Cluster –I: Common with B.Tech in (a) Mechanical Engineering, (b) Aeronautical Engineering (c) Automobile Engineering (d) Civil Engineering (e) Mechatronics Engg. (f) Textile Engineering (g) Chemical Engg.

Bachelor of Technology in Civil Engineering(Credit Based)

KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme of Studies/Examination

Semester I (w.e.f. session 2018-2019)

S.No.	CourseNo./ Code	Subject	L:T:P	Hours/ Week	Credits	ExaminationSchedule(Marks)				Duration of exam(Hours)
						Major Test	MinorTest	Practical	Total	
1A	BS-119A	IntroductiontoElectromagneticTheory	3:1:0	4	4	75	25	0	100	3
1B	BS-101A	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105A	ProgrammingforProblemSolving	3:0:0	3	3	75	25	0	100	3
2B	HM-101A	English	2:0:0	2	2	75	25	0	100	3
3	BS-135A	Multi-variableCalculus&LinearAlgebra	3:1:0	4	4	75	25	0	100	3
4A	ES-109A	EngineeringGraphics&Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111LA	ManufacturingProcessesWorkshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141A	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101A	BasicElectricalEngineering	4:1:0	5	5	75	25	0	100	3
6A	BS-121LA	ElectromagneticsLab	0:0:3	3	1.5	--	20	30	50	3
6B	BS-103LA	ChemistryLab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107LA	ProgrammingforProblemSolvingLab	0:0:2	2	1	--	20	30	50	3
7B	ES-103LA	BasicElectricalEngineeringLab	0:0:2	2	1	--	20	30	50	3
8A	ES-113LA	EngineeringGraphics&DesignPractice	0:0:3	3	1.5	--	20	30	50	3
8B	HM-103LA	LanguageLab	0:0:2	2	1	--	20	30	50	3
		Total	12:5:8/ 12:3:10	25/25	21.0/ 20.0	375/ 300	185/ 200	90/ 150	650A/ 650B	

Note: A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. marked B in one particular semester.
Induction Program (Three weeks duration) is a part of scheme of first year in 1st semester for all branches.

Cluster –I: Common with B.Tech in (a) Mechanical Engineering, (b) Aeronautical Engineering (c) Automobile Engineering (d) Civil Engineering (e) Mechatronics Engg. (f) Textile Engineering (g) Chemical Engg.

Bachelor of TechnologyCivil Engineering(Credit Based)
KURUKSHETRA UNIVERSITY, KURUKSHETRA
Scheme of Studies/Examination
Semester II (w.e.f. session 2018-2019)

S.No.	CourseNo./ Code	Subject	L:T:P	Hours/ Week	Credits	ExaminationSchedule(Marks)				Duration of exam(Hours)
						Major Test	MinorTest	Practical	Total	
1A	BS-119A	IntroductiontoElectromagnetictheory	3:1:0	4	4	75	25	0	100	3
1B	BS-101A	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105A	ProgrammingforProblemSolving	3:0:0	3	3	75	25	0	100	3
2B	HM-101A	English	2:0:0	2	2	75	25	0	100	3
3	BS-136A	Calculus&OrdinaryDifferentialEquations	3:1:0	4	4	75	25	0	100	3
4A	ES-109A	EngineeringGraphics&Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111LA	ManufacturingProcessesWorkshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141A	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101A	BasicElectricalEngineering	4:1:0	5	5	75	25	0	100	3
6A	BS-121LA	ElectromagneticsLab	0:0:3	3	1.5	--	20	30	50	3
6B	BS-103LA	ChemistryLab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107LA	ProgrammingforProblemSolvingLab	0:0:2	2	1	--	20	30	50	3
7B	ES-103LA	BasicElectricalEngineeringLab	0:0:2	2	1	--	20	30	50	3
8A	ES-113LA	EngineeringGraphics&DesignPractice	0:0:3	3	1.5	--	20	30	50	3
8B	HM-103LA	Language Lab	0:0:2	2	1	--	20	30	50	3
		Total	12:5:8/ 12:3:10	25/ 25	21.0/ 20.0	375/ 300	185/200	90/150	650A/ 650B	

Note: A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. marked B in one particular semester.

BS-119A	Introduction to Electromagnetic Theory						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3h

Purpose	To introduce the fundamentals of electromagnetic theory to the students for applications in Engineering field.
Course Outcomes	
CO 1	Introduce the basic concepts of Electrostatics in vacuum.
CO 2	Introduce the basic concepts of Magnetostatics in vacuum.
CO 3	Discuss electrostatics and magnetostatics in linear dielectric medium.
CO 4	Basics of Maxwell's equations and electromagnetic waves.

Unit - I

Electrostatics in Vacuum: Calculation of Electric Field: Coulomb's law, Continuous charge distribution; Divergence and Curl of Electrostatic Fields: Field lines, flux, Gauss's law, Applications of Gauss's law; Electrostatic Potential: Comments on potential, Poisson's and Laplace's Equation, the potential of a localized charge distribution; Electrostatic Boundary Conditions; Work and Energy in Electrostatics: the work done to move a charge, the energy of a point and continuous charge distribution.

Unit - II

Electrostatics in a Linear Dielectric Medium: Polarization:dielectrics, induced dipoles, alignments of polar molecules; The field of a Polarized Object: bound charges and its physical interpretation; The Filed Inside a Dielectric; The Electric Displacement: Gauss's law in the presence of dielectrics, A deceptive parallel, Boundary conditions; Linear Dielectrics: Susceptibility, Permittivity, dielectric constant, Boundary value problems with linear dielectrics, Energy in dielectric systems, Forces in dielectrics.

Unit - III

Magnetostatics: The Lorentz Force Law: magnetic fields, magnetic forces, currents; Biot- Savart law, Divergence and Curl of magnetic field, Magnetic Vector Potential: vector potential, magnetostatic boundary conditions, multiple expansion of vector potential.

Magnetostatics in a linear magnetic: Magnetization: Effect of magnetic field on atomic orbits; The Field of a Magnetized Object: Bound currents, Physical interpretation of bound currents; The Auxiliary Magnetic Field: Ampere's law in magnetized materials, A deceptive parallel, Boundary conditions; Linear and Nonlinear Media: magnetic susceptibility and permeability, ferromagnetism.

Unit - IV

Faraday's law: Electromotive Force: Ohm's law, Motional emf; Electromagnetic Induction: Faraday's law, The induced electric field, inductance, energy in magnetic fields.

Maxwell's Equations: Electrodynamics before Maxwell, How Maxwell fixed Ampere's law, Maxwell's equations, Maxwell's equations in matter.

Electromagnetic Waves: Electromagnetic Waves in Vacuum: the wave equation for electric and magnetic field; Electromagnetic Waves in Matter: propagation in linear media.

Suggested Books:

1. David J. Griffiths, Introduction to Electrodynamics, Pearson Education.
2. Halliday and Resnick, Physics
3. W. Saslow, Electricity, Magnetism and Light

Note: The paper setter will set the paper as per the question paper templates provided.

BS-121LA	Electromagnetics Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**3**	**1.5**	**30**	**20**	**50**	**3h**
Purpose	**To give the practical knowledge of handling the instruments.**						
Course Outcomes							
CO	**To make the students familiar with the experiments related with Electromagnetic Theory.**						

Note: Student will be required to perform at least 10 experiments out of the following list.

1. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
2. To study induced e.m.f. as a function of velocity of magnet.
3. To study the growth and decay of current in a LR circuit using magnetic core inductor.
4. To find the coefficient of self-inductance by Rayleigh's method.
5. To find the coefficient of mutual inductance of two coils.
6. To determine the magnetic induction field between the pole pieces of an electromagnet.
7. To study Bio-Savart's law.
8. To study the dependency of magnetic field on coil diameter and number of turns.
9. To investigate the equipotential liens of electric fields.
10. To draw the equipotential lines of bar electrode.
11. To draw the equipotential lines for ring electrode.
12. Verification of Farady and Lenz's law of induction by measuring the induced voltage as function of time.
13. Measurement of induced voltage impulse as a function of the velocity of magnet.
14. To determine the dielectric constant of different dielectric materials.
15. To measure the spatial distribution of the magnetic field between a pair of identical coils in Helmholtz arrangement.
16. To investigate the spacing between coils at which magnetic field is uniform and to measure its spatial distribution.

Suggested Books:

1. C.L.Arora, B. Sc. Practical Physics, S. Chand.
2. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
3. S.L. Gupta & V. Kumar, Practical Physics, PragatiPrakashan.

BS-101A	Chemistry						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3h

Purpose	To familiarize the students with basic and applied concept in chemistry
CO1	An insight into the atomic and molecular structure
CO2	Analytical techniques used in identification of molecules
CO3	To understand Periodic properties
CO4	To understand the spatial arrangement of molecules

UNIT - I

Atomic and molecular structure (10 lectures)

Molecular orbitals of diatomic molecules (N_2, O_2, CO) Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and energy level diagrams of $[Co(NH_3)_6]$, $[Ni(CO)_4]$, $[PtCl_2(NH_3)_2]$ and magnetic properties of metal complexes. Band structure of solids and the role of doping on band structures.

UNIT - II

Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy(basic concept). Fluorescence and its applications in medicine.Vibrational and rotational spectroscopy of diatomic molecules.Applications.Basic concepts of Nuclear magnetic resonance and magnetic resonance imaging, Diffraction and scattering.

UNIT - III

Use of free energy in chemical equilibria (4 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.

Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries (H_2O, NH_3, PCl_5, SF_6, CCl4, $Pt(NH_3)_2Cl_2$

UNIT - IV

Stereochemistry (6 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis.

Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule(paracetamol and Aspirin)

Suggested Books:

1) University chemistry, by B. M. Mahan, Pearson Education
2) Chemistry: Principles and Applications, byM. J. SienkoandR. A. Plane
3) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan
5) Physical Chemistry, by P. W. Atkins
6)Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore,5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Note: The paper setter will set the paper as per the question paper templates provided.

BS-103LA	Chemistry Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	3	1.5	30	20	50	3h

LIST OF EXPERIMENTS

1. To Determine the surface tension of a given liquid
2. To determine the relative viscosity of a given liquid using Ostwald's viscometer
3. To identify the number of components present in a given organic mixture by thin layer chromatography
4. To determine the alkalinity of a given water sample
5. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using conductometer
6. Synthesis of a drug (paracetamol/Aspirin)
7. Determination of chloride content of a given water sample
8. To determine the calcium & magnesium or temporary & permanent hardness of a given water sample by EDTA method
9. To determine the total iron content present in a given iron ore solution by redox titration
10. Determination of the partition coefficient of a substance between two immiscible liquids
11. To find out the content of sodium, potassium in a given salt solution by Flame Photometer
12. To find out the λmax and concentration of unknown solution by a spectrophotometer
13. To find out the flash point and fire point of the given oil sample by Pensky Martin apparatus
14. To determine the amount of dissolved oxygen present in a given water sample
15. To find out the pour point and cloud point of a lubricating oil
16. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using pH meter
17. Using Redwood Viscometer find out the viscosity of an oil sample

Note: Atleast 9 experiments to be performed from the list.

ES-105A	Programming for Problem Solving						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3h
Purpose	To familiarize the students with the basics of Computer System and C Programming						
Course Outcomes							
CO 1	Describe the overview of Computer System and Levels of Programming Languages.						
CO 2	Learn to translate the algorithms to programs (in C language).						
CO 3	Learn description and applications of conditional branching, iteration and recursion.						
CO 4	To use arrays, pointers and structures to formulate algorithms and programs.						

UNIT – I

Overview of Computers: Block diagram and its description, Number systems, Arithmetic of number systems, Computer Hardware: Printers, Keyboard and Mouse, Storage Devices.

Introduction to programming language: Different levels of PL: High Level language, Assembly language, Machine language; Introduction to Compiler, Interpreter, Debugger, Linker, Loader, Assembler.

Problem Analysis: Problem solving techniques, Algorithms and Flowchart representation.

UNIT – II

Overview of C: Elements of C, Data types; Storage classes in C; Operators: Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators, precedence & associativity of operators.

Input/output: Unformatted & formatted I/O function in C.

Control statements: if statement, switch statement; Repetition: for, while, and do-while loop; break, continue, goto statements.

UNIT – III

Arrays: Definition, types, initialization, processing an array, String handling.

Functions: Definition, prototype, parameters passing techniques, recursion, built-in functions, passing arrays to functions, returning arrays from functions.

UNIT – IV

Pointers: Declaration, operations on pointers, pointers and arrays, dynamic memory allocation, pointers and functions, pointers and strings.

Structure & Union: Definition, processing, passing structures to functions, use of union.

Data files: Opening and closing a file, I/O operations on files.

Suggested Books:

1. Brian W. Kernighan Dennis Ritchie, "C Programming Language" Pearson Education India.
2. SubrataSaha,Subhodip Mukherjee:Basic Computation & Programming with 'C'-Cambridge University Press.
3. Ajay Mittal, "Programming in C - A Practical Approach", Pearson.
4. E Balagurusamy :Programming in ANSI C,TMH Education.
5. PradipDey and ManasGhose, "Computer Fundamental and Programming in C", Oxford Pub.
6. ForouzanBehrouz, "Computer Science: A Structured Programming Approach Using C", Cengage Learning.
7. Ashok Kamthane, "Programming in C, 3e", Pearson Education India..
8. YashwantKanetker, "Let us C", BPB Publications.
9. A K Sharma, " Fundamentals of Computers & Programming" DhanpatRai Publications
10. Rajaraman V., "Computer Basic and C Programming", Prentice Hall of India Learning.

Note: The paper setter will set the paper as per the question paper templates provided.

ES-107LA	Programming for Problem Solving Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**2**	**1**	**30**	**20**	**50**	**3h**
Purpose	**To Introduce students with problem solving using C Programming language**						
Course Outcomes							
CO 1	**To formulate the algorithms for simple problems**						
CO 2	**Implementation of arrays and functions.**						
CO 3	**Implementation of pointers and user defined data types.**						
CO 4	**Write individual and group reports: present objectives, describe test procedures and results.**						

LIST OF PROGRAMS

1. Write a program to find the sum of individual digits of a positive integer.
2. Write a program to generate the first n terms of the Fibonacci sequence.
3. Write a program to generate all the prime numbers between 1 and n, where n is the input value given by the user.
4. Write a program to find the roots of a quadratic equation.
5. Write a function to generate Pascal's triangle.
6. Write a program for addition of Two Matrices
7. Write a program for calculating transpose of a matrix.
8. Write a program for Matrix multiplication by checking compatibility
9. Write programs to find the factorial of a given integer by using both recursive and non-recursive functions.
10. Write a function that uses functions to perform the count the lines, words and characters in a given text.
11. Write a program to explores the use of structures, union and other user defined variables
12. Write a program to print the element of array using pointers
13. Write a program to implement call by reference
14. Write a program to print the elements of a structure using pointers
15. Write a program to read a string and write it in reverse order
16. Write a program to concatenate two strings
17. Write a program to check that the input string is a palindrome or not.
18. Write a program which copies one file to another.
19. Write a program to reverse the first n characters in a file.

Note: At least 10 programs are to be performed & executed from the above list.

HM-101 A	English						
L	T	P	Credit	Major Test	Minor Test	Total	Time
2	-	-	2	75	25	100	3h

Course Outcomes	
CO 1	Building up the vocabulary
CO 2	Students will acquire basic proficiency in English including writing skills

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 formderivatives.
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
4.6 Comprehension
4.7 Précis Writing
4.8 Essay Writing

Suggested Books:

(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

Note: The paper setter will set the paper as per the question paper templates provided.

HM-103LA	Language Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**2**	**1**	**30**	**20**	**50**	**3h**

OBJECTIVES

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

BS-135A	Multivariable Calculus and Linear Algebra						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3 h
Purpose	To familiarize the prospective engineers with techniques in calculus, sequence & series, multivariable calculus, and linear algebra.						
Course Outcomes							
CO1	To introduce the idea of applying differential and integral calculus to notions of improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.						
CO 2	To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.						
CO 3	To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.						
CO 4	To familiarize the student with functions of several variables that is essential in most branches of engineering.						
CO 5	To develop the essential tool of matrices and linear algebra in a comprehensive manner.						

UNIT-I (12 hrs)

Calculus: Evaluation of definite and improper integrals: Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Indeterminate forms and L'Hospital's rule.

UNIT-II **(**12 hrs)

Sequence and Series: Convergence of sequence and series, tests for convergence (Comparison test, D'Alembert's Ratio test, Logarithmic test, Cauchy root test, Raabe's test); Power series.

Fourier series: Introduction, Fourier-Euler Formula, Dirichlet's conditions, Change of intervals, Fourier series for even and odd functions, Half range sine and cosine series.

UNIT-III (09 hrs)

Multivariable Calculus (differentiation): Taylor's series (for one and more variables), series for exponential, trigonometric and logarithm functions.

Partial derivatives, Total differential, Chain rule for differentiation, Homogeneous functions, Euler's theorem, Jacobian, Maxima, minima and saddle points; Method of Lagrange multipliers.

UNIT-IV (07 hrs)

Matrices: Rank of a matrix, elementary transformations, elementary matrices, Gauss Jordon method to find inverse using elementary transformations, normal form of a matrix, linear dependence and independence of vectors, consistency of linear system of equations, linear and orthogonal transformations, eigenvalues and eigenvectors, properties of eigenvalues, Cayley – Hamilton theorem and its applications.

Suggested Books:

1.ErwinKreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Erwin Kreyszig and SanjeevAhuja, Applied Mathematics- I, Wiley India Publication, Reprint 2015.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Note: The paper setter will set the paper as per the question paper templates provided.

BS-136A	Calculus and Ordinary Differential Equations						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3 h
Purpose	To familiarize the prospective engineers with techniques inmultivariate integration, ordinary and partial differential equations and complex variables.						
Course Outcomes							
CO1	To introduce effective mathematical tools for the solutions of differential equations that model physical processes.						
CO 2	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.						
CO 3	To introduce the tools of differentiation and integration of functions of complex variable thatare used in various techniques dealing engineering problems.						

UNIT-I (10 hrs)

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree:equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher orders:

Second order linear differential equations with constant coefficients, method of variation of parameters, Cauchy and Legendre's linear differential equations.

UNIT-II **(**10 hrs)

Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar)

Applications: areas and volumes; Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

UNIT-III (10hrs)

Vector Calculus: Introduction, Scalar and Vector point functions, Gradient, divergence & Curl and their properties, Directional derivative.

Line integrals, surface integrals, volume integrals, Theorems of Green, Gauss and Stokes (without proof).

UNIT-IV (10 hrs)

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, findingharmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) andtheir properties;

Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (withoutproof), Taylor's series,zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof).

Suggested Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Erwin kreyszig and SanjeevAhuja, Applied Mathematics- II, Wiley India Publication, 2015.
4. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary ValueProblems, 9th Edn., Wiley India, 2009.
5. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
6. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice HallIndia, 1995.
7. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
8. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill,2004.
9. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
10. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Note: The paper setter will set the paper as per the question paper templates provided.

Course code	ES-109A							
Coursetitle	EngineeringGraphics&Design							
Scheme and Credits	L	T	P	Credits	Major Test	Minor Test	Total	Time
	1	2	0	3	75	25	100	3h

Course Outcomes

Objective- To expose students to the basics of Engineering Drawing, graphics and Projections.	
CO-1	To learn about construction of various types of curves and scales.
CO-2	To learn about orthographic projections of points, lines and planes.
CO-3	To Learn about the sectional views and development of Right regular solids
CO-4	To Learn about the construction of Isometric Projections and conversion of Isometric views to Orthographic views and vice-versa.

UNIT - I

IntroductiontoEngineeringDrawing:

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

UNIT - II

Orthographic Projections:

PrinciplesofOrthographicProjections-Conventions-Projections ofPointsandlinesinclined tobothplanes;Projectionsofplanesinclined to one principalPlane.

ProjectionsofRegular Solids:

Solid with axis inclinedtobothePlanes;

UNIT - III

Sections andSectionalViewsofRightRegular Solids:

Sectional views of simple right regular solids like prism, pyramid, Cylinder and Cone. Development ofsurfacesofRightRegularSolids-Prism,Pyramid,CylinderandCone;

UNIT - IV

Isometric Projections:

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of IsometricViews to Orthographic Views and Vice-versa, Conventions;

Suggested Books:

1. Engineering Graphics using AUTOCAD 2000: T. Jeyapoovan, Vikas Publishing House.
2. Engineering Drawing: Plane and Solid Geometry: N.D. Bhatt and V.M.Panchal, Charotar Publishing House.
3. Engineering Drawing: Amar Pathak, Dreamtech Press, New Delhi.
4. Thomas E.French, Charles J.Vierck, Robert J.Foster, "Engineering drawing and graphic technology", McGraw Hill International Editions.
5. Engineering Graphics and Drafting: P.S. Gill, Millennium Edition, S.K. Katariaand Sons.
6. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.
7. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press.
8. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann,1999.
9. BSI, Technical production documentation (TPD) – specification for defining, specifying and graphically reporting products, BS8888, 2002.
10. Corresponding'stoCADSoftwareTheoryandUserManuals.

Note: The paper setter will set the paper as per the question paper templates provided.

Course code	ES-113LA							
Coursetitle	EngineeringGraphics&Design Practice							
Scheme and Credits	L	T	P	Credits	Practical	Minor Test	Total	Time
	-	-	3	1.5	30	20	50	3h
Pre-requisites(if any)	-							

Aim: To make student practice on engineering graphics and designsoftwaresand provide exposuretothevisualaspectsofengineeringdesign.	
CO-1	To give an overview of the user interface and toolboxes in a CAD software.
CO-2	To understand to customize settings of CAD software and produce CAD drawing.
CO-3	To practice performing various functions in CAD softwares.
CO-4	To Learn about solid modelling and demonstration of a simple team design project.

Module 1:OverviewofComputerGraphics:
Listingthecomputertechnologiesthatimpactongraphicalcommunication,Demonstrating Knowledgeofthetheory ofCADsoftware[suchas:TheMenuSystem,Toolbars(Standard, ObjectProperties,Draw,Modify andDimension),DrawingArea(Background,Crosshairs, CoordinateSystem),Dialogboxes andwindows,Shortcutmenus(Button Bars),The CommandLine(whereapplicable),TheStatusBar,Differentmethodsofzoom asusedin CAD,Selectanderaseobjects.; IsometricViewsoflines,Planes, Simpleandcompound Solids];
Module2:Customization &CAD Drawing:
Setupofthedrawingpageandtheprinter,includingscalesettings,Settingup ofunitsanddrawing limits;ISOand ANSIstandardsforcoordinatedimensioningandtolerancing; Orthographic constraints, Snap to objects manually and automatically; Producingdrawingsbyusingvariouscoordinateinputentrymethodstodrawstraightlines,Applyingvari ouswaysofdrawingcircles;
Module3:Annotations,layering&other functions:
Applyingdimensionstoobjects,applyingannotationstodrawings;Settingupanduseof Layers,layerstocreatedrawings,Create,editandusecustomizedlayers; Changingline lengthsthroughmodifyingexisting lines(extend/lengthen);Printingdocumentstopaper usingtheprintcommand;orthographicprojection techniques;Drawingsectionalviewsof compositerightregulargeometricsolids andprojectthetrueshapeof thesectionedsurface; Drawing annotation,Computer-aideddesign(CAD)softwaremodelingof partsand assemblies.Parametricandnon-parametricsolid,surface,and wireframemodels.Partediting andtwo-dimensionaldocumentationofmodels.Planarprojectiontheory,includingsketching of perspective,isometric,multiview,auxiliary,andsectionviews.Spatialvisualization exercises.Dimensioning guidelines,tolerancingtechniques; dimensioningandscalemulti viewsofdwelling;
Module4:Demonstration ofasimpleteamdesign project:
Geometryandtopologyofengineeredcomponents:creation ofengineeringmodelsandtheir presentationinstandard2Dblueprintform andas3Dwire-frameandshadedsolids;meshed topologiesforengineeringanalysisandtool-path generationforcomponentmanufacture; geometricdimensioningandtolerancing;Useof solid-modelingsoftwareforcreating associativemodels atthecomponentand assemblylevels;floorplans thatinclude: windows,doors,andfixturessuchasWC,bath,sink,shower,etc.Applying colourcodingaccordingto buildingdrawingpractice;Drawingsectionalelevation showingfoundation toceiling; IntroductiontoBuildingInformationModeling (BIM).
Suggested Books(ES-113L):

1. Chris McMahon and Jimmie Browne, CAD/CAM – Principle Practice and Manufacturing Management, Addison Wesley England, Second Edition, 2000.
2. Chougule N.K.; CAD/CAM /CAE, Scitech Publications India Pvt. Ltd.
3. Vikram Sharma; Computer Aided Design and Manufacturing, S.K. Kataria and Sons.
4. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989
5. Ibrahim Zeid, CAD/CAM theory and Practice, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1992.
6. M.P. Groover, Automation, Productions systems and Computer-Integrated Manufacturing by Prentice – Hall.
7. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.
8. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press.
9. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann,1999.
10. BSI, Technical production documentation (TPD) – specification for defining, specifying and graphically reporting products, BS8888, 2002.
11. (Correspondingsetof)CADSoftwareTheoryandUserManuals
12. Ibrahim Zeid, Mastering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
13. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.
14. Groover M.P. and Zimmers E. W., CAD/CAM: Computer Aided Design and Manufacturing, Prentice Hall International, New Delhi, 1992.
15. Dr. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, New Delhi, Second Edition, 2000.
16. Thomas E.French, Charles J.Vierck, Robert J.Foster, “Engineering drawing and graphic technology”, McGraw Hill International Editions.

Course code	ES-111LA							
Coursetitle	ManufacturingProcessesWorkshop							
Scheme and Credits	L	T	P	Credits	Practical	Minor Test	Total	Time
	0	0	3	1.5	60	40	100	3h
Pre-requisites (if any)								

Aim: To make student gain a hands on work experience in a typical manufacturing industry environment.	
CO-1	To familiarize with different manufacturing methods in industries and work on CNC machine.
CO-2	To learn working in Fitting shop and Electrical and Electronics shops,
CO-3	To practice working on Carpentry and Plastic moulding/glass cutting jobs.
CO-4	To gain hands on practice experience on Metal casting and Welding jobs.

ManufacturingProcessesWorkshop

Contents

1.ManufacturingMethods-casting,forming,machining,joining, advancedmanufacturing methods
2. CNCmachining, Additivemanufacturing
3. Fittingoperations&powertools
4. Electrical&Electronics
5. Carpentry
6. Plasticmoulding,glasscutting
7. Metalcasting
8. Welding(arc welding&gas welding), brazing

Suggested Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology" , 7th edition, Pearson Education India Edition.
2. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K., " Elements of Workshop Technology" , Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
3. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, " Processes and Materials of Manufacture" , 4th edition, Prentice Hall India, 1998
5. Rao P.N., " Manufacturing Technology" , Vol. I and Vol. II, Tata McGraw-Hill House, 2017.

BS-141A	Biology						
L	T	P	Credit	Major Test	Minor Test	Total	Time
2	1	-	3	75	25	100	3h
Purpose	To familiarize the students with the basics of Biotechnology						

Course Outcomes	
CO1	Introduction to essentials of life and macromolecules essential for growth and Development
CO2	Defining the basic concepts of cell division, genes and Immune system
CO3	Introduction of basic Concept of ThermoGenetic Engg. & Biochemistry
CO4	Introduction of basic Concept of Microbiology & Role of Biology in Different Fields

Unit – I

Introduction to living world: Concept and definition of Biology; Importance of biology in major discoveries of life Characteristic features of living organisms; Cell ultra-structure and functions of cell organelles like nucleus, mitochondria,chloroplast, ribosomes and endoplasmic reticulum; Difference between prokaryotic and eukaryotic cell; Difference between animal and plant cell.

Classification of organisms: Classify the organisms on the basis of (a) Cellularity;- Unicellular and Multicellular organisms. (b) Energy and Carbon Utilization:- Autotrophs, Hetrotrophs and Lithotrops (c) Habitat (d) Ammonia excretion:- ammonotelic, 17ricotelic and ureotelic. (e) Habitat- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life

Unit-II

Introduction to Biomolecules: Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids (DNA& RNA: Structure and forms). Hierarch in protein structure: Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Enzymes as biocatalysts: General characteristics, nomenclature and classification of Enzymes. Effect of temperature, Ph, enzyme and substrate concentrations on the activity of enzymes. Elementary concept of and coenzymes. Mechanism of enzyme action. Enzyme kinetics and kinetic parameters (Km and Vmax)

Unit-III

Genetics:-Mendel's laws of inheritance. Variation and speciation.Concepts of recessiveness and dominance. Genetic Disorders: Single gene disorders in human. **Human traits**: Genetics of blood groups, diabetes type I & II.

Cell Division:- Mitosis and its utility to living systems. Meiosis and its genetic significance.Evidence of nucleic acids as a genetic material. Central Dogma of molecular biology

4. Role of immune system in health and disease: Brief introduction to morphology and pathogenicity of bacteria, fungi, virus, protozoa beneficial and harmful for human beings.

Unit-IV

Metabolism:-Concept of Exothermic and endothermic reactions. Concept of standard free energy and Spontaneity in biological reactions. Catabolism (Glycolysis and Krebs cycle) and synthesis of glucose (Photosynthesis:- Light and Dark Reaction) of glucose. ATP as Energy Currency of the cell

Microbiology: Concept of species and strains, sterilization and media compositions, growth kinetics.

Role of Biology : Role of Biology in Agriculture, Medicine, Forensic science, Bioinformatics, Nanotechnology, Micro-electromechanical systems (Bio-MEMS) and Sensors (Biosensors).

Text Book:

1. Introduction to Biotechnology, By Deswal&Deswal, DhanpatRai Publications N.A
2.Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.
4.G. S. Stent and R. Calendar, "Molecular Genetics", Freeman and company, 1978.

Note: The paper setter will set the paper as per the question paper templates provided

Suggested Books:

1. Molecular Biology of cell, 4th ed. Alberts, Bruce et al. Garland Science Publishing, New York.
2. Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. Tata McGraw Hill, New Delhi.
3. Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox. Maxmillan/ Worth publishers.
4. Genetics by Snusted& Simmons.
5. Molecular Biotechnology: Principles Application of Recombinant DNA. Glick, B. R. and Pasternak, J. J. ASM press WashingtonDC.
6. Kuby's Immunology, Goldsby, R A,.Kindt, T.J, Osborne, B.A.(2003) W. H. Freeman and company, New York.
7. Recombinant DNA 2nd Edition. Watson, James D. and Gilman, M. (2001) W.H Freeman and Company, NewYork.
8. Essentials of Molecular Biology 4thed, Malacinski, G. M. (2003) Jones &Bartlet Publishers, Boston.

ES-101A	BASIC ELECTRICAL ENGINEERING						
L	T	P	Credit	Major Test	Minor Test	Total	Time(Hrs)
4	1	-	5	75	25	100	3
Purpose	To familiarize the students with the basics of Electrical Engineering						
Course Outcomes							
CO1	Deals with steady state circuit analysis subject to DC.						
CO 2	Deals with AC fundamentals & steady state circuit response subject to AC.						
CO 3	Deals with introductory Balanced Three Phase System analysis and Single Phase Transformer.						
CO 4	Explains the Basics of Electrical Machines & Electrical installations						

Unit-I

D.C. circuits: Ohm's Law, junction, node, circuit elements classification: Linear & nonlinear, active & passive, lumped & distributed, unilateral & bilateral with examples. KVL, KCL, Loop and node-voltage analysis of resistive circuit.Star-Delta transformation for resistors.

Network Theorems: Superposition, Thevenin's, Norton's and Maximum power transfer theorems in a resistive network.

Unit-II

AC Fundamentals: Mathematical representation of various wave functions. Sinusoidal periodicsignal, instantaneous and peak values, polar & rectangular form of representation of impedances and phasor quantities. Addition & subtraction of two or more phasor sinusoidal quantities using component resolution method.RMS and average values of various waveforms.

A.C. Circuits: Behavior of various components fed by A.C. source (steady state response of pureR, pure L, pure C, RL, RC, RLC series with waveforms of instantaneous voltage, current & power on simultaneous time axis scale and corresponding phasor diagrams), power factor, active, reactive & apparent power. Frequency response of Series & Parallel RLC ckts.including resonance, Q factor, cut-off frequency & bandwidth. Generation of alternating emf.

Unit-III

Balanced Three Phase Systems: Generation of alternating 3- phaseemf). 3-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of 3-phase power by two wattmeter method for various types of star & delta connected balanced loads.

Single Phase Transformer (qualitative analysis only): Concept of magnetic circuits.Relation between MMF & Reluctance.Hysteresis & Eddy current phenomenon.Principle, construction &emf equationPhasor diagram at ideal, no load and on load conditions. Losses & Efficiency, regulation. OC & SC test, equivalent circuit, concept of auto transformer.

Unit-IV

Electrical Machines (qualitative analysis only)**:** Construction and working of dc machine with commutator action, speed control of dc shunt motor. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Basics of Single-phase induction motor, capacitor start capacitor run Single-phase induction motor working. Basic construction and working of synchronous generator and motor.

Electrical Installations (LT Switchgear): Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.

Suggested Books:

1. Basic Electrical Engg: A complete Solution by Vijay Kumar Garg, Wiley India Ltd.
2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
3. Basic Electrical Engg.by S.K. Sahdev, Pearson Education
4. Electrical Engg. Fundamentals:byBobrow, Oxford Univ.Press
5. Basic Electrical Engg. By Del Toro.
6. Saxena&Dasgupta: Fundamentals of Electrical Engg (Cambridge University Press).

Note: The paper setter will set the paper as per the question paper templates provided.

ES-103LA	BASIC ELECTRICAL ENGINEERING LAB						
L	T	Practical	Credit	Minor Test	(Practical)	Total	Time (Hrs)
-	-	2	1	20	30	50	3

Purpose	To familiarize the students with the Electrical TechnologyPracticals

Course Outcomes	
CO1	Understand basic concepts of Network theorems
CO 2	Deals with steady state frequency response of RLC circuit parameters solution techniques
CO 3	Deals with introductory Single Phase Transformer practicals
CO 4	Explains the constructional features and practicals of various types of Electrical Machines

LIST OF EXPERIMENTS

1. To verify KVL and KCL.
2. To verify Superposition theorem on a linear circuit with at least one voltage & one current source.
3. To verify Thevenin's Theorem on a linear circuit with at least one voltage & one current source.
4. To verify Norton's Theorem on a linear circuit with at least one voltage & one current source.
5. To study frequency response of a series R-L-C circuit on CRO and determine resonant frequency& Q- factor for various Values of R, L, and C.
6. To study frequency response of a parallel R-L-C circuit on CRO and determine resonant frequency& Q -Factor for various values of R, L, and C.
7. To perform O.C. and S.C. tests on a single phase transformer.
8. To perform direct load test on a single phase transformer and plot efficiency v/s load characteristic.
9. To perform speed control of DC shunt motor.
10. To perform starting & reversal of direction of a three phase induction motor.
11. Measurement of power in a 3 phase balanced system by two watt meter method.
12. Study of Cut sections of DC Machines, Induction Motor
13. To study components of various LT Switchgears

Note: At least 9 out of the listed experiments to be performed during the semester.

Bachelor of Technology (CIVIL Engineering), KUK

SCHEME OF STUDIES/EXAMINATIONS (Modified)
(Semester -III) Credit-Based (w.e.f. 2019-20)

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	HM-251A	Introduction to Civil Engineering	2:0:0	2	2	75	25	0	100	3
2	BS-204A	Higher Engineering Mathematics	3:0:0	3	3	75	25	0	100	3
3	CE-201A	Introduction to Solid Mechanics	3:0:0	3	3	75	25	0	100	3
4	CE-203A	Introduction to Fluid Mechanics	2:1:0	3	3	75	25	0	100	3
5	CE-205A	Surveying & Geomatics	3:0:0	3	3	75	25	0	100	3
6	CE-207A	Building Construction Practice	3:0:0	3	3	75	25	0	100	3
7	CE-213LA	Fluid Mechanics Lab	0:0:2	2	1	-	40	60	100	3
8	CE-215LA	Surveying & Geomatics Lab	0:0:2	2	1	-	40	60	100	3
9	CE-217LA	Computer-aided Civil Engineering Drawing	0:0:2	2	1	-	40	60	100	3
10	MC-901A**	Environmental Sciences	2:0:0	2	0	75	25	0	100	3
11	**SIM-201A***	Seminar on Summer Internship*	2:0:0	2	0	--	50	0	50	
		Total	20:1:6	27	20	450	270	180	900	

Note: *Note: SIM-201A* is a mandatory credit-less course in which the students will be evaluated for the Summer Internship (training) undergone after 2nd semester and students will be required to get passing marks to qualify.
MC-901A is a mandatory credit less course in which the student will be required to get passing marks in the major test.**

Bachelor of Technology (CIVIL Engineering), KUK

SCHEME OF STUDIES/EXAMINATIONS (Modified)

(Semester -IV) Credit-Based (w.e.f. 2019-20)

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	HM-252A	Civil Engineering - Societal & Global Impact	2:0:0	2	2	75	25	0	100	3
2	ES-205A	Engineering Mechanics	3:0:0	3	3	75	25	0	100	3
3	CE-202A	Structural Analysis-I	3:1:0	4	4	75	25	0	100	3
4	CE-204A	Design of Steel Structure-I	4:0:0	4	4	75	25	0	100	3
5	CE-206A	Soil Mechanics	3:0:0	3	3	75	25	0	100	3
6	CE-208A	Hydraulic Engineering	3:0:0	3	3	75	25	0	100	3
7	CE-212LA	Structural Analysis-I Lab	0:0:2	2	1	-	40	60	100	3
8	CE-216LA	Soil Mechanics Lab	0:0:2	2	1	--	40	60	100	3
9	CE-218LA	Hydraulic Engineering Lab	0:0:2	2	1	--	40	60	100	3
		Total	18:1:6	25	22	450	270	180	900	

B. Tech (3rd Semester) Civil Engineering							
HM-251A	Introduction to Civil Engineering						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
2	0	0	2	75	25	100	3

UNIT-I

Basic Understanding: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career, Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers.

Structural Engineering:

Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies;

UNIT-II

Overview of National Planning for Construction and Infrastructure Development;

Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works;

Surveying & Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;

UNIT-III

Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes.

Basics of Construction Management & Contracts Management:

Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management

UNIT-IV

Environmental Engineering & Sustainability:

Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction.

Hydraulics, Hydrology &Water Resources Engineering:

Fundamentals of fluid flow, basics of water supply systems; Underground Structures;

Underground Structures Multipurpose reservoir projects

Text/Reference Books:

1. Basic Civil and Mechanical Engineering, G. Shanmugam & M.S. Palanichamy, McGeraw Hill Education(India) Private Limited, Chennai.
2. Basic Civil and Mechanical Engineering, Shamugasundaram, Cengage New Delhi.
3. Basic Civil and Mechanical Engineering, by Dhale Shrikrishna A. & Tajne Kiran , S. Chand's Publication New Delhi.

Note: The examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BS-204A	HIGHER ENGINEERING MATHEMATICS						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3 h
Purpose	The objective of this course is to familiarize the prospective Engineers with Laplace Transform, partial differential equations which allow deterministic mathematical formulations of phenomena in engineering processes and to study numerical methods for the approximation of their solution. More precisely, the objectives are as under:						
Course Outcomes							
CO 1	Introduction about the concept of Laplace transform and how it is useful in solving the definite integrals and initial value problems.						
CO 2	To introduce the Partial Differential Equations, its formation and solutions for multivariable differential equations originated from real world problems.						
CO 3	To introduce the tools of numerical methods in a comprehensive manner those are used in approximating the solutions of various engineering problems.						
CO 4	To familiar with essential tool of Numerical differentiation and Integration needed in approximate solutions for the ordinary differential equations.						

UNIT-1

Laplace Transform

Laplace Transform, Laplace Transform of Elementary Functions, Basic properties of Laplace Transform, Laplace transform of periodic functions, finding inverse Laplace transform by different methods, Convolution theorem, solving ODEs by Laplace Transform method.

UNIT-2

Partial Differential Equations

Formation of Partial Differential Equations, Solutions of first order linear and non-linear PDEs, Charpit's method, Solution to homogenous linear partial differential equations (with constant coefficients) by complimentary function and particular integral method.

UNIT-3

Numerical Methods-1

Solution of polynomial and transcendental equations: Bisection method, Newton-Raphson method and Regula-Falsi method, Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT-4

Numerical Methods-2

Numerical Differentiation using Newton's forward and backward difference formulae, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules, Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations.

Textbooks/References:

1. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993. AICTE Model Curriculum in Mathematics.
2. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
3. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
4. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
8. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
9. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
10. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
11. Erwin Kreyszig and Sanjeev Ahuja, Applied Mathematics-II, Wiley India Publication, Reprint, 2015.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

B. Tech (3rd Semester) Civil Engineering							
CE-201A	Introduction to Solid Mechanics						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
3	0	0	3	75	25	100	3

UNIT-I

Analysis of stresses and strains:

Analysis of simple states of stresses and strains, elastic constraints, bending stresses, theory of simple bending, flexure formula, combined stresses in beams, shear stresses, Mohr's circle, Principle stresses and strains, torsion in shafts and closed thin walled sections, stresses and strains in cylindrical shells and spheres under internal pressure.

Theory of Columns:

Slenderness ratio, end connections, short columns, Euler's critical buckling loads, eccentrically loaded short columns, cylinder columns subjected to axial and eccentric loading.

UNIT-II

Bending moment and shear force in determinate beams and frames:

Definitions and sign conventions, axial force, shear force and bending moment diagrams.

Three hinged arches:

Horizontal thrust, shear force and bending moment diagrams.

UNIT-III

Deflections in beams:

Introduction, slope and deflections in beams by differential equations, moment area method and conjugate beam method, unit load method, principle of virtual work, Maxwell's Law of Reciprocal Deflections, Williot's Mohr diagram.

UNIT-IV

Analysis of statically determinate trusses:

Introduction, various types, stability, analysis of plane trusses by method of joints and method of sections, analysis of space trusses using tension coefficient method.

Text Books

1) Structural Analysis-I, Bhavikatti S.S.,Vikas Pub.House, N.Delhi.
2) Strength of Materials, Dr. Sadhu Singh, Khanna Publishers
3) Fundamentals of Structural Analysis, M.K.Pant,S.K.Kataria & Sons, N.Delhi

Reference Books

1) Strength of Materials Part-I, S.Timoshenko, Affiliated East-West Press, New . Delhi
2) Mechanics of Solids, Prasad, V. S. Gakgotia Pub., New Delhi.
3) Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
4) Elementary Structural Analysis, Wibur & Nooris, McGraw Hill Book Co., Newyork.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

B. Tech (3rd Semester) Civil Engineering							
CE-203A	Introduction to Fluid Mechanics						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
2	1	0	3	75	25	100	3

UNIT-I

Introduction:

Fluid properties, mass density, specific weight, specific volume and specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids.

Kinematics of Fluid Flow:

Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional. flows, stream lines, streak lines and path lines, continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows, graphical and experimental methods of drawing flow nets.

UNIT-II

Fluid Statics:

Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

UNIT-III

Dynamic of Fluid Flow:

Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation, Pitot tubes, venture meter, Orifice meter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of nappe.

UNIT-IV

Boundary layer analysis:

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.

Dimensional Analysis and Hydraulic Similitude:

Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modeling, similar and distorted models.

Text Books

1) Hydraulic and Fluid Mechanics by P.N.Modi & S.M.Seth

2. Fluid Mechanics and Hydraulic Machines, Sukumar Pati, McGeraw Hill Education (India) Private Limited, New Delhi.

2) Fluid Mechanics and Hydraulic Machines,Dr. R.K.Bansal, Luxmi Publication

Reference Books

1.Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald

2. Introduction to Fluid Mechanics and Hydraulic Machines, S.K.Som, G. Biswas & S. Chakraborty, McGeraw Hill Education (India) Private Limited.

2) Fluid Mechanics Through Problems by R.J.Garde

3) Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker

Note: The paper setter will set the paper as per the question paper templates provided.

	B. Tech. (3rd Semester) Civil Engineering						
CE-205A	**Survey and Geomatics**						
Lecture	**Tutorial**	**Practical**	**Credits**	**Major Test**	**Minor Test**	**Total**	**Time (Hrs.)**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3**

Unit I

Introduction to Surveying

Fundamental Principles of Surveying, Survey Stations, Survey Lines – Ranging, Methods of traversing, instruments for measurement of angles-prismatic and surveyor's compass, bearing of lines, local attraction, examples

Triangulation and Trilateration

Theodolites Survey: Instruments, temporary adjustment of theodolite, measurement of angles, repetition and reiteration method, traverse surveying with theodolite, checks in traversing, adjustment of closed traverse, examples. Intervisibilty of Height and Distances: Trigonometric Levelling, Axis Signal Corrections

Unit II

Levelling:

Definition of terms used in levelling, types of levels and staff, temporary adjustment of levels, principles of leveling, reduction of levels, booking of staff readings, examples

Contours:

Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, uses of contours maps.

Plane Table Surveying:

Plane table, methods of plane table surveying, radiation, intersection, traversing and resection, two point and three point problems.

Unit III

Curves:

Classification of curves, elements of simple circular curve, location of tangent points-chain and tape methods, instrumental methods, examples of simple curves. Transition Curves-Length and types of transition curves, length of combined curve, examples. Vertical Curves: Necessity and types of vertical curves.

Modern Field Survey Systems:

Principal of Electronic Distance Measurement, Modulation, Types of EDM Instruments.
Working principle and survey with total station.

Unit IV

Elements of Photogrammetry:

Introduction: types of photographs, types of aerial photographs, aerial camera and height displacements in vertical photographs, stereoscopic vision and stereoscopies, height determination from parallax measurement, flight planning,

Introduction of remote sensing and its systems:

Concept of G.I.S and G.P.S. -Basic Components, data input, storage & output.

Text Books

1. Surveying Vol.I & II by B.C.Punmia
2. Surveying Vol.I & II by S.K.Duggal, TMH Publication

Reference Books

1. 1. Surveying Vol.I by T.P.Kanitkar

	B. Tech (3rd Semester) Civil Engineering						
CE-207A	Building Construction Practice						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	4	75	25	100	3

UNIT-I

Masonry Construction:

Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

Cavity and Partition Walls:

Advantages, position of cavity, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall.

Foundation:

Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.

UNIT-II

Damp-Proofing and Water-Proofing:

Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.

Roofs and Floors:

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings.

Doors and Windows:

Locations, sizes, types of doors and windows, fixures and fastners for doors and windows.

UNIT-III

Brick and Tiles:

Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks. Tiles: Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.

Limes, Cement and Mortars:

Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement.

Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

UNIT-IV

Stones:

Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.

Timber:

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, fiberboard, masonite and its manufacturing, important Indian timbers.

Paints and Varnishes:

Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes.

Text Books

1.Building Construction and Material, Gurcharan Singh, Standard Book House

2. Building Material and Construction, G.C.Sahu & Joygopal Jena, McGeraw Hill Education(India) Private Limited, Chennai.

3. Building Construction, Dr. B.C.Punmia, Luxmi Publication

4. Building Construction, Sushil Kumar, Standard Pub., N. Delhi

Reference Books

1. Building Material, Rangawala

2. Construction Engineering, Y.S. Sane

3. Building Construction, Gurcharan Singh, Standard Pub., N. Delhi

Note: The paper setter will set the paper as per the question paper templates provided.

	B. Tech (3rd Semester) Civil Engineering							
CE-213 LA	Fluid Mechanics Lab							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time (Hrs)
0	0	2	1	0	40	60	100	3

List of experiments

1. To determine metacentric height of the ship model.
2. To verify the Bernoulli's theorem.
3. To determine coefficient of discharge for an Orifice meter.
4 To determine coefficient of discharge of a venturimeter.
5 To determine the various hydraulic coefficients of an Orifice (Cd, Cc, Cv).
6 To determine coefficient of discharge for an Orifice under variable head.
7 To calibrate a given notch.
8 To determine coefficient of discharge for a mouth piece.
9 Drawing of a flow net by Viscous Analogy Model and Sand Box Model.
10 To study development of boundary layer over a flat plate.
11 To study velocity distribution in a rectangular open channel.
12 Velocity measurements by current meter, float, and double float (demonstration only)
13 Experiment on Vortex formation (demonstration only).

	B. Tech (3rd Semester) Civil Engineering							
CE-215 LA	**Surveying & Geomatics Lab**							
Lecture	**Tutorial**	**Practical**	**Credits**	**Major Test**	**Minor Test**	**Practical**	**Total**	**Time (Hrs.)**
0	**0**	**2**	**1**	**0**	**40**	**60**	**100**	**3**

List of Experiments:

1. To plot a traverse of a given area by chain surveying & also locate offsets
2. To plot a traverse of a given area with the help of a compass and a chain.
3. To work out relative elevations of various points on the grounds by performing profile or by fly leveling
4. To plot a longitudinal section and cross section of given alignment.
5. To determine the difference in elevations of two points by reciprocal leveling.
6. To plot a contour map of given area.
7. To determine the position of station occupied by plane table using three point problem.
8. To determine the position of station occupied by plane table using two point problem.
9. Use of a tangent clinometer with plane table.

	B. Tech (3rd Semester) Civil Engineering							
CE-217 LA	**Computer-aided Civil Engineering Drawing**							
Lecture	**Tutorial**	**Practical**	**Credits**	**Major Test**	**Minor Test**	**Practical**	**Total**	**Time (Hrs.)**
0	**0**	**2**	**--**	**--**	**40**	**60**	**100**	**3**

LIST OF EXPERIMENTS

Typical drawings of:

Bonds in brick work

Grillage foundation

Preparation of building drawing mentioning its salient features including the following details:

Ground floor plan

Two Sectional Elevations

Front and Side Elevations

Plan and Sectional Elevation of stair case, doors/ windows/ ventilators, floor and roof.

Footings: Isolated footings**,** combined footings, rectangular, trapezoidal, strip, strap, raft footings

RCC Flat slabs

Masonary columns, bearing walls, retaining walls.

MC-901A	Environmental Sciences						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**0**	**75**	**25**	**100**	**3 Hrs.**
Purpose	To learn the multidisciplinary nature, scope and importance of Environmental sciences.						
Course Outcomes (CO)							
CO1	The students will be able to learn the importance of natural resources.						
CO2	To learn the theoretical and practical aspects of eco system.						
CO3	Will be able to learn the basic concepts of conservation of biodiversity.						
CO4	The students will be able to understand the basic concept of sustainable development.						

UNIT 1

The multidisciplinary nature of environmental studies, Definition, Scope and Importance, Need for public awareness, Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems.

(a) Forest Resources: Use and over-exploitation, deforestation, case studies. Timber eztraction, mining, dams and their effects on forests and tribal people.
(b) Water Resources: Use & over-utilization of surface & ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food Resources: World Food Problems, changes caused by agriculture and overgazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy Resources: Growing energy needs, renewable & non-renewable energy sources, use of alternate energy sources. Case studies.
(f) Land Resources: Land as a resource, land, degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyle.

UNIT II

Ecosystem-Concept of an ecosystem. Sturcture and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological Succession, Food Chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest Ecosystem, (b) Grassland Ecosystem, (c) Desert Ecosystem and (d) Aquatic Ecosystems (ponds, streams, lakes, rivers, oceans, esturaries

Field Work: Visit to a local area to document Environment assets-river/forest/grassland/hill/mountain, Visit to a local polluted site-Urban /Rural Industrial/Agricultural, Study of common plants, insects and birds, Study of simple ecosystems-pond, river, hill, slopes etc. (Field work equal to 5 lecture hours).

UNIT III

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

Environmental Pollution Definition: Cause, effects and control measures of (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards

Solid waste management- cause, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

UNIT IV

Social Issues and the Environment. From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people: Its problems and concerns, Case Studies: Environmental ethics-issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies: Wasteland Reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public Awareness, Human population and the Environment, Population growth, variation among nations, Population explosion-Family Welfare Programme, Environment and human health. Human rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human Health, Case Studies, Drugs and their effects; Useful and harmful drugs, Use and abuse of drugs, Stimulant and depressan drugs, Concept of drug de-addiction, Legal position on drugs and laws related to drugs.

Suggested Books

- Environmental Studies- Deswal and Deswal. Dhanpat Rai and Co.
- Environmental Science and Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India.
- Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
- Environmental Science- Botkin and Keller. 2012. Wiley , India

Note: The Examiner will be given the question paper template to set the question paper.

	B.Tech. (4th Semester) Civil Engineering						
HM-252A	Civil Engineering- Societial & Global Impact						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
2	0	0	2	75	25	100	3

UNIT-I

Introduction to Course and Overview; Understanding the past to look into the future: Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis.

UNIT-II

Understanding the importance of Civil Engineering in shaping and impacting the world:- The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering

Infrastructure :- Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability;

UNIT-III

Environment, Traditional & futuristic methods:- Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and nonstationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

Built environment: – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability

UNIT-IV

Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project developmen.

Text/Reference Books:

1. Žiga Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
3. NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
4. Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.
5. Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options
6. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx

Note: The paper setter will set the paper as per the question paper templates provided.

B. Tech (4th Semester) Civil Engineering							
ES-205A	Engineering Mechanics						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
3	0	0	3	75	25	100	3

UNIT-I

Introduction to Engineering Mechanics Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static In-determinancy.

Friction:- Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

UNIT-II

Basic Structural Analysis:- Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;

Centroid and Centre of Gravity:- Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

UNIT-III

Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium.Applications of energy method for equilibrium. Stability of equilibrium.

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy.Impulse momentum (linear, angular); Impact (Direct and oblique).

UNIT-IV

Introduction to Kinetics of Rigid Bodies:- Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

Text/Reference Books:

1.A.K. Dhiman, P. Dhiman & D.C.Dhiman (2015), Engineering Mechanics, McGeraw Hill Education(India) Private Limited, Chennai.

2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Note: The paper setter will set the paper as per the question paper templates provided.

	B.Tech. (4th Semester) Civil Engineering						
CE-204A	Design of Steel Structure-I						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time(Hrs)
3	1	0	4	75	25	100	3

UNIT-I

Introduction:

Loads, structural steels and their specifications, structural elements, steel vs. concrete and timber, design specifications as per IS: 800, structural layout, strength and stiffness considerations, efficiency of cross-section, safety and serviceability considerations.

Riveted/Bolted Connections:

Riveting and bolting, their types, failure of riveted joint, efficiency of a joint, design of riveted joint, concentric riveted joints, advantages and disadvantages of bolted connections, stresses in bolts.

Welded Connections:

Types of welded joints, design of welded joint subjected to axial loads, welded joints subjected to eccentric loads, simple, semi-rigid and rigid connections.

Design of Tension Members:

Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices.

UNIT-II

Design of Compression Members:

Introduction, effective length and slenderness ratio, various types of sections used for columns, built up columns, necessity, design of built up columns, laced and battened columns including the design of lacing and battens, design of eccentrically loaded compression members.

Column Bases and Footings:

Introduction, types of column bases, design of slab base and gussested base, design of gussested base subjected to eccentrically loading, design of grillage foundations.

UNIT-III

Design of Beams:

Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built up beams, web buckling, web crippling and diagonal buckling.

UNIT-IV

Gantry Girders:

Introduction, various loads, specifications, design of gantry girder.

Plate Girder:

Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

DRAWINGS (For Practice Purpose only)

1. Structural drawings of various types of welded connections (simple and eccentric)
2. Beam to column connections (framed & seat connections)
3. Column bases- slab base, gusseted base and grillage foundation.
4. Plate girder.
5. Roof truss.

Text Books

1) Design of steel structures, S.K.Duggal, TMH Pub., New Delhi
2) Design of steel structures, Dr.B.C.Punmia, Luxmi Publication
3) Design of steel structures-I, Dr. Ram Chandra, Scientific Publisher, Jodhpur

Reference Books

1) Design of steel structures, A.S.Arya & J.L.Ajmani, Nem chand & Bros., Roorkee.
2) Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
3) Design of steel structures, S.M.A.Kazmi & S.K.Jindal, Prentice Hall, New Delhi.

Note: The paper setter will set the paper as per the question paper templates provided.

	B.Tech. (4th Semester) Civil Engineering						
CE-202A	Structural Analysis-I						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time
3	1	0	4	75	25	100	3

UNIT-I

Statically Indeterminate Structures:

Introduction, Static and Kinematic Indeterminacies, Castigliano's theorems, Strain energy method, Analysis of frames with one or two redundant members using Castigliano's 2nd theorem.

UNIT-II

Slope deflection and moment Distribution Methods:

Analysis of continuous beams & portal frames, Portal frames with inclined members.

UNIT-III

Column Analogy Method:

Elastic centre, Properties of analogous column, Applications to beam & frames.

Analysis of Two hinged Arches:

Parabolic and circular Arches, Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.

UNIT-IV

Unsymmetrical Bending

Introduction Centroidal principal axes of sections, Bending stresses in beam subjected to unsymmetrical bending, shear centre, shear centre for channel, Angles and Z sections.

Cable and suspension Bridges:

Introduction, uniformly loaded cables, Temperature stresses, three hinged stiffening Girder and two hinged stiffening Girder.

Text Books

4) Structural Analysis-II, Bhavikatti S.S.,Vikas Pub.House, N.Delhi.
5) Theory of Structures, S.Ramamrutham, DPR publishing Company
6) Theory of Structures, B.C.Punmia, Luxmi Publication

Reference Books

1) Statically Indeterminate Structures, C.K. Wang, McGraw Hill Book Co., New York.
2) Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
3) Indeterminate Structures, R.L. Jindal, S. Chand & Co., New Delhi.
4) Theory of Structures, Vol. I, S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi

Note: The paper setter will set the paper as per the question paper templates provided.

	B.Tech. (4th Semester) Civil Engineering						
CE-206A	Soil Mechanics						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time(Hrs)
3	0	0	3	25	75	100	3

UNIT-I

Soil Formation and Composition

Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, interparticle forces, soil structure, principal clay minerals.

Basic Soil Properties

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

Classification of soils

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System.

Permeability of Soils

Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

UNIT-II

Effective Stress Concept

Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, effective stress under steady state hydro-dynamic conditions, seepage force, quick condition, critical hydraulic gradient, two dimensional flow, Laplace's equation, properties and utilities of flownet, graphical method of construction of flownets, piping, protective filter.

Compaction

Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

UNIT-III

Vertical Stress below Applied Loads

Introduction, Boussinesq's equation, vertical stress distribution diagrams, vertical stress beneath loaded areas, Newmark's influence chart, approximate stress distribution methods for loaded areas, Westergaard's analysis, contact pressure.

Compressibility and Consolidation

Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratiopressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation.

UNIT-IV

Shear Strength

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, triaxial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

Earth Pressure

Introduction, earth pressure at rest, Rankine's active & passive states of plastic equilibrium, Rankine's earth pressure theory Coulomb's earth pressure theory, Culmann's graphical construction, Rebhann's construction.

Text Books

1. Soil Mechanics and Foundation Engineering by Dr. K.R.Arora
2. Soil Mechanics and Foundations, Dr.B.C.Punmia, Luxmi Publication
3. Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age International(P)Ltd. Pub.N.Delhi

Reference Books

1. Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delhi.
2. Engg.Properties of Soils by S.K.Gulati, Tata-Mcgraw Hill N Delhi.
3. Geotechnical Engg. by P.Purshotam Raj,Tata Mcgraw Hill.
4. Principles of Geotechnical Engineering by B.M.Das, PWS KENT, Boston.

Note: The paper setter will set the paper as per the question paper templates provided.

B. Tech (4th Semester) Civil Engineering							
CE-208A	Hydraulic Engineering						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
3	0	0	3	75	25	100	3

UNIT-I

Laminar Flow:

Navier Stoke's equation, Laminar flow between parallel plates, Couette flow, laminar flow through pipes-Hagen Poiseuille law, laminar flow around a sphere-Stokes'law.

Flow through pipes:

Types of flows-Reynold's experiment, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy's weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method, water hammer.

UNIT-II

Drag and Lift:

Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil.

Open Channel Flow:

Type of flow in open channels, geometric parameters of channel section, uniform flow, most economical section (rectangular and trapezoidal), specific energy and critical depth, momentum in open channel, specific force, critical flow in rectangular channel, applications of specific energy and discharge diagrams to channel transition, metering flumes, hydraulic jump in rectangular channel, surges in open channels, positive and negative surges, gradually varied flow equation and its integration, surface profiles.

UNIT-III

Compressible flow:

Basic relationship of thermodynamics continuity, momentum and energy equations, propagation of elastic waves due to compression of fluid, Mach number and its significance, subsonic and supersonic flows, propagation of elastic wave due to disturbance in fluid mach cone, stagnation pressure.

UNIT-IV

Pumps and Turbines:

Reciprocating pumps, their types, work done by single and double acting pumps. Centrifugal pumps, components and parts and working, types, heads of a pump-statics and manometric heads,. Force executed by fluid jet on stationary and moving flat vanes, Turbines-classifications of turbines based on head and specific speed, component and working of Pelton wheel and Francis turbines, cavitation and setting of turbines.

Paper Setter's Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Text Books

1. Hydraulic and Fluid Mechanics by P.N.Modi & S.M.Seth
2. Fluid Mechanics and Hydraulic Machines,Dr. R.K.Bansal, Luxmi Publication

Reference Books

1. Flow in Open Channels by S.Subraminayam
2. Introduction to Fluid Mechanics by Robert N.Fox & Alan T.Macnold

	B.Tech. (4th Semester) Civil Engineering							
CE-212LA	Structural Analysis-I Lab							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time
0	0	2	1	0	40	60	100	2

LIST OF EXPERIMENTS

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss- horizontal deflection & vertical deflection of various joints of a pin- jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behavior of struts with various end conditions.
7. To determine elastic properties of a beam.
8. Uniaxial tension test for steel (plain & deformed bars)
9. Uniaxial compression test on concrete & bricks specimens.

	B.Tech. (4th Semester) Civil Engineering							
CE-216LA	Soil Mechanics Lab							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time
0	0	2	1	0	40	60	100	2

List of Experiments:

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:

Sand replacement method

Core cutter method

6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine grained soil sample.

Note: At least ten experiments are required to be performed by students from the above list and two may be performed from the experiments developed by the institute.

	B. Tech. (4th Semester) Civil Engineering						
CE-218A	**Hydraulics Engineering lab**						
Lecture	**Tutorial**	**Practical**	**Credits**	**Major Test**	**Minor Test**	**Total**	**Time (Hrs.)**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3**

1 To determine the coefficient of drag by Stoke's law for spherical bodies.
2 To study the phenomenon of cavitation in pipe flow.
3 To determine the critical Reynold's number for flow through commercial pipes.
4 To determine the coefficient of discharge for flow over a broad crested weir.
5 To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
6 To study the scouring phenomenon around a bridge pier model.
7 To study the scouring phenomenon for flow past a spur.
8 To determine the characteristics of a centrifugal pump.
9 To study the momentum characteristics of a given jet.
10 To determine head loss due to various pipe fittings.

Bachelor of Technology (CIVIL Engineering), KUK
Credit-Based (2018-19 Onwards)
SCHEME OF STUDIES/EXAMINATIONS (Semester -V)

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	HM-255A	Professional Practice, Law & Ethics	2:0:0	2	2	75	25	0	100	3
2	CE-301A	Structural Analysis-II	2:1:0	3	3	75	25	0	100	3
3	CE-303A	Design of Concrete Structure-I	3:0:0	3	3	75	25	0	100	4
4	CE-305A	Hydrology	2:0:0	2	2	75	25	0	100	3
5	CE-307A	Geotechnical Engineering	3:0:0	3	3	75	25	0	100	3
6	CE-309A	Concrete Technology	2:0:0	2	2	75	25	0	100	3
7	CE-311LA	Structural Analysis-II Lab	0:0:2	2	1	-	40	60	100	3
8	CE-313LA	Concrete Technology Lab	0:0:2	2	1	--	40	60	100	3
9	CE-315LA	Geotechnical Engineering Lab	0:0:2	2	1	--	40	60	100	3
10	CE-317A	Survey Camp	0:0:0	0	0	--	100	50	150	
		Total	14:1:6	21	18	450	370	230	1050	

Note: All students have to undertake the Survey Camp for 2 weeks after 4th semester which will be evaluated in 5thsemester.

Bachelor of Technology (CIVIL Engineering), KUK

Credit-Based

*SCHEME OF STUDIES/EXAMINATIONS (***Semester -VI***)*

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	CE-302A	Design of Steel Structure-II	3:0:0	3	3	75	25	0	100	3
2	CE-304A	Transportation Engineering	3:0:0	3	3	75	25	0	100	3
3	CE-306A	Irrigation Engineering	2:0:0	2	2	75	25	0	100	3
4	OE-I	Open Elective-I	3:0:0	3	3	75	25	0	100	3
5	EL-I	Elective-I	2:0:0	2	2	75	25	0	100	3
6	EL-II	Elective-II	2:0:0	2	2	75	25	0	100	3
7	CE-310LA	Transportation Engineering Lab	0:0:2	2	1	-	40	60	100	3
8	CE-312LA	ENVIRONMENTAL ENGINEERING-I (P)	0:0:2	2	1	-	40	60	100	3
9	CE-314LA	Irrigation Engineering Design &Drawing	0:0:3	3	1.5	--	40	60	100	3
10	*MC-902	Constitution of India*	3:0:0	3	0	75	25	0	100	3
		Total	18:0:7	25	18.5	525	295	180	1000	

Note: (1) *MC-902 is a mandatory credit-less course in which the students will be required to get passing marks in the major test

SIM-903 is a credit course in which the students will be evaluated for the Summer Internship (training) undergone after 6thsemester and whose credit will be evaluated in 7th semester.

OPEN ELECTIVE-I

S. No	Code No.	Subject	Semester	Credits
1.	OE-308A	Soft Skills and Interpersonal Communication	VI	3
2.	OE-310A	Introduction to Art and Aesthetics	VI	3
3.	OE-312A	Human Resource Development and Organizational Behavior	VI	3

ELECTIVE-IELECTIVE-II

Sl. No	Code No.	Subject	Semester	Credits
1.	EL-322A	Structure Dynamics	VI	2
2.	EL-324A	Solid and Hazardous waste Management	VI	2
3.	EL-326A	Engineering Geology	VI	2
4.	EL-328A	Ground Water	VI	2

S.No	Code No.	Subject	Semester	Credits
1.	EL-330A	Repair & Rehabilitation of Structures	VI	2
2.	EL-332A	Construction Engineering & Management	VI	2
3.	EL-334A	Structure Analysis by Matrix Method	VI	2
4.	EL-336A	Disaster Preparedness & Planning	VI	2

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	**Time**
HM-255A	Professional Practice, Law & Ethics	**2**	**-**	**25**	**75**	**100**	**3 Hr**
Course Objective	To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineeringprofession.						

Unit	**Course Outcome**
I	To familiarise the students to what constitutes professional practice, introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing theprofession.
II	To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement oflabour.
III	To give an understanding of Intellectual Property Rights,Patents.
IV	To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineeringprofession

UNIT-I

Professional Practice – Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)

UNIT-II

Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

UNIT-III

General Principles of Contracts Management: Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /" Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms;

UNIT-IV

Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piecerate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

Text/Reference Books:

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts,1974.
2. The National Building Code, BIS,2017
3. RERA Act,2017
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash PublicationsMumbai
6. Avtarsingh (2002), Law of Contract, Eastern BookCo.
7. Dutt (1994), Indian Contract Act, Eastern LawHouse
8. Anson W.R. (1979), Law of Contract, Oxford UniversityPress
9. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council ofArbitration
10. Wadhera (2004), Intellectual Property Rights, Universal Law PublishingCo.
11. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia LawHouse

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
CE-301A	STRUCTURAL ANALYSIS-II	**2**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	Students will acquire the knowledge about the methods of analysis of different structures.

Unit	Course Outcome
I	Students will be able to understand behavior in the form of S.F and B.M for continuous beams by influence line method
II	Students will be able to analyze the behavior of rolling load on structures and fixed arches
III	Students will be able to analyze the frames structures
IV	Students will be able to drive methods for stiffness and flexibility.

UNIT-I

Influence lines:Introduction, influence lines for three hinged and two hinged arches, load position for Max. S.F.and B.M. at a section in the span.Influence Line for statically indeterminate Beams:Muller-Breslau Principle, I.L. for B.M. & S.F. for continuous Beams

UNIT-II

Rolling Loads:Introduction, Single concentrated load, uniformly distributed load longer than span, shorter than span, two point loads, several point loads, Max. B.M. and S.F. Absolute, Max. B.M.Fixed Arches:Expression for Horizontal Thrust and Bending Moment at a section, Elastic centre

UNIT-III

Kani's Method:Analysis of continuous beams and simple frames, analysis of frames with different column lengths and end conditions of the bottom story.

UNIT-IV

Approximate Analysis of frames:(i) For vertical loads, (ii) for lateral loads by Portal method & Cantilever method.

Matrix MethodsIntroduction, Stiffness Coefficients, Flexibility Coefficients, development of flexibility & stiffness matrices for plane frame, Global axis and local axis, analysis of plane frame, pin jointed and rigid jointed.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books Recommended:

1.Indeterminate structures, R.L.Jindal S.Chand & Co.,N.Delhi.
2.Advanced Structural Analysis-A.K.Jain, NemChand & Bros.,Roorkee.
3.Structural Analysis-A Unified Approach, D.S.Prakash Rao,, University Press, Hyderabad.
4.Structural Analysis-A unified classical & Matrix Approach, A.Ghali & A.M.Neville,Chapman & Hall London.
5.Theory of Structures-Vol. I&II-S.P.Gupta & G.S.Pandit, Tata McGraw Hill, N.Delhi.
6.Basic Structural Analysis –C.S. Reddy, Tata McGraw Hill, New Delhi.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	**Time**
CE-303A	**DESIGN OF CONCRETE STRUCTURES-I**	**3**	**-**	**25**	**75**	**100**	**4 Hr**
Course Objective	To learn about the design of different types of structures by using reinforced cement concrete (RCC)						

Unit	**Course Outcome**
I	Students will be able to gain knowledge of design philosophies of different methods for RCC structures.
II	Students will be able to design of RCC beams using working stress and limit state method.
III	Students will be able to design of RCC columns and footing using working stress and limit state method.
IV	Students will be able to design of RCC slab and retaining walls and detailing of steel using working stress and limit state method.

UNIT-I

Elementary treatment of concrete technology:

Physical requirements of cement, aggregate, admixture and reinforcement, Strength and durability, shrinkage and creep. Design of concrete mixes, Acceptability criterion, I.S. Specifications,

Design Philosophies in Reinforced Concrete:

Working stress and limit state methods, Limit state v/s working stress method, Building code, Normal distribution curve, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, stress -strain relationship for concrete and steel.

UNIT-II

Working Stress Method:

Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

Limit State Method:

Basic assumptions, Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement, and design examples.

UNIT-III

Analysis and Design of Sections in shear bond and torsion:

Diagonal tension, shear reinforcement, development length, Anchorage and flexural bond, Torsional, stiffness, equivalent shear, Torsional reinforcement, Design examples.

Columns and Footings:

Effective length, Minimum eccentricity, short columns under axial compression, Uniaxial and biaxial bending, slender columns, Isolated and wall footings, Design examples.

Serviceability Limit State:

Control of deflection, cracking, slenderness and vibrations, deflection and moment relationship for limiting values of span to depth, limit state of crack width, Designexamples.

UNIT-IV

Concrete Reinforcement and Detailing:

Requirements of good detailing cover to reinforcement, spacing of reinforcement, reinforcement splicing, Anchoring reinforcing bars in flexure and shear, curtailment of reinforcement.

One way and Two Ways Slabs:

General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Nonrectangular slabs, openings in slabs, Design examples.

Retaining Walls:

Classification, Forces on retaining walls, design criteria, stability requirements, Proportioning of cantilever retaining walls, counterfort retaining walls, criteria for design of counterforts, design examples.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections. **Time Duration: 4 Hours.**

Books:

1. Design of Reinforced Concrete Structures,P.Dayaratnam,Oxford & IBHPub.,N.Delhi.
2. Reinforced Concrete-Limit State Design, A.K.Jain, Nem Chand &Bros.,Roorkee.

3. Reinforced Concrete, I.C.Syal & A,K,Goel, A.H,Wheeler &Co.Delhi.
4. Reinforced Concrfete Design, S.N.Sinha, TMHPub.,N.Delhi.
5. SP-16(S&T)-1980, 'Design Aids for Reinforced Concrete to IS:456, BIS,N.Delhi.
6. SP-34(S&T)-1987 'Handbook on Concrete Reinforcement and Detailing', BIS,N.Delhi.
7. Reinforced Concrete Design – Pillai and Menon, TMH, NewDelhi.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
CE-305A	**HYDROLOGY**	**2**	**-**	**25**	**75**	**100**	**3Hr**
Course Objective	Hydrology is the scientific study of the movement, distribution, and quality of water on Earth and other planets, including the water cycle, water resources and environmental watershed sustainability.						

UNIT	Course Outcome
I	Students will be able to get better knowledge about the total precipitation in the particular area using different rain gauges
II	Students will be able to measure the evaporation, transpiration and infiltration and can analyze the measured data.
III	Students will be able to calculate the total runoff and able to draw hydrographs for the different durations of rainfall and can predict the future runoff.
IV	Students will be able to get the knowledge of ground water, its quality and efficiency of the ground storage.

UNIT-I

Introduction:

Hydrologic cycle, scope and application of hydrology to engineering problems, drainage basins and its characteristics, stream geometry, hypsometric curves.

Precipitation:

Forms and types of precipitation, characteristics of precipitation in India, measurement of Precipitation, recording and non-recording rain gauges, rain gauge station, rain gauge network, estimation of missing data, presentation of rainfall data, mean precipitation, depth
-area –duration relationship, frequency of point rainfall, intensity-duration- frequency curves, probable max. precipitation.

UNIT-II

Evaporation & Transpiration:

Process, evaporimeters and empirical relationships, analytical method, reservoir evaporation and methods of its control, transpiration, evapotranspiration and its measurement, Penman's equation and potential evapotranspiration.

Infiltration:

Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.

UNIT-III

Runoff:

Factor affecting run-off, estimation of runoff, rainfall-run off relationships, measurement of stage-staff gauge, wire gauge, automatic stage recorder and stage hydrograph, measurement of velocity-current meters, floats, area velocity method, moving boat and slope area method, electromagnetic, ultra-sonic and dilution methods of stream flow measurement, stage discharge relationship.

Floods and Flood Routing:

Flood frequency studies, recurrence interval, Gumbel’s Method, flood routing, reservoir flood routing, channel flood routing and flood plain mapping.

Hydrograph:

Discharge hydrograph, components and factors affecting shape of hydrograph, effective rainfall, unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH, triangular UH, Snyder's synthetic UH, floods, rational methods, empiricalformulae.

UNIT-IV

Ground Water:

Occurrence, types of aquifers, compressibility of aquifers, water table and its effects on fluctuations , wells and springs, movement of ground water, Darcy's law, permeability and its determination, porosity, specific yield and specific retention, storage coefficient, transmissibility.

Ground Water Quality:

Indian and International standards, pollution of ground water and possible source, remedial and preventive measures.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Engineering Hydrology by K.Subramanya, TMH, NewDelhi
2. Hydrology by H.M.Raghunath.

3. Hydrology for Engineers by Linsely, Kohler,Paulhus.
4. Elementary Hydrology byV.P.Singh.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
CE-307A	**Geotechnical Engineering**	**3**	**-**	**25**	**75**	**100**	**3 Hr**
Course Objective	The subject gives a better idea about the soil and its properties & also design of types of foundation.						

UNIT	Course Outcome
I	Students will be able to get better knowledge the sub-surface soil and its properties and methods of sampling and testing.
II	Students will be able to analyse and Design the different types of shallow foundation.
III	Students will be able to analyse and Design the different types of pile foundation.
IV	Students will be able to analyse and Design the different types of Drilled Piers and Caisson Foundations.

UNIT-I

Sub-Surface Exploration: Purpose, stages in soil exploration, depth and lateral extent of exploration, guidelines for various types of structures, ground water observations, excavation and boring methods, soil sampling and disturbance, major types of samplers, sounding methods-SCPT, DCPT, SPT & interpretation, geo-physical methods, pressure-meter test, exploration logs. **Drainage & Dewatering:** Introduction, ditches and sumps, well point systems, shallow well system, deep well drainage, vacuum method, Electro-osmosis, consolidation by sand piles, Eductor method.

UNIT-II

Shallow Foundations-I: Design criteria for structural safety of foundation (i) location of footing, (ii) shear failure criterion, (iii) settlement criterion, ultimate bearing capacity, modes of shear failure, Rankine's analysis Tergazi's theory, Skempton's formula, effect of fluctuation of G.W.T. , effect of eccentricity on bearing capacity, I.S Code recommendations, factors affecting bearing capacity, methods of improving bearing capacity.
Shallow Foundations-II: Various causes of settlement of foundation, allowable bearing pressure based on settlement, settlement calculation, elastic and consolidation settlement, allowable settlement according to I.S.Code. Plate load test and its interpretation, bearing capacity from penetration tests, design bearing capacity.
Shallow Foundations-III: Situation suitable for the shallow foundations, types of shallow foundations and their relative merits, depth of foundation, footing on slopes, uplift of footings, conventional procedure of proportioning of footings, combined footings, raft foundations, bearing capacity of raft in sands and clays, various methods of designing rafts, floating foundations.

UNIT-III

Pile Foundations-I: Introduction, necessity of pile foundations, classification of piles, load capacity, static analysis, analysis of pile capacity in sands and clays, dynamic analysis, pile load tests, negative skin friction, batter piles, lateral load capacity, uplift capacity of single pile, under-reamed pile.
Pile Foundations-II: Group action in piles, pile spacing, pile group capacity, stress on lower strata, settlement analysis, design of pile caps, negative skin friction of pile group, uplift resistance of pile group, lateral resistance, batter pile group.

UNIT-IV

Drilled Piers and Caisson Foundations: Drilled piers-types, uses, bearing capacity, settlement, construction procedure. Caissons-Types, bearing capacity and settlement, construction procedure. well foundations-shapes, depth of well foundations, components, factors affecting well foundation design lateral stability, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books Recommended:

1. Analysis and Design of Foundation and Retaining Structures by S. Prakash, Gopal Ranjan & S.Saran, SaritaPrakashan.
2. Analysis and Design of Sub Structures by Swami Saran, IBHOxford
3. Basic and Applied Soil Mechanics by Gopal Ranjan and ASR Rao, NewageInt.Pub.
4. Soil Dynamic by Shamsher Prakash, McGrawHill
5. Foundation Design by Teng, PrenticeHall
6. Soil Mechanics & Foundation Engineering by Bharat Singh, Shamsher Prakash, Nem Chand & Bros,Roorkee.

7. Soil Mechanics and Foundation Engineering by AlamSingh.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
CE-309A	**CONCRETE TECHNOLOGY**	**2**	**-**	**25**	**75**	**100**	**3 Hr**

Course Objective	To have better understanding about the various properties of materials and ingredients of concrete.

UNIT	**Course Outcome**
I	Students will be able to gain knowledge of the construction materials like Cement & Aggregates and its properties
II	Students will be able to design concrete and perform test on concrete on various strength parameters, modifying its properties using other substances.
III	Students will be able to examine various effects on concrete & its non-destructive tests for properties evaluation.
IV	Students will be able to gain knowledge about methods of repairing and design of special concrete.

UNIT-I

Introduction: Introduction of Concrete, preparation of concrete, grades of concrete, advantages of concrete, concept of quality control.

Cement: Introduction of Cement, ingredient in cement. basic chemistry, types of cement, ordinary Portland cement, rapid hardening cement, low heat cement, sulphate resistant cement, Portland-pozzolona cement, high strength Portland cement, high alumina cement, waterproof cement, white Portland cement, hydrophobic cement, colored Portland cement, Field and laboratory tests on cement. Pozzolanic materials, Fly ash, metakaoline, GGBS, iron slag, rise husk ash - its types, properties, applications &limitations.

Aggregates: Aggregates, classification of aggregates based on petrography, size, shape and textures, deleterious substances in aggregates, bulking of fine aggregates, sieve analysis, grading of aggregates as per IS-383-1970, fineness modulus, Maximum size of aggregate, Quality of mixing water, curing water.

UNIT-II

.**Production of Concrete:** Introduction, Design of mix by IS & ACI methods including batching of materials, mixing of concrete materials, transportation of concrete, compaction of concrete, ready mixed concrete, vibrators, Internal vibrators, external vibrators, concrete curing and formwork removal.

Properties of Concrete: Introduction, workability, factors influencing workability, measurement of workability, requirements of workability, properties of hardened concrete, stress and strain characteristics of concrete, Young's modulus of concrete, creep and shrinkage of concrete, permeability of concrete, durability of concrete sulphate attack, fire-resistance, thermal properties of concrete, construction joints, expansion and contraction joints.

UNIT-III

Non-Destructive Testing of Concrete: Significance of Non-Destructive Testing, Rebound Hammer, Ultrasonic pulse velocity techniques, Penetration techniques, pullout tests, vibration methods, radioactive techniques, Cover meter, core-tests.

Deterioration of Concrete & its Prevention: Causes of concrete deterioration, deterioration by water, surface weir, frost action, deterioration by chemical reactions, sulphate attack, alkali-aggregate reaction, corrosion of embedded steel in concrete, Prevention of deterioration ofconcrete.

UNIT-IV

Repair Technology for Concrete Structures: Symptoms and diagnosis of distress, evaluation of cracks, repair of cracks, common types of repairs, distress in fire damaged structures, underwater repairs.

Special Concrete: Light weight concrete, definition and its properties, applications, high strength concrete, definitions, its properties and applications, Mass Concrete, waste material based concrete, shortcrete, fiber reinforced concrete: Materials Fibres types and properties, ferrrocement, polymer concrete composites, heavy weight concrete for radiation shielding.

Prestressed Concrete: Introduction, basic concepts, classifications and types of prestressing, prestressing systems, and properties of materials, pre tensioned and post tensioned concrete elements.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

TEXT BOOKS

1. Neville A M and Brookes J J “Concrete Technology” Pearson Publishers, New Delhi,1994.
2. Neville A M “Properties of Concrete” Pearson Publishers, New Delhi,2004.
3. Gambhir M L “Concrete Technology” Tata McGraw Hill, New Delhi,1995.
4. Shetty M S “Concrete Technology” S. Chand & Company, New Delhi,2002.
5. Mehta P K “Microstructure of Concrete” Indian Concrete Institute and ACC,Bombay.

Code	Nomenclature of Practical	P	Major Test	Minor Test	Total	Time
CE-311LA	**STRUCTURAL ANALYSIS –II (P)**	**2**	**60**	**40**	**100**	**2H**
Course Objective	To make students acquire the knowledge of methods of analysis of structure fitness for use, physical test and determining the effects of load in a structure					

LIST OF EXPERIMENTS

1. Experiment on a two hinged arch for horizontal thrust & influence line for Horizontalthrust
2. Experimental and analytical study of a 3-bar pin-jointedTruss.
3. Experimentalandanalyticalstudyofdeflectionsforunsymmetricalbendin gofa Cantilever beam.
4. Begg's deformeter- verification of Muller Breslauprinciple.
5. Experimental and analytical study of an elastically coupledbeam.
6. Determine the Forces in members of redundantframes.
7. Sway in portal frames -demonstration.

References:

1. A Laboratory Manual on Structural Mechanics by Dr. Harwinder Songh; New Academic Publishing Comp. Ltd.

Code	Nomenclature of Practical	P	Major Test	Minor Test	Total	Time
CE-313LA	**CONCRETE TECHNOLOGY (P)**	**2**	**60**	**40**	**100**	**2H**
Course Objective	To have better understanding about the various properties of materials used for preparation of concrete, Design of concrete by IS method and different tests to evaluate the strength of concrete.					

LIST OF EXPERIMENTS

1. To determine the standard consistency and initial and final setting time of cement using Vicat'sapparatus.
2. To determine the Fineness of cement by Sieve analysis and Blaine's air permeabilitymethod.
3. To determine the (1) specific gravity of cement (2) Soundness of cement by Le Chatelier'sapparatus.
4. To determine the Compressive strength ofcement.
5. ToDeterminetheFinenessModulus,BulkDensity,WaterAbsorptionandSpecificgravityofFineAggregates.
6. ToDeterminetheFinenessModulus,BulkDensity,WaterAbsorptionandSpecificgravityofCoarseAggregates.
7. Mix Design of Concrete by ISmethods.
8. Workability of cement concrete by (1) Slump test, (2) Compaction factor test, (3) Flow tabletest.
9. To Determine the Compressive strength of concrete by (1) Cube test, (2)Cylindertest.
10. To Determine the Split Tensile and Flexural strength ofConcrete.
11. To Determine the Bond strength between steel bar and concrete by pull-outtest.
12. To evaluate the Non-destructive testing of concrete by (1) Rebound hammer, (2) ultrasonic pulse velocitytest.
13. To Determine the Compressive strength of Brick and Tile as ISstandard.

Books Recommended:

1. Concrete Manual-M.L.Gambhir, Dhanpat Rai & Sons,N.Delhi.
2. Concrete Technology-M.L.Gambhir, Tata McGeraw Hill,N.Delhi.
3. Concrete Technology – Nevellie, PearsonEducation.

Code	Nomenclature of Practical	P	Major Test	Minor Test	Total	Time
CE-315LA	**Geotechnical Engineering Lab**	**2**	**60**	**40**	**100**	**2H**
Course Objective	The subject gives better idea about the soil and its properties which are very useful indesign of types of foundation.					

LIST OF EXPERIMENTS

1. Grain Size Analysis-Hydrometermethod.
2. Shrinkage LimitDetermination.
3. Relative Density of GranularSoils.
4. Consolidated Drained (CD) TriaxialTest.
5. Consolidated Undrained (CU) Triaxial Test with Pore Water Pressuremeasurement.
6. ConsolidationTest.
7. UndisturbedSampling.
8. Standard PenetrationTest.
9. Dynamic Cone PenetrationTest.
10. Model Plate LoadTest.

Books:

1. Soil Testing for Engineers by S.Prakash & P.K.Jain, Nem Chand &Bros.,Roorkee.
2. Engineering Soil Testing by Lambi,Wiley-Eastern.
3. Engineering Properties of Soils & Their Measurement by JE Bowles, McGraw-Hill.
4. Soi l Engineer ing in Theory & Pract ice by Alam Singh, Vol. II, Geotechnical Testing & Instrumentation, CBSPub.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
CE-302A	**DESIGN OF STEEL STRUCTURES-II**	**3**	**-**	**25**	**75**	**100**	**3 Hr**

Course Objective	To Impart knowledge and ability to design various steel structures.

UNIT	**Course Outcome**
I	Students will be able to familiar with the Elementary Plastic Analysis and Design of steel structures.
II	Students will be able to design steel water tank and steel stacks and their stability checks.
III	Students will be able to design steel towers and Cold Formed Sections and their stability checks.
IV	Students will be able to design steel industrial building and their stability checks.

UNIT-I

Elementary Plastic Analysis and Design:

Introduction, Scope of plastic analysis, ultimate load carrying capacity of tension members and compression members, flexural members, shape factor, mechanisms, plastic collapse, analysis, plastic analysis applied to steel beams and simple portal frames and design.

UNIT-II

Design of Water Tanks:

Introduction, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

Design of Steel Stacks:

Introduction, various loads to be considered for the design of steel stacks, design of steel stacks including foundation.

UNIT-III

Towers:

Tmicrowave towers, Design loads, classification, design procedure and specification.

Cold Formed Sections:

Introduction and brief description of various types of cold formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, design of compression and bending elements.

UNIT-IV

Industrial Buildings:

Loads, general arrangement and stability, design considerations, design of purlins, design of roof trusses, industrial building frames, bracings and steppedcolumns.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Design of Steel Structures, A.S.Arya & J.L.Ajmani, Nem Chand & Bros.,Roorkee.
2. Design of Steel Structures, P.Dayartnam, Wheeler Pub.Allahabad.
3. Design of Steel Structures, Gaylord & Gaylord, MGH, Newyork/International StudentsEd.
4. IS:800-1984, Indian Standard Code of Practice for General Construction inSteel.
5. IS-801-1975, Indian Standard Code of Practice for Use of Cold formed light gauge steel structural members in general buildingconstruction.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
CE-304A	**TRANSPORTATION ENGINEERING**	**3**	**-**	**25**	**75**	**100**	**3 Hr**

Course Objective	The study of safe & optimum geometric design of highways & fundamental parameters of highway materials.

UNIT	**Course Outcome**
I	Students will able to gain knowledgeabout the history review of roads and development of their concern authorities.
II	Students will be able to examine geometric design and their cross sectional elements of highways.
III	Students will gain knowledge about regulation and safe movements of the traffic.
IV	Students will gain knowledge about different fundamental parameters of highway materials.

UNIT-I

Introduction: Transportation and its importance. Different modes of transportation. Brief review of history of road development in India and abroad: Roman, Tresagne, Telford and Macadam constructions. Road patterns. Classification of roads, Objectives of highway planning, Planning surveys. Saturation system of planning.

Traffic Characteristics and Traffic Surveys: Road user and vehicular characteristics. Traffic studies such as volume, speed and O & D study. Parking and accident studies. Fundamental diagram of traffic flow. Level of service. PCU. Capacity for non-urban roads. Causes and preventive measures for road accidents.

Traffic Control Devices: Traffic control devices: signs, signals, markings and islands. Types of signs. Types of signals. Design of an isolated fixed time signal by IRC method.

UNIT-II

Design of Flexible Pavements:

Types of pavements. Flexible and rigid pavements. Components of a pavement and their functions. Factors affecting design of pavements. Design of thickness of a flexible pavement by Group Index method, CBR method (including latest IRC guidelines), riaxial method and Burmister's method.

Design Of Rigid Pavements:

Westergaard's theory, critical locations of loading, load and temperature stresses. Critical combination of stresses. IRC guidelines for determination of thickness of a rigid pavement. Joints: requirements, types, patterns. Spacing of expansion and contraction joints. Functions of dowel and tie bars.

UNIT-III

Cross Section Elements and Sight Distance Considerations: Cross section elements: friction, carriageway, formation width, land width, camber, IRC recommended values. Types of terrain Design speed. Sight distance, stopping sight distance, overtaking sight distance, overtaking zones, intermediate sight distance, sight distance at intersections, head light sight distance, set back distance. Critical locations for sight distance

.

Design of Horizontal and Vertical Alignment: Effects of centrifugal force. Design of super-elevation. Providing super- elevation in the field. Radius of circular curves. Extra-widening. Type and length of transition curves. Gradient, types, values. Summit curves and valley curves, their design criterion. Grade compensation on curves.

UNIT-IV

Bituminous Materials and Bituminous Mixes: Types of bituminous materials: bitumen, tar, cutback and emulsions. Various tests, testing procedures and IRS/IS specifications for suitability of bituminous materials in road construction. Bituminous mix, desirable properties. Marshall' method of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

Construction of Bituminous Pavements:

Various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of BUSG, Premix carpet, BM, DBM and AC. Brief coverage of machinery for costruction of bituminous roads:

bitumen boiler, sprayer, pressure distributer, hot-mix plant, cold-mix plant, tipper trucks, mechanical paver or finisher, rollers. Mastic asphalt. Introduction to various IRC and MOST specifications.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Highway Engg. by S.K.Khanna & C.E.G.Justo, Nem Chand &Bros,Roorkee.
2. Principles of Transportation and Highway Engg. by G.V.Rao,Tata McGraw Hill Pub.,N.Delhi.
3. Traffic Engg. And Transport Planning by L.R.Kadiyali,KhannaPub.Delhi.
4. Traffic Engg. by Matson, T.M.,Smith,W.S. and Hurd,P.W.McGraw Hill Book Co., NewYork.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
CE-306A	IRRIGATIONENGINEERING	**2**	**-**	**25**	**75**	**100**	**2 Hr**
Course Objective	The student is exposed to different phases in irrigation practices and Planning and management of irrigation. Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigationmanagement.						
UNIT	**Course Outcome**						
I	Students will be able to understand the methods and management ofirrigation						
II	Students will be able to gain knowledge on types of Impounding structures						
III	Students will be able understand methods of irrigation including canalirrigation.						
IV	Students will be able understand water management on optimization of wateruse.						

UNIT-I

CROP WATER REQUIREMENT Need and classification of irrigation- historical development and merits and demerits of irrigation- types of crops-crop season-duty, delta and base period- consumptive use of crops-estimation of Evapotranspiration using experimental and theoretical methods

UNIT-II

IRRIGATION METHODS Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and MicroIrrigation design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigationefficiencies.

UNIT-III

DIVERSION ANDIMPOUNDINGSTRUCTURES Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages-

CANAL IRRIGATION Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy's and Lacey's Regime theory-Design of unlined canal

UNIT- IV

WATER MANAGEMENTINIRRIGATION Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On form development works-Participatory irrigation management- Water resources associations- Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation

.

TEXTBOOKS:

1. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers,2005
2. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc,2000
3. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw- Hill Inc., New Delhi,1997

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
OE- 308A	**Soft Skills and Interpersonal Communication**	**3**	**-**	**25**	**75**	**100**	**3 Hr**

UNIT	Course Outcome
I	Develop basic understanding of Communication
II	Understand the process of communication and speaking
III	Develop the Personality concepts and its implementation
IV	Develop the basic of Group Discussion and interviews

UNIT-I

Communication**:** Introduction Verbal, Non-Verbal, kinesics, proxemics, chronemics, Types of communication, extrapersonal communication, intrapersonal communication, intrapersonal communication, mass communication,Creativity in communication, Role of communication, flow of Communication and its need, Persuasive communication and negotiation;Time management in Persuasive communication, Importance of Persuasive Communication

UNIT-II

Barriers in the way of communication, noise, intrapersonal barriers, interpersonal barriers,organizational barriers, Extrapersonal barriers, Basics of communication:importance of communication,process of communication, objectives and characteristics of communication,Communication skills: Accent, Intonation, Phonetics, Speaking skills, Confidence, clarity, Fluency,Quality,pronunciation

UNIT-III

Personality Development; what is personality? Role of personality,Heredity, Environment, situation, Basics of personality, Soft skills; Needs and training, Activity in soft skills, Organizational skill;Introduction and its need,basics principles for Organization skills,Stress management;Introduction, Stress at home and office, Stress prevention, analyze the model of stress.

UNIT-IV

Group discussion, form of Group discussion, strategy for Group discussion, discussing problems and solution, Oral presentation, introduction, planning, Occasion, Purpose, Modes of delivery, Resume making;Purpose of Resume, Resume design and structure, contents in Resume, types of resume, Job interview, introduction, objective of Interview, types of interview, stages of interview,Face to face interview and campus interview

Text Books:

1.Technical Communication Principles and Practice by Meenakshi Raman and Sangeeta Sharma by Oxford Publication

Reference Books:

1. Personality Development and soft skills by Barun K. Mitra, OxfordPublication
2. Communication Skills ForEngineers by C.Muralikrishna and Sunita Mishra, PearsonPub.

Note: The paper setter will set the paper as per the question paper templates provided.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
OE-310A	**Introduction to art and aesthetics**	**3**	**-**	**25**	**75**	**100**	**3 Hr**

Course objective	The course will examine the role and development of the visual arts in past and present cultures throughout the world.
UNIT	**Course Outcome**
I	To help students to develop art application, aesthetic judgment
II	To increase visual perception and critical thinking skills
III	To gain the knowledge of architecture.
IV	To know the different styles in Interior design and furniture design

Unit-I

Movement in Art in the 18th and 19th Century. Neoclassicism - Romanticism – Impressionism – Monet and contemporary artists - Post Impressionism - Van Gogh and contemporaries.

Movements in art in the 20th Century. Fauvism – Cubism – Picasso – Braque - Expressionism - Futurism – Dadaism - Duchamp - Surrealism - Dali - Abstract Expressionism – Pollock - Warhol - Constructivism - De Stijl - Bauhaus School and Gropius - Conceptual Art - Site Specific Art- Op Art – Neo-Expressionism.

Unit-II

Rajasthani Architecture - Islamic Architecture : Tajmahal, Charminar, Golgumbaz, Fatehpur Sikri -Colonial Architecture in India at Lucknow, Patna, Kolkota. – Painting schools in Medieval India – Malwa, Deccan and Jodhpur Schools – Mughal and Rajput Painting – Mysore and Tanjore Paintings – Kangra, Madhubani and Pattachitra Styles.

Art & Architecture in Kerala – Traditional Architecture – Traditional Wood Carvings and Mural Paintings.

Unit-III

Indian Art in 19^{th} and 20^{th} Centuries. European influence in Indian Art, Company School, Raja Ravi Varma - Realistic academic painting & sculpture. Revivalist movement - Bengal school - Abanidranath Tagore – Nandalal Bose – Ramkinker Baij – Jamini Roy – Amrutha Shergil - Post – Independent developments in Indian Art: Progressive art Movements – Kolkata, Mumbai, Chennai - Souza – Hussain – Ara - Raza – Madras School: KCS Panicker and followers.

Unit-IV

Different styles in Interior Design and Furniture Design: Egyptian, Rococo, Art Deco, Bauhaus, Modernism and Post Modernism, Minimalism, Eclecticism, High tech & hard edge style – Eastern influences.

Text Books:

1.Indian Art : Parthe Mitter 6. Indian Art: A Concise History : Roy C Craven

REFERENCE

1.The Story of Art : E. H. Gombrich
2.A People's History of the World : Chris Harman
3.Gardner's Art Through the Ages: The Western Perspective : Fred S. Kleiner
4.The Social History of Art Volume III & IV : Arnold Hauser

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
OE- 312A	**Human Resource Management and organizational behaviour**	**3**	**-**	**25**	**75**	**100**	**3 Hr**
UNIT	**Course Outcome**						
I	Develop basic understanding Human Resource Management						
II	Understand the process of Human resource training and development						
III	Develop the Leadership quality						
IV	Develop the concept of formal and informal organizational behaviour						

UNIT-I

HRD-Macro Perspective: HRD Concept, Origin and Need, HRD as a Total System; Approaches to HRD, Human Development and HRD, HRD at Macro and Micro Climate.

HRD–Micro Perspective: Areas of HRD, HRD Interventions Performance Appraisal, Potential Appraisal, Feedback and Performance Coaching, Training, Career Planning, OD or Systems Development, Rewards, Employee Welfare and Quality of Work Life and Human Resource Information, Staffing for HRD, Roles of HR Developer, Physical and Financial Resources for HRD, HR Accounting, HRD Audit, Strategic HRD

UNIT-II

Instructional Technology for HRD : Learning and HRD, Models and Curriculum, Principles of Learning, Group and Individual Learning, Transactional Analysis, Assessment Centre, Behaviour Modeling and Self Directed Learning, Evaluating the HRD

Human Resource Training and Development : Concept and Importance, Assessing Training Needs, Designing and Evaluating T&D Programmes, Role, Responsibilities and challenges to Training Managers.

Training Methods: Training with in Industry (TWI): On the Job & Off the Job Training, Management Development: Lecture Method, Role Play, Simulation, Globalization challenges and Strategies of Training Program, Review on T&D Programmes in India.

UNIT-III

Motivation: Types of Motives, Theories of Maslow, Herzberg, McGregor, Alderfers, Porter and Lawler's Model; Job Enlargement, Job Enrichment, Behaviour Modification. Leadership : Concept, Leader Vs. Manager; Classical Studies on Leadership, Trait Theories, Behavioral Theories, Group and Exchange Theories; Contingency Theory of Leadership, Leadership Styles.

UNIT-IV

Formal and Informal Organisations: Orgin of Formal and Informal Organisations, Problems Associated with Informal Organisations.

Organisational Effectiveness (OE) : Concept; Approaches to O E, Adoptive Coping Cycle for Effectiveness; Achieving OE, Organisational Climate: Concept, Determinants of Organisational Climate, Physical Environment; Values and Norms

Organization Theory: Classical Theory; Neo-Classical Theory, Modern Behavioural Theories, contingency theory, system theory, modern structural models, Organizational Culture, Creating and Sustaining Culture, Work Culture

Books recommended

1.Nadler, Leonard : Corporate Human Resource Development.

2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems, Oxford IBH Pub. Pvt.Ltd, New Delhi , 2005.

3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2004.

4. Viramani, B.R and Seth, Parmila: Evaluating Management Development, Vision Books, New Delhi .
5. Luthans, Fed : Organisational Behaviour, Tata McGraw-Hill Co. New Delhi , 2004.
6. Stephen, P. Robins : Organisational Behaviour, Prentice-Hall of India Pvt., Ltd., 2004.
7. John, W. NMewstrom & Davis, Ketih : Organisational Behavior (Human Behavior at Work), Tata McGraw-Hill, New Delhi , 2002.
8. Bhatia, Hans Raj : General Psychology, Oxford and IBH Publishers, New Delhi .

ELECTIVE-1

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
EL-322A	Structural Dynamics	**2**	**-**	**25**	**75**	**100**	**2 Hr**
Course Objective	To understand the behaviour of dynamic loading. Study the effect of earthquake loading on the behaviour of structures. Understand the codal provisions to design the structures as earthquakeresistant.						
UNIT	**Course Outcome**						
I	Students will be trained to identify, formulate and solve complicatedproblem.						
II	Students will be able to understand the role of natural calamity in the damage ofstructures.						
III	Students will be able to develop the skill to analyse data and to apply the same in the practicalproblems.						
IV	Students will be able to apply the developed methodologies for the safe and stable design ofstructures						

UNIT-I

Introduction: Objective, difference between static and dynamic analysis, loading, essential characteristics of a dynamic problem, principles of dynamics, formulation of equation of motion.

UNIT-II

Single Degree Of Freedom System: analysis for free and forced vibration, Duhamels integral, Damping — types and evaluation, Response of SDOF system to harmonic excitation, Periodic excitation, Impulsive loading, arbitrary, step, pulse excitation, Response to General Dynamic loading, Numerical evaluation of dynamic response-superposition and step by step methods, generalized SDOF system.

UNIT-III

Multi degree of freedom: equation of motion, equation of structural property matrices, problem statement and solution methods, free vibration, forced harmonic vibration, damped motion for MDOF, Generalized co-ordinates, principle of orthogonality of modes,

UNIT-IV

Multi degree of freedom:Eigenvalue problem, model response, approximate methods: Stodalla-Vanaello, Modified Reyleigh's method, Holzer's Method, Holzer Myklested method, Matrix method, Energy method, Lagrange's equation, model analysis, stochastic response of linier SDOF and MDOF system to Gaussian inputs.

Books recommended:

I. Clough and Penzien, 'Dynamics of Structures' McGraw Hill Book co.
II. Chopra, A.K., Dynamics of Structures', Theory and Application to Earthquake Engineering', Prentice Hall of India, New Delhi. 1995.
III. Glen V. Berg, 'Element of Structural Dynamic', Prentice Hall, Engewood Cliffs, NJ.
IV. Grover L. Rogers, 'Dynamics of Framed Structures', John Wiley and Sons Inc., New York.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
EL-324A	**Solid and hazardous waste management**	**2**	**-**	**25**	**75**	**100**	**2 Hr**

UNIT	Course Outcome
I	Examine physical and chemical composition of hazardous wastes.
II	Analyze activities associated with the management of solid waste.
III	Understand method to recover materials, conserve products, and to generate energy from solid and hazardous wastes
IV	Design and locate waste containment systems as per regulatory standards.

UNIT-I

Introduction, sources & types of solid waste; Municipal solid waste: composition & its quantity of generated Municipal solid waste; Industrial solid waste: classification & extent of generation of waste in India.
Physical, Chemical, and Biological characteristics of Municipal Solid waste; Impact of solid waste on environment

UNIT-II

Collection: Collection of Solid waste; collection policy, collection system, equipments,factors affecting collection, analysis of collection system , collection routes
Transfer and Transport: Need for transfer operation, transfer stations, types, transport means and methods, location of transport stations, Transfer stations: selection of location, types & design requirements, operation & maintenance.

UNIT-III

Physicochemical Treatment of Solid and Hazardous Waste: Combustion, stabilization and solidification of hazardous wastes, soil vapour extraction, air stripping
Biological Treatment of Solid and Hazardous Waste: Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; slurry phase bioreactor; in-situ remediation; Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration

UNIT-IV

Hazardous solid waste: Introduction; biomedical waste Management**:** Biomedical waste and their impacts on health and environment; legislative laws on management; labeling and storage of biomedical waste; transportation and disposal methods
Radioactive Waste Management: Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options

Books recommended:

1. John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.
2. LaGrega, M.D. Buckingham, P.L. and Evans, J.C. Hazardous Waste Management, McGraw Hill International Editions, New York, 1994.
3. Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, New York, 1997.
4. Basics of Solid and Hazardous Waste Mgmt. Tech. by Kanti L. Shah 1999, Prentice Hall.
5. Solid And Hazardous Waste Management 2007 by S.C. Bhatia Atlantic Publishers & Dist.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
EL-326A	**ENGINEERING GEOLOGY**	**2**	**-**	**25**	**75**	**100**	**2 Hr**
Course Objective	At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor.						
UNIT	**Course Outcome**						
I	Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geologicalagencies.						
II	Will get basics knowledge on properties ofminerals.						
III	Gain knowledge about types of rocks, their distribution anduses.						
IV	Will understand the methods of study on geologicalstructure.						

UNIT-I

Introduction:

Definition, object, scope and sub division of geology, The interior of the earth, crust, mantle and core, Importance of geology in Civil Engineering projects. Different branches of geology.

Physical Geology:

Origin of earth, external and internal geological forces causing changes, erosion of the surface of the earth.

Geological work of ice, water and wind, Soil profile and its importance ,Earth movement, earthquakes and volcanoes.

UNIT-II

Mineralogy and Petrology:

Definition of mineral and rocks, Classification of minerals, physical and chemical properties of minerals. Classification of rocks. Mineral composition, Textures, structure and origin of Igneous, Sedimentary and Metamorphic rocks.

Structural Geology and general stratigraphy of India:

Elementary idea about outcrop, dip and strike, bedding plane, fold, fault, joint and unconformity. General principles of stratigraphy of India and their characteristics

UNIT-III

Geological Investigations:

Preliminary geological investigations- Use of geological maps and interpretation of data, geological reports, hydrogeology, water table, springs and artesian well, ground water in engineering projects, artificial recharge of ground water, Elementary ideas of geological investigation, Remotesensing techniques for geological and hydrological survey and investigation.

Geological conditions and stability of foundation sites and abutments:

Geological condition and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges. Geological definitions and aspects of landslides and Hill-slope stability.

UNIT-IV

Improvement of foundation rocks:

Precaution and treatment against faults, joints and ground water (electrical and seismic methods). Retaining walls and other treatments.

Geology and environment of earth.

Engineering geology and its case study, water table, geology as a subject, flood plane deposits, deltas, waterfalls, lakes etc.Earth environment, global warming and effect.

Note: The physical study of rock samples and minerals may be performed in the tutorials.

Paper Setter's Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from eachunit. The candidate is required to attempt five questions in all, taking at least one from each of the foursections.

Text Books

1. Engineering and General Geology by Prabin Singh
2. General & Engineering Geology by Dr. D.S.Arora

Reference Books

1. A Text Book of Geology by P.K. Mukherjee
2. Physical and General Geology by S.K.Garg

Introduction of Physical Geology by A.Holmes

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
EL-328A	**GROUND WATER**	**2**	**-**	**25**	**75**	**100**	**2 Hr**
Course Objective	To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers, To understand the techniques of development and management of groundwater						
UNIT	**Course Outcome**						
I	Understand aquifer properties and itsdynamics						
II	Get an exposure towards well design and practicalproblems						
III	Develop a model for groundwatermanagement.						
IV	Students will be able to understand the importance of artificial recharge and groundwater qualityconcepts						

UNIT-I

Properties of Aquifers, Formation constants, compressibility of aquifers, Equation of motion for steady and unsteady ground water flow in isotropic homogeneous aquifers, Dupit's assumptions. Unconfined flow with a recharge, tile drain problem. Ground water exploration and methods of investigations.

UNIT-II

Effect of Boundaries, interference of water, leaky aquifers, Thiem's equilibrium formula for unconfined and confined aquifers and determination of hydraulic properties of aquifers. Partial penetration of an aquifer by a well, spherical flow in a well. Non equilibrium formula for aquifer (unsteady radial flows).

UNIT-III

Tubewells, optimum capacity, silting of tubewell, design of Tubewells in different aquifers, tubewell types, parts, bore hole, strains, its types, well pipe, causing pipe, blind pipe. Construction and working of tubewells, site selection, drilling operation, cable tool method, hydraulic method, rivers Rotary Method and drilling fluids, well screen assembly installation, verticality and alignment of tubewells, gravel packing, development of tubewells, sickness, in construction and corrosion and failure of tubewells, Pumping equipment and hydraulic testing of pumps.

UNIT-IV

Artificial Recharge of Ground Water, considerations and methods, recharge techniques induced infiltration, water spreading, flooding, basins, ditching, modification of natural channels, irrigation, recharge pits, shafts and recharge wells.

Books:

Groundwater Hydrology, D.K. Todd, John Wiley & Songs Inc. New York.
Groundwater H.M. Raghunath, Wiley Eastern Ltd., N.Delhi.

ELECTIVE-II

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
EL-330A	Repair and rehabilitation of structure	**2**	**-**	**25**	**75**	**100**	**2 Hr**
Course Objective	To acquire the knowledge on Quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.						
UNIT	**Course Outcome**						
I	The importance of maintenance and assessment method of distressedstructures.						
II	The strength and durability properties ,their effects due to climate andtemperature.						
III	Recent development inconcrete.the techniques for repair rand protectionmethods						
IV	Repair, rehabilitation and retrofitting of structures and demolitionmethods.						

UNIT-I

Maintenance and repair strategies: Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of distress and deterioration of concrete- Evaluation of existing buildings through field investigations, Seismic evaluation ot existing buildings

Serviceability and durability of concrete: Quality assurance for concrete construction concrete properties - strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion — design and construction errors - Effects of cover thickness and cracking.

UNIT-II

Materials and techniques for repair: Special concretes and mortar, , concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacutlm concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning - Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating and cathodic protection.

UNIT-III

Repairs, rehabilitation and retrofitting of structures: Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure - Special techniques for structural Retrofitting (Bracing, Shear walls, Base isolation etc).

UNIT-IV

Demolition techniques: Engineered demolition techniques for Dllapidated structures — case studies - Case Studies on Restoration of fire damaged buildings, Case study on repairs and strengthening corrosion damaged buildings; Case study on use of composite fibre wraps for strengthening of building components.

Books recommended:

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, (1991).
2. R.T. Allen and S.C. Edwards, Repair of Concrete structures, Blakie and Sons, UK, (1987)
3. M. S. Shetty, Concrete Technology — Theory and Practice, S. Chand and Company, New Delhi, (1992).
4. Santhakumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, "RH DC — NB0" Anna University, July (1992).
5. Raikar, R.., Learning from failures — Deficiencies in Design, Construction and Service — R & D centre (SDCPL), Raikar Bhavan, Bombay, (1987).
6. N. Palaniappan, Estate Management, Anna Institute of Management, Chennai, (1992).
7. Lakshmipathy, M. et al. Lecture notes of Workshop on Repairs and Rehabilitation of Structures, 29 -30th October 1999, (1999).

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
EL-332A	CONSTRUCTION ENGINEERING & MANAGEMENT	**2**	**-**	**25**	**75**	**100**	**2 Hr**
Course Objective	To make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool.						
UNIT	**Course Outcome**						
I	Understand basic concepts of construction planing. Schedule the construction activities.						
II	Forecast and control the cost in a construction.						
III	Understand the quality control and safety during construction.						
IV	Organize information in Centralized database Management systems.						

UNIT-I

CONSTRUCTION PLANNING Basic concepts in the development of construction plans-Choice of Technology and Construction method-Defining Work Tasks- Work breakdown structure- Definition-Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems.

SCHEDULING PROCEDURESAND TECHNIQUES Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads,lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations- Crashing and time/cost tradeoffs -Improving the Scheduling process – Introduction to application software.

UNIT-II

COST CONTROL MONITORINGANDACCOUNTING The cost control problem-The project budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

UNITIII

QUALITY CONTROL AND SAFETYDURINGCONSTRUCTION Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT IV

ORGANIZATION AND USE OFPROJECTINFORMATION Types of project information-Accuracy and Use of Information-Computerized organization and use of Information - Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TEXTBOOKS:

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi,2009
2. Srinath,L.S., “Pert and CPM Principles and Applications“, Affiliated East West Press,2001

REFERENCES:

1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals

Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh,2000.
2. Moder.J., Phillips. C. and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition,1985.
3. Willis., E.M., "Scheduling Construction projects", John Wiley and Sons,1986.
4. Halpin,D.W., "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York,1985.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time

EL-334A	Structure Analysis by matrix method	2	-	25	75	100	2 Hr

Course Objective : The analysis of structure by matrix method

UNIT	Course Outcome
I	Students will be able to familiar with Stiffness and flexibility method.
II	Students will be able to familiar with Elementary approach of matrix.
III	Students will be able to familiar with Stability analysis of structure.
IV	Students will be able to familiar with Plastic analysis of beams and frames.

UNIT-I

Stiffness Method (Systems Approach): Basis of stiffness method, Degrees of freedom, Force-displacement relationships, Nodalstiffness.

Flexibility Method (Systems Approach): Flexibility coefficients, Basis of the method, Application to various types ofstructures.

UNIT-II

IntroductiontoElementApproach: Memberstiffnessmatrix,LocalorMember co-ordinate system, Global or Structural co-ordinate system, Rotation of axes etc, Structure stiffnessmatrix.

UNIT-III

Structural Stability Analysis: Elastic Instability, Introduction to stability problem, Energy methods, buckling of axially loaded members for different end conditions, Concept of effective length, approximate techniques, Stability analysis of beam-column andframes.

UNIT-IV

Plastic Analysis: Concept of Limit load analysis, Upper and lower bonds. Plastic analysis of beams and multi-storey frames using mechanismmethod.

Non Linear Analysis: Introduction to geometric and materialnon-linearity.

Books recommended:

1. Przemieniecki, J.S., 'Theory of Matrix Structure Analysis', Tata McGraw, Hill Book Co.
2. Martin, H.C. ' Introduction to Matrix Methods of StructuralAnalysis'McGraw Hill Book Co.
3. Meghre & Deshmukh, 'Matrix Methods of Structural Analysis' Charotar Publishing House,Anand.
4. Pandit & Gupta, Matrix Analysis of Structures, Tata McGraw Hill Publications (2003). lyengar, N.G.R., Elastic Stability of Structural Elements, Macmillan India Ltd(1980).
5. Gere, G. M. and Weaver, Jr. W., Matrix Analysis of Framed Structures. CBS Publishers(1987).
6. McCormac, J. C. & Nelson, J. K., Structural Analysis: A Classical and Matrix Approach, John Wiley and Sons(1997).

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
EL-336A	Disaster preparedness & planning	**2**	**-**	**25**	**75**	**100**	**2 Hr**

Course Objective : To Impart knowledge Disaster management and design & planning about to control the accidents.

UNIT	Course Outcome
I	Students will be able to gain knowledge about Disaster and their types.
II	Students will be able to examine about the assessment of disaster and management of its control.
III	Students will be able to understand the building structures and their efficiency to control hazard.
IV	Students will be able to gain knowledge about the efficient structures and analysis of Hazard by case study.

UNIT-I

Introduction to Disaster Management:Define and describe disaster, hazard, emergency, vulnerability, risk and disastermanagement; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle.

Disaster Mitigation and Preparedness: Natural Hazards: causes, distribution pattern, consequences and mitigation

measures for earth quake, tsunami, cyclone, flood, landslide drought etc. Man-made hazards: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas.

UNIT-II

Hazard and Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages indisaster recovery and associated problems.

Emergency Management Systems (EMS): Emergency medical and essential public health services, response andrecovery operations, reconstruction and rehabilitation.

UNIT-III

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skillsof government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines..

Application of Geo-informatics and Advanced Techniques: Use of Remote Sensing Systems (RSS) and GIS indisaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems.

UNIT-IV

Integration of public policy: Planning and design of infrastructure for disaster management, Community based approachin disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.

Case Studies: Lessons and experiences from various important disasters with specific reference to Civil Engineering.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from eachunit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books/References:

1. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill. Pub
2. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester
3. Disaster Management, R.B. Singh (Ed), Rawat Publications
4. ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction.
5. www.http//ndma,gov,in
6. Disaster Management –Future Challenges & Opportunities by Jagbir Singh, I.K. International Publishing House.

Code	Nomenclature of Practical	P	Major Test	Minor Test	Total	Time
CE-310LA	**TRANSPORTATION ENGINEERING (P)**	**2**	**60**	**40**	**100**	**2Hr**
Course Objective	The aim of study is to determine the different properties of highway construction materials.					

Test on Aggregate/soil

1. To determine the toughness of the aggregate by Impact Test.
2. To determine the hardness of the aggregate by Los-Angeles Abrasion Test, Dorry's Abrasion test and Deval Attrition test on aggregates
3. To determine the Crushing Strength Test of Aggregates.
4. Flakiness and Elongation Index of aggregates.
5. Proportioning of aggregates.
6. Stripping test on aggregates.
7. Specific gravity and water absorption test on aggregates.
8. CBR lab test on soil.

Test on Bitumen

1. To determine the grade and hardness of the bitumen by Penetration Test.
2. To determine the elastic property of the bitumen by Ductility Test.
3. To determine the grade and hardness of the bitumen by Viscosity Test.
4. To determine the Softening Point Test on Bitumen.
5. To determine the Flash and Fire Point Test on Bitumen.
6. Determination of bitumen content.
7. Specific gravity and water absorption test of bitumen.
8. Marshall’s stability test.

Code	Nomenclature of Practical	P	Major Test	Minor Test	Total	Time
CE-312LA	**ENVIRONMENTAL ENGINEERING-I (P)**	**2**	**60**	**40**	**100**	**2H**
Course Objective	To Impart knowledge of quality and mineral composition of drinking water supply.					

LIST OF EXPERIMENTS

1. To determine the pH value of a given sample of water wastewater.
2. To determine the turbidity in given water waste watersample.
3. To determine the acidity of given sample of water wastewater.
4. To determine the alkalinity of given sample of water wastewater.
5. To determine temporary and permanent hardness in a given watersample.
6. To determine the chlorine does required for a given watersample.
7. To determine total suspended, suspended, dissolved settable solids in a sewagesample.
8. To determine the chloride concentration in a given sample of wastewater.
9. To determine the sulphate concentration in given watersample.

Code	Nomenclature of Practical	P	Major Test	Minor Test	Total	Time
CE-314LA	**Irrigation Engg. Design &Drawing**	**2**	**60**	**40**	**100**	**3H**
Course Objective	To Impart knowledge of irrigation structures					

Complete design and drawing of the following:

1. Design of weirs and barrages on permeable foundation for surface and sub surface flow conditions.
2. Design of Guide Banks.

3. Flood Routing using step by step method.

4. Design of Syphon Aqueduct.

5. Design of Sarda type fall & sloping glacis fall.

6. Seepage line in a homogeneous earth dams on impermeable foundation with horizontal drainage.

7. Design of Ogee Spillway and stilling basin.

Note: Emphasis would be given to the computer aided designs of some of above structures.

Code	Nomenclature of Subject	L	T	Minor Test	Major Test	Total	Time
MC-902A	**Constitution of India**	**2**	**-**	**25**	**75**	**100**	**3 Hr**
Course Objective : To know the basic features of Constitution of India							
UNIT	**Course Outcome**						
I	The students will be able to know about salient features of the Constitution of India.						
II	To know about fundamental duties and federal structure of Constitution of India.						
III	To know about emergency provisions in Constitution of India.						
IV	To know about fundamental rights under constitution of India.						

UNIT-I

Meaning of the constitution law and constitutionalism, Historical perspective of the Constitution of India. Salient features and characteristics of the Constitution ofIndia.
Scheme of the fundamentalrights

UNIT -II

The scheme of the Fundamental Duties and its legal status. The Directive Principles of State Policy – Its importance and implementation. Federal structure and distribution of legislative and financial powers between the Union and theStates.
Parliamentary Form of Government in India – The constitution powers and status of the President ofIndia

UNIT - III

Amendment of the Constitutional Powers and Procedure. The historical perspectives of the constitutional amendments inIndia.
Emergency Provisions: National Emergency, President Rule, Financial Emergency. Local Self Government – Constitutional Scheme inIndia.

UNIT-IV

Scheme of the Fundamental Right to Equality. Scheme of the Fundamental Right to certain Freedom under Article19.Scope of the Right to Life and Personal Liberty under Article21.

Text Books

1. Constitution of India. Prof.Narender Kumar (2008) 8th edition. Allahabad LawAgency.

ReferenceBooks:

1. The constitution of India. P.M. Bakshi (2016) 15th Edition. Universal lawPublishing.

Note: The paper setter will set the paper as per the question paper templates provided.

Bachelor of Technology (CIVIL Engineering), KUK

CreditBased (2018-19 Onwards)

*SCHEME OF STUDIES/EXAMINATIONS (***Semester VII***)*

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	CE401A	Design of Concrete StructureII	2:0:0	2	2	75	25	0	100	3
2	ES212A	Energy Science & Engineering	2:0:0	2	2	75	25	0	100	3
3	CE405A	Water Resources Engineering	2:0:0	2	2	75	25	0	100	3
4	OEII	Open ElectiveII	2:0:0	2	2	75	25	0	100	3
5	ELIII	ElectiveIII	3:0:0	3	3	75	25	0	100	3
6	ELIV	ElectiveIV	3:0:0	3	3	75	25	0	100	3
7	CE411LA	Concrete Drawing	0:0:3	3	1.5		40	60	100	3
8	ES212LA	Energy Science & Engineering Lab	0:0:2	2	1		40	60	100	3
9	CE415LA	Minor Project	0:0:8	8	4		40	60	100	3
10	SIM903A	Seminar on Summer Internship	1:0:0	1	0		50		50	3
		Total	15:0:13	28	22.5	450	320	180	950	

Note: (1) SIM903A is a credit course in which the students will be evaluated for the Summer Internship (training) undergone after 6th semester.

(2)The students have to carry out the MINOR Project either from Transportation Engineering, Hydraulic Engineering and GeotechnicalEngineering.

OPEN ELECTIVE II

Sl. No	Code No.	Subject	Semester	Credits
1.	OE407A	Metro Systems and Engineering	VII	3
2.	OE409A	Indian Music System	VII	3
3.	OE417A	Introduction to Philosophical Thoughts	VII	3

ELECTIVEIII A

Sl. No	Code No.	Subject	Semester	Credits
1.	EL419A	Environmental Impact Assessment	VII	3
2.	EL421A	Air and Noise Pollution Control	VII	3
3.	EL423A	Foundation engineering	VII	3
4.	EL425A	Rock Mechanics	VII	3

ELECTIVEIV A

Sl. No	Code No.	Subject	Semester	Credits
1.	EL427A	Railway Engineering	VII	3
2.	EL429A	Airport Planning and Design	VII	3
3.	EL431A	River Engineering	VII	3
4.	EL433A	Pipeline Engineering	VII	3

CreditBased (2018-19 Onwards)

SCHEME OF STUDIES/EXAMINATIONS **(Semester VIII)**

S. No.	Course No./ Code	Subject	L:T:P	Hours / Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	CE402A	Engineering Economics, Estimation & Costing	2:0:0	2	2	75	25	0	100	3
2	CE404A	Bridge Engineering	2:0:0	2	2	75	25	0	100	3
3	OEIII	Open ElectiveIII	2:0:0	2	2	75	25	0	100	3
4	ELV	ElectiveV	3:0:0	3	3	75	25	0	100	3
5	ELVI	ElectiveVI	3:0:0	3	3	75	25	0	100	3
6	CE412LA	Compressive Viva	0:0:0	0	0			50	50	3
7	CE414LA	Major Project	0:0:10	10	5		40	60	100	3
8	CE LA	SeminarII	0:0:2	2	0		50	0	50	3
		Total	12:0:12	24	19	375	215	110	700	

Note: The student have to carry out the MAJOR Project either from Structural Engineering, Environmental Engineering and Water ResourceEngineering.

OPEN ELECTIVE – III

Sl. No	Code No.	Subject	Semester	Credits
1.	OE406A	ICT for Development	VIII	3
2.	OE408A	Comparative Study of Literature	VIII	3
3.	OE410A	History of Science & Engineering	VIII	3
4	OE418A	Economic Policies in India	VIII	3

ELECTIVEV A

Sl. No	Code No.	Subject	Semester	Credits
1.	EL420A	Prestress Concrete	VIII	3
2.	EL422A	Earthquake Engineering	VIII	3
3.	EL424A	Offshore Engineering	VIII	3
4.	EL426A	Structural Geology	VIII	3

ELECTIVEVI A

Sl. No	Code No.	Subject	Semester	Credits
1.	EL428A	Wastewater Treatment	VIII	3
2.	EL430A	Water and Air Quality Modelling	VIII	3
3.	EL432A	Traffic Engineering and Management	VIII	3
4.	EL434A	Infrastructure Planning and Design	VIII	3

B. Tech. VII Semester (Civil Engineering)

SUBJECT: DESIGN OF CONCRETE STRUCTUTRESII

L	T	P/D	Total	**Subject Code: CE-401A**	Max. Marks: 100
2	0	0	2		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		Students will acquire the knowledge about the design of concrete structures like Beam, Slabs, Stair case, Water Tanks and Building frames.			
UNIT		**Course Outcomes**			
I		Students will be able to study behavior in the Beam and Prestressed concrete – moments, shear and design of beam.			
II		Students will be able to design different types of Slabs, Stair case and Foundations.			
III		Students will be able to design of Water tanks, Silos and Bunkers.			
IV		Students will be able to analyze the frames structures			

UNIT I

Continuous Beams:

Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear, beams curved in plananalysis for torsion, redistribution of moments for single and multispan beams, design examples.

Prestressed Concrete:

Basic principles, classification of prestressed members, various Prestressing systems, losses in prestress, initial and final stress conditions, analysis and design of sections for flexure and shear, load balancing concept, I:S:Specifications. End blocksAnalysis of stresses, Magnel's method, Guyon's method, Bursting and spelling stresses, design examples.

UNIT II

Flat slabs and staircases:

Advantages of flat slabs, general design considerations, approximate direct design method, design of flat slabs, openings in flat slab, design of various types of staircases, design examples.

Foundations:

Combined footings, raft foundation, design of pile cap and piles, underreamed piles, design examples.

UNIT III

Water Tanks, Silos and Bunkers:

Estimation of Wind and earthquake forces, design requirements, rectangular and cylindrical underground and overhead tanks, Intze tanks, design considerations, design examples. Silos and BunkersVarious theories, Bunkers with sloping bottoms and with high side walls, battery of bunkers, design examples.

UNIT IV

Building Frames:

Introduction, Member stiffness’s, Loads, Analysis for vertical and lateral loads, Torsion in buildings, Ductility of beams, design and detailing for ductility, design examples.

Yield Line Theory:

Basic assumptions, Methods of analysis, yield line patterns and failure mechanisms, analysis of one way and two way rectangular and nonrectangular slabs, effect of top corner steel in square slabs, design exampl

Books:

1. Plain and Reinforced Concrete, Vol.2, Jai Krishna &O.P.Jain, Nem Chand & Bros.,Roorkee.

2. PreStressed Concrete, Krishna Raju, TMH Pub,New, Delhi.
3. Design of Prestressed Concrete Structures, T.Y.Lin, John Wiley &Sons, New .Delhi.
4. Reinforced ConcreteLimit Stage Design, A.K.Jain, Nem Chand & Bros., Roorkee.
5. IS 13431980,IS Code of Practice for Prestressed Concrete.
6. IS 33701976(Part I to IV), Indian Standard Code of Practice for Liquid Retaining Structures.
7. IS 4562000, Indian Standard of Practice for Plain and Reinforced Concrete, IS 1893, 4326 & 13920 Indian Standard Code of Practice for Earthquake Resistant Design of Structures.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Energy Science & Engineering					
L	T	P/D	Total	**Subject Code: ES-212A**	Max. Marks: 100

2	0	0	2		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		The knowledge acquired lays a goodfoundation for design of various civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.			
UNIT		**Course Outcomes**			
I		To provide an introduction to energy systems and renewable energy resources			
II		It will explore fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear.			
III		It will explore society's present needs and future energy demands, examine conventional energy sources.			
IV		Energy conservation methods will be emphasized from Civil Engineering perspective.			

UNIT I

Introduction to Energy Science: Introduction to Energy, sustainability & the environment, Energy systems and resources Scientific principles and historical interpretation of energy use in critical societal, environmental and climate issues.

UNIT II

Energy Sources: Fossil fuels (coal, oil, oilbearing shale and sands, coal gasification) past, present & future, Remedies & alternatives for fossil fuels biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental tradeoffs of different energy systems; possibilities for energy storage or regeneration.

UNIT III

Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; economics of energy.

UNIT IV

Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration off shore platforms, Underground and undersea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations aboveground and underground along with associated dams, tunnels, penstocks, etc.

Books:

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
4. JeanPhilippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of
Decision Making, Loulou, Richard; Waaub, XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy

and the Environment, 2nd Edition, John Wiley
6. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
7. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, AddisonWesley Publishing Company

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Water Resource Engineering					
L	T	P/D	Total	**Subject Code: CE-405A**	Max. Marks: 100
2	0	0	2		Theory: 75 marks
					Sessional: 25 Marks

					Duration: 3 hrs.
Course Objective	Understand application of systems concept, advanced optimization techniques to cover the sociotechnical aspects in the field of water resources				
UNIT	**Course Outcomes**				
I	Students will able to study the concept of water resource planning				
II	Students will of understand basics of economics				
III	Students will study about water resource systems				
IV	Students Will study about application of system approaches for water resources				

UNIT I

Water Resources Planning:

Role of water in national development, assessment of water resources, planning process, environmental consideration in planning, system analysis in water planning, somecommon problems in project planning, functional requirements in multipurpose projects,multipurpose planning, basin wise planning, long term planning.Reservoir planningdependable yield, sedimentation in reservoir, reservoir capacity,empiricalarea reduction method.

UNIT II

Economic and Financial Analysis:

Meaning and nature of economic theory, micro and macroeconomics, the concept ofequilibrium, equivalence of kind, equivalence of time and value, cost benefit, discountingfactors and techniques, conditions for project optimality, cost benefit analysis, cost allocation, separable and nonseparable cost, alternate justifiable and remaining benefitmethods, profitability analysis.

UNIT III

Water Resources Systems Engineering:

Concept of system's engineering, optimal policy analysis, simulation and simulationmodeling, nature of water resources system, analog simulation, limitations of simulation,objective function, production function, optimality condition, linear, nonlinear anddynamic programming, applications to real time operations of existing system,hydrologic modeling and applications of basic concepts.

UNIT IV

Applications of System Approach in Water Resources:

Applications of system engineering in practical problems like hydrology, irrigation anddrainage engineering, distribution network, and mathematical models for forecasting andother water resources related problems.

Books:

1 Water Resources Engineering by Linseley and Franzini

2 Economics of Water Resources Engineering by James and Lee.

3 Optimisation Theory and Applications by S.S.Roy

4 Water Resources Systems Planning & Economics by R.S.Varshney.

5 Operational ResearchAn Introduction by HamdyA.Taha.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Metro Systems and Engineering					
L	T	P/D	Total	**Subject Code: OE-407A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks

					Duration: 3 hrs.
Course Objective	To impart the knowledge about basic engineering principles of Metro System.				
UNIT	**Course Outcomes**				
I	Students will be able to know about the metro systems.				
II	Students will be able to learn about different metro structures and their construction methods.				
III	Students will be able to learn about electronic signaling systems and Automatic fare collection.				
IV	Students will be able to understand different facilities in metro.				

Unit – I

General: Overview of Metro Systems; Need for Metros; routing studies; Basic Planning and Financials.

Unit –II

Civil Engineering Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systemspermanent way. Facilities Management

UnitIII

Electronics And Communication Engineering Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.

UnitIV

Mechanical &TVS, AC: Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators. ELECTRICAL: OHE, Traction Power; Substations TSS and ASS; Power SCADA; Standby and Backup systems.

Textbook:

1. Guidebook on Delhi Metro, DMRC
2. World Metro System, Paul. E. Garbutt.
3. Metro Rail in India for Urban Mobility, M.M Agarwal, S.Chandra, K.K Miglani

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Indian music system					
L	T	P/D	Total	**Subject Code: CE-409A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.

Course Objective	To learn basic concept of Indian Music.
UNIT	**Course Outcomes**
I	Students will be able to learn about ragas
II	Students will be able to understand to learn about different notation of sound.
III	Students will able to learn notation compositions.
IV	Students will learn theory of ragas.

UNIT I

Raga, Va(Nada, Swara, Shruti, Raga, Mela (Thata), Alankar, Tana, Gamak, Sthaya, Kaku, MargiDeshi, RagalapRupkalap, Vadi, Samvadi, Anuvadi, Vivadi, Tala, Laya, Avirbhav, Tirobhav, Parmelpraveshak Raga, Sandhiprakash ggeyakara, Kalawant.

UNIT II

Vibration, Pitch, Intensity, Timbre, Just intonation, Equal tempered scale, forced Vibration, Free Vibration.

UNIT III

Notation of compositions in prescribed ragas.

UNIT IV

Theoretical knowledge of prescribed ragas.

Books

1. S.S. Paranjape Bhartiya Sangeet Ka Itihasa
2. S.S. Paranjape Sangeet Bodh
3. V.N. Bhatkhande Bhatkhande Sangeet Shastra PartIII
4. Swami Prajnananda History of Indian Music

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Introduction to Philosophical Thoughts					
L	T	P/D	Total	**Subject Code**: **OE-417A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks

					Duration: 3 hrs.
Course Objective	Students will acquire the knowledge about the Philosophical concepts				
UNIT	**Course Outcomes**				
I	Students will be able to understand concept of philosophy				
II	Students will be able to understand concept of ethics				
III	Students will be able to understand concept of philosophy of religion				
IV	Students will be able to understand concept of aesthetics				

UNIT I

Introduction to Class: Introduction to Philosophy and its worldview. 7 fold criteria for analysis, Presocratic Philosophy, Metaphysics & Epistemology: Ancient (Plato; Aristotle), Medieval (Plotinus; St. Augustine; St. Aquinas), Metaphysics & Epistemology continued: Stoicism, Epicureanism, Skepticism, & NeoPlatonism Berkeley; Leibniz; Spinoza; Locke; Hume; Kant; Introduction to Continental Philosophy

UNIT II

Introduction to Ethics: Virtue, Deontological, & Consequential Ethics: Consequential Ethics; Utilitarianism (Jeremy Bentham; John Stuart Mill); Egoism of Ayn Rand; Relativism; Ethics of Care vs. Ethics of Justice (Carol Gilligan) Existentialism/ Nihilism

UNIT III

Introduction to Philosophy of Religion: Existence of God: Arguments; Evidences; Existential; Religious Experience, Problem of Evil: Moral Evil: Natural Evil: God as Origin of Evil; Natural Evil; Pointless Evil, Problem of Miracles:

UNIT IV

Introduction to Aesthetics: Historical Survey: From Plato to Kuspit Read and discuss"Aesthetic Universals" by Denis Dutton Aesthetics continued: Objective/subjective beauty; aesthetic value; aesthetic experience

Books:

The Power of Idea, Book by Isaiah Berlin

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Environmental Impact Assessment					
L	T	P/D	Total	**Subject Code: EL-419A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	The aim of study is to understand the effect of Environment , Air and Water pollution on environment				

UNIT	Course Outcomes
I	Students will study the different sources of Environment pollution
II	Students will study the different sources of Air pollution and its effects
III	Students will study about the Waste management and its disposal of waste
IV	Students will study about Environmental assessment

UNIT I

Environment and Human Activity: Resources, pollution, reuse and environmental management. Management of Aquatic Environment: Water quality controls. Drainage basin activities and water pollution. The impact of human activity on aquatic resources. The control measures, regional planning.

UNIT II

Air Quality Management: Atmosphere, effect of human activity on air quality, waste disposal alternative. Optimization, planning of waste disposal.

UNIT III

Waste Management: Waste disposal methods, impact of waste disposal of human activity. Land Use Management: Impact of land use on human life. Control, of hazards in land use, management of land use.

UNIT IV

Environmental Assessment: National environmental policy, implication of environment assessment in design process. Preparation of assessment, quantification. General requirements of environmental standards. Techniques of setting standards.

Books:

1. Environmental Impact Analysis by R.K. Jail and L.V. Urban.
2. Environmental Impact Assessment by Canter
3. Environmental Impact Assessment by J.Glasson.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Air and Noise Pollution Control					
L	T	P/D	Total	**Subject Code EL-421A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.

Course Objective	To impart the knowledge about basic engineering principles of River Engineering
UNIT	**Course Outcomes**
I	To take up the basic concepts of air pollution
II	The contents involved the knowledge of causes of air pollution
III	The contents involved the knowledge of health related to air pollution and to develop skills relevant to control of air pollution.
IV	To take up the basic concepts of Noise pollution

Unit I

Introduction: History of Air pollution and episodes, Sources of air pollution and types, Introduction to meteorology and transport of air pollution: Global winds, Headley cells, wind rose terrestrial wind profile, Effects of terrain and topography on winds, lapse rate, maximum mixing depths, plume rise

Unit II

Effects of Air Pollution: Effects of Air Pollution on human beings, plants and animals and Properties. Global EffectsGreen house effect, Ozone depletion, heat island, dust storms, Automobile pollution sources and control, Photochemical smog, Future engines and fuels

Unit III

Air Pollution control: Air Pollution control at sourceequipments for control of air pollutionFor particulate matterSettling chambersFabric filtersScrubbersCyclones, Electrostatic precipitators, For Gaseous pollutantscontrol by absorptionadsorption scrubberssecondary combustion after burners, Working principles advantages and disadvantages, design criteria and examples.

Air Quality Sampling and Monitoring: Stack sampling, instrumentation and methods of analysis of SO2, CO etc, legislation for control of air pollution and automobile pollution.

Unit IV

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; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods.

Books:

1. C. S. Rao, “Environmental Pollution Control Engineering”, Wiley Eastern Limited, 2000.
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt Ltd, New Delhi, 1993
3. Dr. Y. Anjaneyulu, “Air Pollution and Control Technologies”, Allied publishers Pvt. Ltd., 2002.
4. Advanced Air and Noise Pollution Control by Lawrence K. Wang, Norman C. Pereira & Yung Ise Hung.
5. Noise Pollution and Control by S. P.Singhal, Narosa Pub House

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Foundation Engineering					
L	T	P/D	Total	**Subject Code: EL-423A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To impart the knowledge on various soil exploration techniques, and analyses and design of various substructure			
UNIT		**Course Outcomes**			
I		Students will be able to study different types of soil exploration			

II	Students will be able to study slope stability
III	Students will be able to understand Earth pressure theories
IV	Students will be able to understand shallow foundation and pile foundation

UNIT I

Soil Exploration: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test – pressure meter – planning of soil exploration programand preparation of soil investigation report.

UNIT II

Slope Stability: Infinite and finite earth slopes – types of failures – factor of safety of infiniteSlopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices – Taylor's Stability Number stability of slopes of earth dams under different conditions.

UNIT III

Earth Pressure Theories: Atrest earth pressures, Rankin's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Cullman's graphical method, effect of pore water, earth pressure due to surcharge loads.

Retaining Walls: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity modes of failure, Drainage from backfill, introduction to reinforced earth walls.

UNIT IV

Shallow Foundations Types choice of foundation, location and depth safe bearing capacity, shear criteria, Terzaghi's, and IS code methods settlement criteria, allowable bearing pressure based on SPT N value and plate load test, allowable settlements of structures.

Pile Foundation: Types of piles, load carrying capacity of piles based on static pileformulae, dynamic pile formulae – Pile Capacity through SPT and CPT results pile loadtests load carrying capacity of pile groups in sands and clays, Settlement of pile groups, negative skin friction

TEXT BOOKS:

1. Das, B.M., (2011) Principles of Foundation Engineering –7th edition, CengagePublishing.
2. Foundation Design Principles and Practices, Donald P. Coduto, 2nd Edition, PearsonPublishers.
3. Bowles, J.E., (2012) Foundation Analysis, and Design – 5th Edition, McGrawHill Publishing Company, Newyork.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Rock Mechanics					
L	T	P/D	Total	**Subject Code: EL-425A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To impart the knowledge about rock mechanism.			
UNIT		**Course Outcomes**			
I		Students will be able to understand basic concepts of rock engineering			

II	Students will be able to learn about different methods of rock exploration
III	Students will be able to learn different tests performed on rocks.
IV	Students will be able to learn about Pressure arch theory, subsidence and suitable protective measures

Unit I

Definition & its importance: Rock mass & material form; Effects of discontinuities on rock mass. Physical properties of rocks, Mechanical properties of rocks. Engineering Classification of rock Masses (by deer & miller). Moh's scale of Hardness Rock Pressure & Subsidence.

Unit II

Object and Methods of rock exploration, Rock exploration by direct penetration Core boring Core recovery Rock quality designation Fracture frequency by indirect penetration Large diameter calyx hole Logging of core

Unit III

Sampling and Sample preparation, Specimen Uniaxial compressive strength Test; Protodykanov strength index. Tests for measuring rock strengths Tensile strength tests, Flexural strength test, Shear strength test, Punch shear test and In situ tests.

Unit IV

Pressure arch theory Rectangular opening, circular shaft & long wall working. Creep, Convergence, Rock burst & Coal bumps, Rock Mass Rating. Subsidence: Definition & factors governing subsidence. Angle of draw, line of break; Critical area, Subcritical area, super critical area. Protective measures against Subsidence.

Books:

1. Fundamentals of Rock Mechanics" by J C Jaeger and N G W Cook
2. Rock Mechanics and Design Structures of Rock" by Obert and W I Duvall

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Railway Engineering					
L	T	P/D	Total	**Subject Code: EL-427A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		Students will acquire the knowledge about the design of Railways			
UNIT		**Course Outcomes**			
I		Students will be able to study about permanent way and different types of rails			
II		Students will be able to study different types of Sleepers, fastenings and Ballast			
III		Students will be able to learn about Points and crossings, signalling and interlocking			

	system
IV	Students will be able to learn geometric design of Rails and stations

UNIT I

Introduction, Permanent Way and Rails

Rail transportation and its importance in India. Permanent way: requirements and components. Gauges in India and abroad. Selection of gauge. Coning of wheels. Adzing of sleepers. Rails: functions, composition of rail steel, types of rail sections, requirements of an ideal rail section, length of rails. Defects in rails. Creep of rails. Long welded rails and continuously welded rails.

UNIT II

Sleepers, Fastenings and Ballast

Sleepers: functions, requirements of an ideal sleeper. Types of sleepers: wooden, cast iron, steel and concrete sleepers, advantages, disadvantages and suitability of each type. Sleeper density. Fastenings for various types of sleepers: fish plates, spikes, bolts, bearing plates, keys, chairs, jaws, tie bars. Elastic fastenings. Ballast: functions, requirements, types of ballast and their suitability.

UNIT III

Points and Crossings

Necessity. Turnout: various components, working principle. Switch: components, types. Crossing: components and types. Design elements of a turnout, design of a simple turnout. Layout plan of track junctions: crossovers, diamond crossing, singledouble slips, throw switch, turn table, triangle.

Signalling, Interlocking and Train Control

Signals: objects, types and classification. Semaphore signal: components, working principle. Requirements / principles of a good interlocking system. Brief introduction to devices used in interlocking. Methods of control of train movements: absolute block system, automatic block system, centralized train control and automatic train control systems.

UNIT IV

Geometric Design of the Track

Gradients, grade compensation. Super elevation, cant deficiency, negative super elevation. Maximum permissible speed on curves .Tractive resistances, types. Hauling capacity of a locomotive.

Stations, Yards and Track Maintenance

Stations: functions and classification. Junction, nonjunction and terminal stations. Yards: functions, types. Marshalling yard: functions, types. Maintenance of railway track: necessity, types of maintenance. Brief introduction to mechanized maintenance, M.S.P and D.T.M.

Books:

1. A text book of Railway Engineering by S.C.Saxena and S.P.Arora, Dhanpat Rai Publicatios, N.Delhi
2. Railway Track Engg. ByJ.S.Mundray, Tata McGrawHill Publishing Co. Ltd. N.Delhi.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Airport Planning and Design					
L	T	P/D	Total	**Subject Code**: **EL-429A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		Students will acquire the knowledge about airport planning and design.			
UNIT		**Course Outcomes**			
I		Students will be able to understand layout of airport plan			
II		Students will be able to design runway			
III		Students will be able to understand Structural design of airport pavement			

IV	Students will be able to understand basics of visual aids and to understand basics of airport grading and drainage

UNIT I

Airport Planning: General Regional Planning Development of New Airport Data Required before Site Selection Airport Site Selection Surveys for Site Selection Drawings to be prepared Estimation of Future Air Traffic Needs.

UNIT II

Runway Design: Runway Orientation Basic Runway Length Corrections for Elevation, Temperature and Gradient Airport Classification Runway Geometric Design Airport Capacity Runway Configurations Runway Intersection Design.

UNIT III

Structural Design of Airport Pavements: Introduction Various Design Factors Design Methods for Flexible Pavement Design Methods for Rigid Pavement LCN System of Pavement Design Joints in Cement Concrete Pavement Airport Pavement Overlays Design of an Overlay.

UNIT IV

Visual Aids: General Airport Marking Airport Lighting.

Airport Grading And Drainage: General Computation of Earthwork Airport Drainage Special Characteristics and Requirements of Airport Drainage Design Data Surface Drainage Design Subsurface Drainage Design.

Books:

1. Airport Planning and Designing by S.K. Khanna, M.G. Arora.
2. Highway Engineering including Expressways and Airport Engineering by Dr. L. R. Kadyali, Dr. N. B. Lal.
3. Highway Engineering including Airport Pavements by Dr. S. K. Sharma.
4. Transportation Engineering by S. P. Chandola.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: River Engineering					
L	T	P/D	Total	**Subject Code: EL-431A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To impart the knowledge about basic engineering principles of River Engineering			
UNIT		**Course Outcomes**			
I		Students will be able to study different rivers and related budgets and schemes			
II		Students will be able to study behavior of rivers			
III		Students will be able to understand mechanics of alluvial river and bio engineering techniques			

IV	Students will be able to understand various river training works

Unit I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes.

Unit II

Behavior of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.

Unit III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Sociocultural influences and ethics of stream restoration.

Bioengineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, and Analysis of flow, Sediment and channel geometry data.

Unit IV

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampers and other river/ flood protection works.

Books:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering, B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: Pipeline Engineering					
L	T	P/D	Total	**Subject Code: EL-433A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To impart the knowledge about basic engineering principles of Pipeline Engineering			
UNIT		**Course Outcomes**			
I		To familiarize the students with the various elements and stages involved in transportation of oil and gas.			
II		To understand international standards and practices in piping design.			

III	To know various equipment and their operation in pipeline transportation.
IV	To understand modern trends in transportation of oil and gas

UNIT I

Elements of pipeline design: Fluid properties, Environment, Effects of pressure and temperature, Supply / Demand scenario, Route selection, Codes and standards Environmental and hydrological considerations,

UNIT II

Economics – Materials / Construction, Operation, Pipeline protection, Pipeline integrity monitoring. Pipeline route selection, survey and geotechnical guidelines: Introduction – Preliminary route selection. Key factors for route selection -Engineering survey – Legal survey – Construction / Asbuilt survey – Geotechnical design.

UNIT III

Natural gas transmission: General flow equation, Steady state, Impact of gas molecular weight and compressibility factor on flow capacity, Flow regimes, Widely used steadystate flow equations. Summary of the impact of different gas and pipeline parameters on the gas flow efficiency

Pressure drop calculation for pipeline in series and parallel, Pipeline gas velocity, Erosional velocity – Optimum pressure drop for design purposes – Pipeline packing – Determining gas leakage using pressure drop method – Wall thickness / pipe grade, Temperature profile, Optimization process – Gas transmission solved problems.

UNIT IV

Gas compression and coolers: Types of compressors, Compressor drivers, Compressor station configuration. Thermodynamics of isothermal and adiabatic gas compression, Temperature change in adiabatic gas compression, Thermodynamics of polytropic gas compression, Gas compressors in series. Centrifugal compressor horsepower, Enthalpy / Entropy charts (Mollier diagram) – Centrifugal compressor performance curve . Influence of pipeline resistance on centrifugal compressor

Textbooks

1. MSc Pipeline Engineering, Newcastle University
2. MSc Subsea Engineering & Management, Newcastle University
3. MSc Offshore & Ocean Technology, Cranfield University

4. MSc Pipeline Asset Management, North Umbria University (This is a Distance Learning course available online worldwide

B. Tech. VII Semester (Civil)
CE-411LA CONCRETE DRAWING

L T P/D: 0 0 3
Total Marks: 100 **Sessional: 40 marks**
Vivavoce: 60 marks **Duration: 3 hrs.**

Preparing drawing sheets showing reinforcement details in case of:

1. Flat slabs
2. Underground and Overhead Water Tanks.
3. Combined Footings, Pile Foundations and Raft foundation.
4. T-Beam Bridge.
5. Silo/Bunker.

B. Tech. (Civil) VII Semester

ES – 212LA Energy Science & Engineering Lab

L T P/D 0 0 2

Total Marks: 100 **Sessional: 40 marks**

Vivavoce: 60 marks **Duration: 3 hrs.**

LIST OF EXPERIMENTS

1 Determination of Flash point and Fire point of lubricating oil using Abel Pensky and Pensky Martin (closed) Apparatus.

2 Determination of Calorific values of solid, liquid and gaseous fuels

3 Determination of Viscosity of lubricating oil using Redwood and Saybolt Viscometers

4 Valve Timing diagram of an I.C. Engine.

5 To determine the flash and fire point of the lubricating oil by Pensky martens apparatus

6 To determine the kinematic and absolute viscosities of the given oil using red wood viscometer.

7 To determine the viscosity of given oil using torsion viscometer

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Engineering Economics, Estimation & Costing					
L	T	P/ D	Total	**Subject Code: CE-402A**	Max. Marks: 100
2	0	0	2		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	The aim of study is to get knowledge about estimation of different civil works.				
UNIT	**Course Outcomes**				
I	Students will study the different methods of estimation				
II	Students will study about different types of specification used in civil works				
III	Students will study about rate analysis of different items				
IV	Students will study the terms used in civil works and public works accounts				

UNIT I

Estimate:

Principles of estimation, units, items of work, different kinds of estimates, different methods of estimation, estimation of materials in single room building, two roomed building with different sections of walls, foundation, floors and roofs, R.B. and R.VC.C. Works, Plastering, Whitewashing, Distempering and painting, doors and windows, lump sum items, Estimates of canals, roads etc.

UNIT II

Specification of Works:

Necessity of specifications, types of specifications, general specifications, specification for bricks, cement, sand, water, lime, reinforcement; Detailed specifications for Earthwork, Cement, concrete, brick work, floorings, D.P.C., R.C.C., cement plastering, white and colour washing, distempering, painting.

UNIT III

Rate Analysis:

Purpose, importance and requirements of rate analysis, units of measurement, preparation of rate analysis, procedure of rate analysis for items: Earthwork, concrete works, R.C.C. works, reinforced brick work, plastering, painting, finishing (whitewashing, distempering).

UNIT IV

Public Works Account:

Introduction, function of P.W. department, contract, guidelines, types of contracts, their advantages and disadvantages, Tender and acceptance of tender, Earnest money, security money, retention money, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction.

Books

1. Estimating and Costing for Building & Civil Engg.Works by P.L.Bhasin, S.Chand& Co., N.Delhi.
2. Estimating, Costing & Specification in Civil Engg. ByM.Chakarborty, Calcutta.
3. Estimating & Costing in Civil Engg..: Theory & Practice by B.N.Dutta, S.Dutta& Co., Lucknow.
4. Building Construction Estimating by George H.Cooper, McGraw Hill Book Co., New York.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: BRIDGE ENGINEERING					
L	T	P/D	Total	**Subject Code: CE-404A**	Max. Marks: 100
2	0	0	2		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		Students will acquire the knowledge about the design of Railway, R.C.C and Steel Bridge and its foundation			
UNIT		**Course Outcomes**			
I		Students will be able to study Specifications for Roads and Railways Bridges			
II		Students will be able to design consideration for R. C. C. Bridges			
III		Students will be able to design consideration for Steel Bridges			
IV		Students will be able to Hydraulic & Structural design of Bridge			

UNIT I

Introduction:
Definition, components of bridge, classification of bridges, selection of site , economical span, aesthetics consideration, necessary investigations and essential design data.

Standard Specifications for Roads and Railways Bridges:
General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.

UNIT II

Design Consideration for R. C. C. Bridges:
Various types of R.C.C. bridges, design of R.C.C. culvert and Tbeam bridges.

UNIT III

Design Consideration for Steel Bridges:
Various types of steel bridges (brief description of each), design of truss and plate girder bridges.

UNIT IV

Hydraulic & Structural Design:
Piers, abutments, wingwall and approaches. Bearings, joints, articulation and other details.

Bridge Foundation:
Various types, necessary investigations and design criteria of well foundation.

Books:

1. Essentials of Bridge Engineering, D.J.Victor, Oxford & IBH Pub.N.Delhi.
2. Design of Bridges, N.Krishna Raju, Oxford & IBH, N.Delhi.
3. Bridge Deck Analysis, R.P.Pama&A.R.Cusens, John Wiley & Sons.
4. Design of Bridge Structures, T.R.Jagadish&M.A.Jairam, Prentice Hall of India, N.Delhi.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: ICT for Development					
L	T	P/D	Total	**Subject Code**: **OE-406A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To apply basics of Information technology in Civil Engineering problems.			
UNIT		**Course Outcomes**			
I		To study various optimization techniques in real world problems related to civil engineering			
II		To study the inventory models			
III		To study about assigning jobs to people in an efficient way			
IV		To study about sequencing techniques			

UNIT I

Introduction to ICT: New media and ICT, Different types of ICT. Use of ICT for development; e-learning; Web commerce; Mobile telephony and Development: telecom industry in India. ICT Projects implemented in India and Northeast – Problems and Prospects

UNIT II

Digital Revolution and Digital Communication: Basics of New media theories - Information Society; Surveillance society; Digital Divide, Knowledge society; Network society. Works of Machlup, Bell, Negroponte and Castells

UNIT III

Technology and Development: ICT for Development its societal implications; Evolution of ICT in Development Endeavour; ICT and Millennium Development Goals. Democratic and decentralized processes in development. Technology and culture: community and identity; participatory culture and ICT, community informatics

UNIT IV

Computer Mediated Communication and development:Different types of CMC; Important theoretical framework of CMC, cyber platform and communities, Social Networking Site; Convergent media, Multimedia platforms, Scope of convergent journalism for Development; Characteristics of convergent journalism; Different types of convergent journalism: precision journalism; annotative and open-source journalism; wiki journalism; open source journalism; citizen journalism; back-pack journalism,

Books

1. Heeks, R. (2017). Information and communication technology for development (ICT4D). Routledge.
2. Gairola, C. M., Chandra, M., Mall, P., Chacko, J. G., Phet, S., & Loh, H. (2004). Information and Communications Technology for development.

B. Tech. VIII Semester (Civil Engineering)

SUBJECT: Comparative Study of Literature					
L	T	P/D	Total	**Subject Code**: **OE-408A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		The course aims to give the basic knowledge of methods and models of Comparative Literature.			
UNIT		**Course Outcomes**			
I		The course is expected to introduce the students about Conceptual Framework of Comparative Literature			
II		It will give the idea to students about the History of Comparative Literature.			
III		It will orient students towards History and Politics of Translation			
IV		It will give closer look at Indian Poetics and Literary Theory			

Unit I

Conceptual Framework of Comparative Literature: The Emergence of Comparative Literature. Difference/ Alterity and the Ethics of Plurality. Limitations of the Idea of National Literature. Theories of Interpretation

Unit II

History of Comparative Literature: French, German, Russian and Tel Aviv Schools Comparative Literature in India: From Tagore to the Present. World Literature: From Goethe to the Present, "The State of the Discipline" Reports

Unit III

History and Politics of Translation: Translation as Reception, Problems and Promises of Translation in Multilingual Situations, Untranslatability and Silence

Unit IV

Poetics and Literary Theory: Indian Poetics: Sanskrit and Tamil, Perso-Arabic Traditions, Western Classical Literary Theory

Books:

1. Bassnett, S. (1993). Comparative Literature: A Critical Introduction. Oxford: Blackwell.
2. Claudio Guillen. (1993). The Challenge of Comparative Literature. (Cola Franzen, Trans.). London: Harvard University Press.
3. Dev, A. (1984). The Idea of Comparative Literature in India. Kolkata: Papyrus.
4. Bernheimer, C. (1995). Ed. Comparative Literature in the Age of Multiculturalism. Baltimore: The Johns Hopkins University Press.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: History of Science & Engineering					
L	T	P/D	Total	**Subject Code**: **OE-410A**	Max. Marks: 100

3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To provide the insight about the history of Science and Technology			
UNIT		**Course Outcomes**			
I		The course is expected to introduce the history of development of science and technology			
II		Students will able to learn statistical profile of science & engineering			
III		Students will able to learn about keys of effective learning.			
IV		Students will able to gain problem solving skill.			

Unit I

History of science & technology: introduction, beginning of science, technology & engineering, traveling through the ages. Science, Engineering & technology Major: Introduction, function, emerging field.

Unit II

Profile of Engineers, scientist & technologist: Statistical profile of science & engineering profession: Statistical, overview, college enrolment trends of science and engineering students, college majors of recent science &engineering students. Job placement trends, diversity of profession distribution of scientist and engineers by type of employer.

Unit III

Succeeding in the classroom: Introduction, attitude, goal, key to effectiveness, test taking, learning style, accountability and overcoming challenges. Biography of Isaac Newton, Einstein, Thomas Edison, Alfred Nobel, M. Visvesvaraya .

Unit IV

Problem solving: Introduction, analytical and creative problem solving, analytical problem solving, personal problem solving styles, brainstorming strategies, critical thinking. Failure of science & technology.

Textbooks;

1. Engineering your future by William C. Oaks, Oxford university press.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Economic Policies in India					
L	T	P/D	Total	**Subject Code**: **OE-418A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks

					Duration: 3 hrs.
Course Objective	Students will acquire the knowledge about Economic policies practiced in India				
UNIT	**Course Outcomes**				
I	Students will be able to understand concept of economy				
II	Students will be able to calculate National Income for India				
III	Students will be able to get introduction to five year plans.				
IV	Students will be able to understand role of agriculture in economy				

Unit I

Underdevelopment – Basic Features of Indian Economy: Growth and Structural Changes in Indian Economy – Demographic Features – Population: Size, Growth, Composition and their Implications on Indian Economy – Concept of Demographic Dividend –Occupational Distribution of Population in India – Population Policy of India.

Unit II

Estimation of National Income – Trends and Composition of National Income in India – Income Inequalities in India: Magnitude, Causes, Consequences and Remedial Measures – Poverty in India: Concept, Types, Causes and Consequences – Unemployment in India: Concept, Types, Trends, Causes and Consequences – Poverty Alleviation and Employment Generation Programmes in India.

Unit III

Five Year Plans: Concept and Objectives – Review of Five Year Plans – NITI Aayog – Economic Reforms: Liberalization, Privatization and Globalization – Impact of WTO onIndian Economy.

Unit IV

Importance and Role of Agriculture in Indian Economy – Trends in Agricultural Production and Productivity – Land Reforms – Green Revolution – Agricultural Finance – Agricultural Marketing – Agricultural Pricing – Food Security in India. Structure, Growth, Importance and Problems of Indian Industry – Large, Medium and Small Scale Industries: Role and Problems – Industrial Policies of 1948, 1956 and 1991– FEMA and Competition Commission of India –Disinvestment Policy – Foreign Direct Investment

Books:

1) SK Misra and Puri : Indian Economy, Himalaya Publishing House
2) Ishwar C Dhigra : The Indian Economy: Environment and Policy, SC Chand & Sons, New Delhi Dutt and Sundaram : Indian Economy

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Prestress Concrete					
L	T	P/ D	Total	**Subject Code: EL-420A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks

					Duration: 3 hrs.
Course Objective	To understand the concept of pre stress Concrete				
UNIT	**Course Outcomes**				
I	To learn the principles, materials, methods and systems of prestressing				
II	To know the different types of losses and deflection of prestressed members				
III	To learn the design of prestressed concrete beams for flexural, shear and tension				
IV	To learn the design the flexural members in pre stress				

UNIT I

Introduction: Basic concepts of Prestressing, terminology, advantages and applications of prestressed concrete. Materials for Prestressed Concrete: High strength Concrete, permissible stresses in concrete, high strength steel, permissible stresses in steel. Prestressing Systems: Prestensioning and post tensioning systems, various types of tensioning devices, LecMacall systems, MagnelBlaton post tensioning, Freyssinet systems, Gifford Udal system.

UNIT II

Losses of Prestress: Types of losses of Prestress, loss due to elastic deformation of concrete, loss due to shrinkage of concrete, loss due to creep of concrete, loss due to relaxation of stress in steel, loss due to friction, loss due to anchorage slip, total loss in pretension and post tensioned members. Analysis of Prestress and bending stresses: Basic assumptions, resultant stresses at a section, concept of load balancing, cracking moment.

UNIT III

Deflections: Factors influencing deflections, short term deflections of uncracked members, deflections of cracked members, prediction of long term deflections. Shear and Torsional Resistance: Ultimate shear resistance of prestressed concrete members, prestressed concrete members in torsion, design of reinforcements for torsion, shear and bending.

UNIT IV

Design of Flexural Members : Dimensioning of flexural members, design of pretensioned andpost tensioned beams, design of partially prestressed members, design of one way and two way slabs, continuous beams.Design for axial tension, compression and bending, bond and bearing.

Books:

1. Prestressed Concrete by N. Krishna Raju, TMH Publishing Company, New Delhi,
2. Prestressed Concrete by P. Dayartnam, Oxford and IBH Publication, New Delhi.
3. Design of Prestressed Concreet Structures by T Y Lin& Ned H. Burns

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Earthquake Engineering					
L	T	P/ D	Total	**Subject Code: EL-422A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25

					Marks
					Duration: 3 hrs.
Course Objective	To understand basics of Earthquake Engineering				
UNIT	**Course Outcomes**				
I	To introduce the basics of Seismology				
II	To introduce the seismic analysis and design				
III	To learn to assess the seismic performance of the structure				
IV	To learn about vibration control measures				

UNIT I

Seismology: Introduction, plate tectonics, earthquake distribution & mechanism, seismicity, seismic wave, earthquake magnitude & intensity, seismic zoning &seismometer.

UNIT II

Seismic Analysis and Design: General principles, assumptions, Seismic coefficient method, response spectrum method, strength and deflection, design criterion for structures, significance of ductility, codal provisions, and design examples.

UNIT III

Seismic performance, Repair and strengthening: Methods for assessing seismic performance influence of design ductility and masonry infills, criterion for repair and strengthening techniques and their applications, addition of new structural elements.

UNIT IV

Vibrational control: General features of structural control, base isolation, active and passive, Control system, earthquake resistance design as per IS: 1893, IS: 4326 and: 13920.

Books:

1. Elements Of Earthquake of Engineering, Jai Krishna, A. R. Chandershekaran&Brajesh Chandra, South Asian Pub New Delhi.
2. Dynamics of Structures, Clough &Penzion, McGraw Hill.
3. Earthquake Engineering, YX Hu, SC. Liu and W. Dong, E and FN Sons., Madras.
4. Earthquake Resistant Concrete Structures, George G. Penelis and J. Kapoors, E and FN Sons., Madras.Structural Dynamic, Mario Paz, CBB Pub. N.Delhi.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Offshore Engineering					
L	T	P/ D	Total	**Subject Code: EL-424A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks

					Sessional: 25 Marks
					Duration: 3 hrs.

Course Objective	To impart the basic knowledge of off shore engineering
UNIT	**Course Outcomes**
I	To introduce the basics of offshore structures
II	To introduces different loads on offshore structure
III	To introduce the concept of general layout and consideration given
IV	To introduce the concept of installation of offshore structurs

UNIT I

Historical Development of Offshore Structures

Introduction, Definition of Offshore Structure, Historical Developments Deepwater challenges, Functions of Offshore Structures, selection of Offshore Structure and its Configurations, Bottom Supported Fixed Structures, Complaint Structures, Floating Structures, Novel offshore design, Field development concepts

UNIT II

Load and Responses

Introduction, Gravity Load, Hydrostatic Loads, Resistance Loads, Current loads on Structures, Current Drag and Lift Force, Steady and Dynamic Wind Loads on Structures, Wave Loads on Structures, Varying Wind Load, Impulse loads and Introduction to design

UNIT III

Topside Facilities and Layout

Introduction General layout Considerations Areas and Equipment Deck Impact Loads Deck Placement and Configuration Float over Deck Installation Helipad Platform Crane Living quarters Oil and gas treatment Oil and gas storage, offloading and export Utility and process support systems Drilling facilities

UNIT IV

Offshore Installation

Introduction , Installation of Fixed Platform Substructures Floating Structures, Foundations Subsea Templates , loadouts transportation Platform Installation Methods and installation criteria, Installation of Pipelines and Risers

Books:

1. Dawson, T.H., “Offshore Structural Engineering”, Prentice Hall, 1983
2. B.C Gerwick, Jr. “Construction of Marine and Offshore Structures”, CRC Press, Florida, 2000.
3. Subrata K Ckakrabarti, “Handbook of Offshore Engineering”, Vol 1, Vol 2, Elsevier Publishers, 1st edition, 2005.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: STRUCTURAL GEOLOGY					
L	T	P/D	Total	**Subject Code: EL-426A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25

					Marks
					Duration: 3 hrs.
Course Objective	To introduce the concept of structural geology				
UNIT	**Course Outcomes**				
I	To introduce the concept of topography and its impact on structure.				
II	To introduce the concept of rock deformation.				
III	To understand geometric and genetic classification of folds				
IV	To learn origin and classification of fractures and fault.				

UNITI

Structure and Topography Effects of topography on structural features, Topographic and structural maps; Importance representative factors of the map

UNIT II

Stress and strain in rocks Concept of rock deformation: Stress and Strain in rocks, Strain ellipses of different types and their geological significance. Planar and linear structures; Concept of dip and strike; Outcrop patterns of different structures.

UNIT III

Folds and Fold morphology; Geometric and genetic classification of folds; Introduction to the mechanics of folding: Buckling, Bending, Flexural slip and flow folding

UNIT IV

Foliation and lineation Description and origin of foliations: axial plane cleavage and its tectonic significance Description and origin of lineation and relationship with the major structures

Fractures and faults Geometric and genetic classification of fractures and faults Effects of faulting on the outcrops Geologic/geomorphic criteria for recognition of faults and fault plane solutions

Books:

1. Davis, G. R. (1984) Structural Geology of Rocks and Region. John Wiley
2. Billings, M. P. (1987) Structural Geology, 4th edition, PrenticeHall.
3. Park, R. G. (2004) Foundations of Structural Geology.Chapman & Hall
4. Pollard, D. D. (2005) Fundamental of Structural Geology. Cambridge University Press.
5. Ragan, D. M. (2009) Structural Geology: an introduction to geometrical techniques (4th Ed). Cambridge University Press (For Practical)
6. Lahee F. H. (1962) Field Geology. McGraw Hill

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B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Waste Water Treatment					
L	T	P/D	Total	**Subject Code: EL-428A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks

					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	The aim of study is to understand the effect of waste water on environment and its treatment				
UNIT	**Course Outcomes**				
I	Students will study the effect of waste water on streams				
II	Students will study the working process of treatment plant				
III	Students will study about the standard for disposal				
IV	Students will study the types of industry responsible for waste generation				

Unit I

Sewer appurtenances: Man holes, Catch basin, flushing devices, inverted siphon. Ventilation of sewers. Sewage, Sewerage, Systems of sewerage, Sewage characteristics Physical, chemical and biological parameters, Biological oxygen demand, first stage BOD, Chemical Oxygen demand, Relative stability, Population equivalent.

Unit II

Waste water disposal systems Selfpurification of streams, DilutionOxygen sag curve, Streeter Phelp's Equation, land treatment, Treatment of sewage, Preliminary and Primary treatment –Theory and design of Screen, Grit chamber, Detritus chamber, Flow Equalization tank and Sedimentation tank.

Unit III

Secondary treatment methods Contact bed, Intermittent sand filter, Theory and design of Trickling filter, Activated sludge process, Trickling filterHigh rate, standard. Rotating biological contactor Design of Septic tank and Imhoff tank, Principle and working of Oxidation ditch and oxidation ponds.

Aerated lagoons, Design of up flow anaerobic sludge blanket reactors, Sludge treatment and disposalMethods of thickening, Sludge digestion Anaerobic digestion, Design of sludge digestion tanks and Sludge drying beds, methods of sludge disposal

Unit IV

Effects of industrial wastes on streams, sewerage systems and wastewater treatment plants. Minimizing the effects of industrial effluents on waste water treatment plants and receiving streamsconservation of water, process change, reuse of waste water, volume reduction, strength reduction, neutralization, equalization and proportioning.

Books:

1. Industrial and Hazardous Waste Treatment by N.L.Nemerow&A.Dasgupta.
2. Industrial Effluents by N.Manivasakam.
3. Waste Water Treatment by M.N.Rao&A.K.Dutta.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Water and Air Quality Modelling					
L	T	P/	Total	**Subject Code: EL-430A**	Max. Marks: 100

		D			
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		This course aims at developing mathematical models for air and water quality check			
UNIT		**Course Outcomes**			
I		Students will learn the Mathematical Models for water quality			
II		Students will learn the Mathematical Models for dissolved oxygen.			
III		Students will learn the Mathematical Models for Estuary and Lakes			
IV		Students will learn about micrometeorological process.			

UNITI

Introduction to Mathematical Models: water quality modeldevelopment, calibration and verification cost: benefit analysis using models, Modelrequirements and limitations.

UNITII

D.O. Models for Streams: Dissolved oxygen model for streams sources and sinks of dissolved oxygen estimation of system parameters Streeter Phelps model oxygen 'sag' curvedetermination of Deoxygenation and reaeration coefficients

UNITIII

Benthal oxygen demand mass transport mechanisms Models for Estuary and Lakes: Physical chemical and biological processes in estuaries; Air quality models:

UNITIV

Micrometeorological processes, wind rose, dispersion, coefficients and stability classes, Gaussian and dispersion model, Stack height computation, Regional air quality models, Source inventories and significance

Books

1. Deaton, M.L and Winebrake, J.J., Dynamic Modelling of Environmental Systems, Verlag, 2000.
2. Chapra, S.C. Surface Water-Quality Modelling, McGraw-Hill, 2008.
3. Arthur C.Stern., Air Pollution (Third Ed.) Volume I – Air Pollutants, their transformation and Transport, (Ed.), Academic Press, 2006.
4. Wainwright, J and Mulligan, M., Environmental Modelling Finding simplicity in complexity, John Wiley and Sons Inc., New York, 2013

B. Tech. VIII Semester (Civil Engineering)
SUBJECT: TRAFFIC ENGINEERING AND MANAGEMENT

L	T	P/D	Total	**Subject Code: EL-432A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To understand and explain the various modes of Transport viz. Surface, Air, Rail and Water.			
UNIT		**Course Outcomes**			
I		To introduce the significance and scope of traffic engineering.			
II		Describe the different methods of conducting Traffic volume studies.			
III		Mention the various driver characteristics affecting traffic behavior onroads.			
IV		State the objectives in providing road markings and describe its effectiveness in traffic regulation.			

UNIT I

Introduction: Importance of Transportation Employment in Transportation Transportation Systems and Organization Characteristics of Driver, the Pedestrian, the Vehicle and Road, Traffic and Environment, Introduction to MRTS, LRTS and Underground railways.

UNIT II

Traffic Engineering Studies: Statistical studies for Traffic Engineering, Speed studies Volume Studies Travel time and Delay Studies Parking StudiesTraffic Forecasting Accident Studies, Traffic Flow Theory, Macroscopic and Microscopic Traffic model, Shock Waves Traffic Flow at signal and un signal intersection Simulation of Traffic.

UNIT III

Airport Planning: Airport -Accessibility ,Transport Connections, Forecasting Future Traffic – Airfield Capacity and Delay Aircraft characteristics , Airport Site Selection, Airport Classification, Planning of Airfield Components, Runway, Taxiway, Apron, Hanger, Passenger Terminals.

UNIT IV

Waterways Transport Systems: Fresh Water and Salt Water Navigation –Ocean, Currents and Tide, Canals and Waterways, Ports, Types of Ships Inland Water Transport-Planning, limitations and advantages Case Studies-Pipelines, Ropeways, Beltways and other means of transport.

Books:

1. Kadiyali L.R, “Traffic Engineering and Transportation Planning” Khanna Publishers, Delhi, 2005.
2. Khanna SK and Justo CEG, “Highway Engineering”, Nem Chand & Bros, Roorkee, 2010.
3. Brase/Brase “Understandable Statistics 3rd edition”,D C Health and Company, Lexington, Massachusetts,Toronko,1987.
4. Jason C.yu, Transportation Engineering: Introduction to Planning, Design and Operations, Elsevier,1992.
5. Taylor M.A.P and Young W,Traffic AnalysisNew Technology and New solution.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Infrastructure Planning and Design					
L	T	P/ D	Total	**Subject Code: EL-434A**	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		To understand various concepts of infrastructure planning and management.			
UNIT		**Course Outcomes**			
I		To understand the basic concepts related to Infrastructure Projects			
II		To understand the role of private sector infrastructure growth.			
III		To impart the strategies for successful Infrastructure Project implementation.			
IV		To develop Infrastructure modeling and Life Cycle AnalysisTechniques.			

Unit I

An Overview Of Basic Concepts Related To Infrastructure: Introduction to Infrastructure, an overview of the Power Sector in India., an Overview of the Water Supply and Sanitation Sector in India., an overview of the Road, Rail, Air and Port Transportation Sectors in India. An overview of the Telecommunications Sector in India. An overview of the Urban Infrastructure in India, an overview of the Rural Infrastructure in India, an Introduction to Special Economic Zones, Organizations and layers in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle., an overview of Infrastructure Project Finance.

Unit II

Private Involvement In Infrastructure: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study, Privatization of Infrastructure in India: Case Study, Privatization of Road Transportation Infrastructure in India.

Unit III

Challenges To Successful Infrastructure Planning And Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks: The Case study for Political Risks, SocioEnvironmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

Unit IV

Sustainable Development Of Infrastructure: Information Technology and Systems for Successful Infrastructure Management, Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management Infrastructure Management Systems and Future Directions.

Books:

1. Grigg, Neil, Infrastructure engineering and management, Wiley, (1988).
2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, (1994).

3. Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).
4. Munnell, Alicia, Editor, Is There a Shortfall in Public Capital Investment? Proceedings of a Conference Held in June (1990).
5. World Development Report 1994: Infrastructure for Development (1994).
6. Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1st European Pavement Management Systems Conference, Budapest, September (2000).