw Hill Education, 2011.
4. B K Marsh, Design of normal concrete mixes, Construction Research Communications Ltd, BRE publications, 1997.
5. A. M. Nevellie, Properties of concrete, Pearson Education Limited, 2011.
6. M. S. Shetty, Concrete Technology, S. Chand Publishers, 2013.

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B. Tech. (CE) VIII SEMISTER
PE4202 CEIntroduction to Environment Impact Assessment
(Professional Elective Course)

Course code	PE4202 CE				
Category	Professional Elective Course				
Course title	Introduction to Environment Impact Assessment				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT -I
Environmental Impact Assessment: Definition, basic concepts and principles of EIA. Regulatory frame work in India. Environmental inventory, base line studies, over view of EIA studies.

UNIT -II
Assessment and Methodologies: Physical, biological assessment, Socio economic and cultural environmental assessment, EIA methodologies-Adhoc, matrix, checklist approaches. Economic evaluation of impacts-cot benefits of EIA, Public participation in environmental decision making. Procedures for reviewing EIA analysis and statement.

UNIT - III
Environmental Laws: Introduction; Resource conservation laws. Indian forest act, 1927, Wildlife protection act, 1972, Forest conservation act, 1980. Anti-pollution laws, Water (prevention and control of pollution), Act, 1974, Water (prevention and control of pollution), Cess act, 1977, air (prevention and control of pollution) act,1981, Environment (protection) act, 1986, Dispute redressal legislation. A. Public liability insurance act, 1991. National environment tribunal act, 1995.

UNIT -IV
Introduction to resource conservation laws; Indian forest act, Wildlife protection act, 1972, Forest conservation act, 1980, Anti-Pollution laws: Water (prevention and control of pollution), Act, 1974, Water (prevention and control of pollution) Cess act, 1977, Air (prevention and control of pollution) act,1981. Environment (protection) act, 1986, dispute redressal legislation.

UNIT V
Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/recycle, energy recovery, treatment and disposal).

References:
1. Canter, L.W. 'Environmental Impact Assessment', McGraw-Hill Book Company, NewYork. 1996
2. Corbitt Robert A. Standard Hand Book of Environmental Engineering McGraw-Hill Book Company, New York. 1999
3. Marriott 'Environmental Impact Assessment: A Practical Guide', McGraw-Hill Book Company, New York. 2005

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B. Tech. (CE) VIII SEMISTER
PE4203 CE WaterShed Management
(Professional Elective Course)

Course code	PE4203 CE				
Category	Professional Elective Course				
Course title	Water Shed Management				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	3	-	-	3	External Marks = 70

UNIT-I

Definition and concept of Watershed: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

UNIT-II

Characteristics of Watershed: Size, shape, physiographic, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-III

Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT-IV

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks.Land Management: Land use and land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

UNIT-V

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, silvi pasture, horticulture, social forestry and afforestation. Applications: Planning of watershed management activities, peoples participation, preparation of action plan, administrative requirements. Social aspects of watershed management, community participation, private sector participation, industrial issues, socio- economy, integrated development, water legislation and implementations, case studies, applications of geospatial techniques in watershed management systems.

References:
1. JVS Murthy, Watershed Management, New Age International publ., New Delhi, 1998
2. R. Awurbs and WP James, Water Resources Engineering, Prentice Hall Publishers
3. VVN Murthy, Land Water Management, Kalyani Publishers
4. D.K. Majumdar, Irrigation and Water Management, Prentice Hall, New Delhi, 2000.
5. C.T. Haan, H.P. Johnson, D.L. Brakensiek, Hydrologic Modeling of Small Watersheds, ASAE, Michigan, 1982.

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B. Tech. (CE) VIII SEMISTER
PC4204 CE Computer Aided Design and Drafting Lab
(Professional Core Course)

Course code	PC4204CE				
Category	Professional Core Course				
Course title	Computer Aided Design and Drafting Lab				
Scheme and Credits	L	T	P	Credits	Internal marks = 25
	-	-	3	1.5	External Marks = 50

Pre Requisites: Structural Analysis I & II RCC Design Steel Design

List of Experiments to be performed:
1. Analysis of Beams (Simply Supported and Continuous)
2. Analysis of Plane Frames for D.L & L.L
3. Analysis of Space Frames for D.L & L.L
4. Analysis of Space Frames subjected to wind & Earthquake Loads
5. Analysis and Design of Residential Building (G+ 2 floors)
6. Analysis and Design of Roof Truss

Structure Frame
Model Generation in any 2 software like STAAD PRO, ETABS etc.

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B. Tech. (CE) VIII SEMISTER
PW4205 CEPROJECT WORK PART B
(Project Work)

Course code	PW4205 CE				
Category	Project Work				
Course title	Project Work PART B				
Scheme and Credits	L	T	P	Credits	Internal marks = 50
	-	-	12	6	External Marks = 100

The aim of project work -II is to implement and evaluate the proposal made as part of project - I. Students can also be encouraged to do full time internship as part of project work-II based on the common guidelines for all the departments. The students placed in internships need to write the new proposal in consultation with industry coordinator and project guide within two weeks from the commencement of instruction.

The Department will appoint a project coordinator who will coordinate the following:
Re-grouping of students - deletion of inters hip candidates from groups made as part of project work-I
Re-Allotment of internship students to project guides
Project monitoring at regular intervals

All re-grouping/re-allotment has to be completed by the IInd week of VIII semesters that students get sufficient time for completion of the project. All projects (internship and departmental) will be monitored at least twice in a semester through student presentation for the award of Sessional marks. Sessional marks are awarded by a monitoring committee comprising of faculty members as well as by the supervisor. The first review of projects for 25 marks can be conducted after completion of five weeks. The second review for another 25 marks can be conducted after 12 weeks of instruction. Common norms will be established for the final documentation of the project report by the respective departments. The students are required to submit draft copies of their project report within one week after completion of instruction.

Note: Three periods of contact load will be assigned to each project guide.

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B. Tech. (CE) VIII SEMISTER
OE4201EE Non Conventional Energy Sources
(Open Elective Course)

Course code	OE4201EE				
Category	Open Elective Course				
Course title	Non Conventional Energy Sources				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

UNIT-I

Review of Conventional and Non-Conventional energy sources - Need for non-conventional energy sourcesTypes of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H2°2 Cell - Classification and Block diagram of fuel cell systems - Ion exchange membrane cell –Moltencarbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell – Advantagesand disadvantages of Fuel Cells-Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT-II

Solar energy - Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems- Solar Pond - Application of Solar Pond - Applications of solar energy.

UNIT-III

Wind energy- Principles of wind energy conversion systems - Nature of wind - Power in the Wind-Basic components of WECS -Classification of WECS -Site selection considerations -Advantages and disadvantages of WECS -Wind energy collectors -Wind electric generating and control systems - Applications of Wind energy -Environmental aspects.

UNIT- IV

Energy from the Oceans - Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal powergeneration -Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversiondevices -Advantages and disadvantages of wave energy - Geo-Thermal Energy - Types of Geo-ThermalEnergy Systems - Applications of Geo-Thermal Energy.

UNIT-V

Energy from Biomass - Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants – Detailsof commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation – Thermalgasification of biomass -Biomass gasifiers.

Suggested Readings:
1. Rai G.D, *Non-Conventional Sources of Energy,* Khandala Publishers, New Delhi, 1999.
2. M.M. El-Wakil, Power *Plant Technology.* McGraw Hill, 1984

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B. Tech. (CE) VIII SEMISTER
OE4204CSInformation Security
(Open Elective Course)

Course code	OE4204 CS				
Category	Open Elective Course				
Course title	Information Security				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

UNIT – I

Introduction: Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, Threats, A model for Network Security.

UNIT – II

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques (mono-alphabetic cipher, poly-alphabetic, one-time pad) encryption and decryption, symmetric and asymmetric key cryptography, key range and key size

UNIT – III

Symmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES, RC4), Key distribution in symmetric system

UNIT – IV

Asymmetric key Ciphers: Principles of public key crypto systems, Public key Algorithms: RSA, Diffie-Hellman, ECC, Key Distribution Key in asymmetric system.

UNIT – V

Authentication: Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure Hash Algorithm-1, Digital signatures, MD5.

Suggested Readings
1. Cryptography and Network Security : William Stallings, Pearson Education,4″' Edition
2. Information Security, Principles and Practice: Mark Stamp, Wiley India.
3. Cryptography and Network Security: C K Shyamala, N Harin i, Dr T R Padmanabhan, Wiley India,1"Edition.
4. Cryptography and Network Security:ForouzanMukhopadhyay, MC Graw Hill, 2″″ Edition.
5. Cryptography and Network Security:AtulKahate, McGraw hill Edition.
6. Introduction to Network Security: Neal Krawetz, CENGAGE Learning

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B. Tech. (CE) VIII SEMISTER
OE4205EC Nano Technology
(Open Elective Course)

Course code	OE4205 EC				
Category	Open Elective Course				
Course title	Nano Technology				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

UNIT I
INTRODUCTION TO NANOTECHNOLOGY: Introduction: need for new concepts in electronics from microelectronics towards bio-molecule electronics, types of nanotechnology and nanomachines, periodic table, atomic structure, molecules and phases, energy, molecular and atomic size.

UNIT II
FUNDAMENTALS OF NANO ELECTRONICS: Fundamentals of logic devices: Requirements, dynamic properties, threshold gates, physical limits to computations, concepts of logic devices: classifications, two terminal devices, field effect devices.

UNIT III
SILICON MOSFETs: Silicon MOSFETS, novel materials and alternate concepts: fundamentals of MOSFET Devices, scaling rules, silicon-dioxide based gate dielectrics.

UNIT IV
Quantum transport devices based on resonant tunneling: Electron tunneling, resonant tunneling diodes, resonant tunneling devices; Single electron devices for logic applications

UNIT V
CARBON NANOTUBES: Carbon Nanotube, Fullerenes, types and formation of nanotubes, purification of carbon nanotubes, electronic properties, synthesis of carbon nanotubes

SuggestedReadings:

1. G.W. Hanson, *Fundamentals of Nan electronics*, Pearson, 2009.
2. W. Ranier, *Nan electronics and Information Technology* (Advanced Electronic Materialand Novel Devices), Wiley-VCH, 2003.
3. K.E. Drexler, *Nanosystems*, Wiley, 1992.
4. J.H. Davies, *The Physics of Low-Dimensional Semiconductors*, Cambridge University Press, 1998.
5. C.P. Poole, F. J. Owens, *Introduction to Nanotechnology*, Wiley, 2003

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B. Tech. (CE) VIII SEMISTER
OE4206 HS Startup Entrepreneurship
Open Elective Course

Course code	OE4206 HS				
Category	Open Elective				
Course title	Startup Entrepreneurship				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

Unit I

Creativity & Discovery
Definition of Creativity, self test creativity, discovery and delivery skills, The imagination threshold, Building creativity ladder, Collection of wild ideas, Bench marking the ideas, Innovative to borrow or adopt, choosing the best of many ideas, management of tradeoff between discovery and delivery, Sharpening observation skills, reinventing self, Inspire and aspire through success stories

Unit II
From Idea to Start up Introduction to think ahead backward, Validation of ideas using cost and strategy, visualizing the business through value profile, activity mapping, Risks as opportunities, building your own road map

Unit III
Innovation career lessons Growing & Sharing Knowledge, The Role of Failure In achieving Success, Creating vision, Strategy, Action & Resistance: Differentiated Market Transforming Strategy; Dare to Take Action; Fighting Resistance; All About the startup Ecosystem; Building a Team; Keeping it Simple and Working Hard.

Unit IV
Action driven business plan Creating a completed non-business plan (a series of actions each of which moves your idea toward implementation), including a list of the activities to be undertaken, with degrees of importance (scale of 1 to 3, where 1 is 'most important). A revision of the original product or service idea, in light of information gathered in the process, beginning to design the business or organization that will successfully implement your creative idea. Preparing an activity map.

Unit V
Startup financing cycle: Preparing an initial cash flow statement, showing money flowing out (operations; capital) and flowing in. Estimate your capital needs realistically. Prepare a bootstrapping option (self financing). Prepare a risk map. Prepare a business plan comprising five sections: The Need; The Product; Unique Features; The Market; Future Developments. Include a Gantt chart (project plan - detailed activities and starting and ending dates); and a project budget.

Suggested Readings:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project - Planning, Analysis, Selection, Implementation and Review", Tata McGraw-Hill Publishing Company Ltd., 1995.
3. B. Badhai, "Entrepreneurship for Engineers", DhanpathRai& Co., Delhi, 2001.
4. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster, 2002.
5. Robert D. Hisrich and Michael P.Peters, " Entrepreneurship", Tata McGRaw Hill Edition, 2002.

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B. Tech. (CE) VIII SEMISTER
OE4207ME Metallurgy Of Alloy Steels
(Open Elective Course)

Course code	OE4207 ME				
Category	Open Elective Course				
Course title	Alloy Steels				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	2	External Marks = 70

UNIT-I

Introduction: Level of structures, structure property relationship, Defects in materials, Strengthening Mechanisms.

UNIT-II

The Iron carbon systems: Definition of phase, phase diagram. Iron Carbon phase diagram. Definition of phases in Fe-C system.Concept of steel and Cast Iron.Effect of alloying elements on steel

UNIT-III

Heat Treatment of Steels: Annealing, Normalizing, Hardening and tempering. Thermo Mechanical Treatments. Surface Heat Treatments.

UNIT-IV

Steels: Plain Carbon Steels: Low-carbon Mild steels, Medium Carbon Steels, High Carbon Steels, properties and applications of Plain Carbon Steels. High Strength Steels, Tool Steels, Creep Resistance Steel

UNIT-V

Stainless steels: Composition, properties and applications of Austenitic Stainless steel, Ferritic Stainless steel, Martensitic Stainless steel, Precipitation Hardened Stainless steel.

Suggested Readings:
1. Introduction to Physical Metallurgy – SH Avner, TATA Mc GRAW HILL ,1997
2. Alloys Steels – Wilson
3. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

Faculty of Engineering & Technology	**2021-22**

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CE) VIII SEMISTER
MC 42a HSYoga Practice
(Humanity Science Course)

Course code	MC 42aHS				
Category	Humanity Science				
Course title	Yoga Practice				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	-	

UNIT – I

Introduction: Yoga definition, health definition from WHO, yoga versus health, basis of yoga, yoga is beyond science, Gist of eighteen chapters of Bhagavad-Gita, four types of yoga: Karma, Bhakti, Gnyana andRaja yoga, Internal and External yoga, elements of Ashtanga yoga (Yama, Niyama, Asana, Pranayama,Prathyahara, Dharana, Dhyana and Samadhi), Panchakoshas and their purification through Asana,Pranayama and Dhyana.

UNIT – II

Suryanamaskaras (Sun Salutations): Definition of sun salutations, seven chakras (Mooladhaar, Swadhishtaan, Manipura, Anahata, Vishuddhi, Agnya and Sahasrar), various manthras (Om Mitraya, Om Ravaye, Om Suryaya, Om Bhanave, Om Marichaye, Om Khagaye, Om Pushne, Om HiranyaGarbhaye, OmAdhityaya, Om Savitre, Om Arkhaya, and Om Bhaskaraya) and their meaning while performing sun salutations, physiology, seven systems of human anatomy, significance of performing sun salutations.

UNIT – III

Asanas (Postures): Pathanjali's definition of asana, sthiramsukhamasanam, 3rd limb of Ashtanga yoga, loosening or warming up exercises, sequence of perform in asanas (standing, sitting, prone, supine and inverted), nomenclature of asanas (animals, trees, rishis and so on), asanas versus chakras, asanas versus systems, asanas versus physical health, activation of Annamayakosha.

UNIT – IV

Pranayama (Breathing Techniques): Definition of Pranayama as per Shankaracharya, 4th limb of Ashtanga yoga, various techniques of breathing, Pranayama techniques versus seasons, bandhas and their significance in Pranayama, mudras and their significance in Pranayama, restrictions of applying bandhas with reference to health disorders, Pranayama versus concentration, pranayama is the bridge between mindand body, pranayam versus mental health, activation of Pranamayakosha through Pranayama.

UNIT – V

Dhyana (Meditation): Definition of meditation, 7th limb of Ashtanga yoga, types of mind (Conscious andSub-Conscious), various types of dhyana. Meditation versus spiritual health, Dharana and Dhyana, extentionofDhyana to Samadhi, Dhyana and mental stress, activation of Manomayakosha through dhyana, silencingthemind.

Suggested Readings:
1. *Light on Yoga* by BKS lyengar.
2. *Yoga Education for Children,* Vol-1 by Swami SatyanandaSaraswati.
3. *Light on Pranayama* by BKS lyengar.
4. *Asana Pranayama Mudra and Bandha*by Swami SatyanandaSaraswati.
5. *Hatha Yoga Pradipika*by Swami Mukhtibodhananda.
6. *Yoga education for children,* Vol-11 by Swami NiranjananandaSaraswati.
7. *Dynamics of Yoga* by Swami SatyanandaSaraswati.

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Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Civil Engineering

B. Tech. (CE) VIII SEMISTER
MC 42b HS NSS
(Humanity Science Course)

Course code	MC 42b HS				
Category	Humanity Science				
Course title	NSS				
Scheme and Credits	L	T	P	Credits	Internal marks = 30
	2	-	-	-	

List of Activities:
1. Orientation programme about the role of NSS in societal development.
2. Swachh Bharat Program.
3. Guest lectures from eminent personalities on personality development.
4. Plantation of saplings/Haritha Haram Program.
5. Blood Donation / Blood Grouping Camp.
6. Imparting computer education to school children.
7. Creating Awareness among students on the importance of Digital transactions.
8. Stress management techniques.
9. Health Check-up Activities.
10. Observation of Important days like Voters' day, World Water Day and so on.
11. Road Safety Awareness Programs.
12. Energy Conservation Activities
13. Conducting Programs on effective communication skills.
14. Awareness programs on national integration.
15. Orientation on Improving Entrepreneurial Skills.
16. Developing Effective Leadership skills.
17. Job opportunity awareness programs in various defense, public sector undertakings.
18. Skill Development Program.
19. Creating awareness among students on the Importance of Yoga and other physical activities.
20. Creating awareness among students on various government sponsored social welfare schemes for the people.

Note: At least Ten Activities should be conducted in the Semester**.** Each event conducted under Swachh Bharat, Plantation and important days like Voters' day, world water day may be treated as a separate activity