Revised Syllabus to be implemented from the Academic Year 2010
(for the new batch only)
First Year First Semester

Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
		A. THEORY					
			L	T	P	Total	
1	HU101	ENGLISH LANGUAGE & TECHNICAL COMMUNICATION	2	0	0	**2**	2
2	PH101/ CH101	Chemistry -1 (Gr-B) / Physics – 1 (Gr-A)	3	1	0	4	4
3	M101	Mathematics-1	3	1	0	4	4
4	ES101	Basic Electrical & Electronic Engineering – 1 (GrA+GrB)	3	1	0	4	4
5	ME101	Engg. Mechanics	3	1	0	4	4
		Total of Theory				**18**	**18**
		B. PRACTICAL					
6	PH191/ CH191	Chemistry -1 (Gr-B)/ Physics – 1 (Gr-A)	0	0	3	3	**2**
7	ES191	Basic Electrical & Electronic Engineering -1	0	0	3	3	**2**
8	ME191 /192	Engg Drawing & Computer Graphics (Gr-B) / Workshop Practice (Gr-A)	1	0	3	4	**3**
		Total of Practical				**10**	**7**
		C. SESSIONAL					
9	HU181	Language Laboratory	0	0	2	2	**1**
10	XC181	Extra Curricular Activities(NSS/NCC/NSO etc)	0	0	2	2	**1**
		Total of Sessional				**4**	**2**
		Total of Semester				**32**	**27**

Physics based branches divided in to Gr-A & Gr-B, Gr-A= Phys in sem-I , Gr-B = Phys in sem-II; Chemistry based branches Physics in sem-1.
Group division:
Group-A: Chemistry based subjects: [Bio-Technology, Food Technology, Leather Technology, Textile Technology, Ceramic Technology, Chemical Engineering and any other Engineering that chooses to be Chemistry based] + Physics based subjects: [Mechanical Engineering, Production Engineering, Civil Engineering, Automobile Engineering, Marine Engineering, Apparel Production Engineering, Computer Science & Engineering, Information Technology.]
Group-B: All Physics based subjects which are also Electrical & Electronics based [Electrical Engineering, Electronics & Communication Engineering, Applied Electronics & Instrumentation Engineering, Power Engineering, Electrical & Electronics Engineering, Bio-Medical Engineering, Instrumentation & Control Engineering]

First Year Second Semester

Sl. No.	Field	Theory	L	T	P	Total	Credit Points
A. THEORY				**Contact Hours/Week**			
1	**CS201**	Basic Computation & Principles of Computer Programming	3	1	0	4	**4**
2	**PH201/ CH201**	Physics - 1(Gr-B) / Chemistry-1(Gr-A)	3	1	0	4	**4**
3	**M201**	Mathematics-2	3	1	0	4	**4**
4	**ES201**	Basic Electrical & Electronic Engineering-II	3	1	0	4	**4**
5	**ME201**	Engineering Thermodynamics & Fluid Mechanics	3	1	0	4	4
		Total of Theory				**20**	**20**
B. PRACTICAL							
7	**CS291**	Basic Computation & Principles of Computer Programming	0	0	3	3	**2**
8	**PH291/ CH291**	Physics – 1 (Gr-B) /Chemistry-1 (Gr-A)	0	0	3	3	**2**
9	**ES291**	Basic Electrical & Electronic Engineering- II	0	0	3	3	**2**
10	**ME291/ 292**	Workshop Practice (Gr-B) / Basic Engg Drawing & Computer Graphics (Gr-A)	1	0	3	4	**3**
		Total of Practical				**13**	**9**
		Total of Semester				**32**	**29**

	Group-A	Group-B
1st Sem	Physics-I; Workshop Practice	Chemistry –1; Engg Drawing & Computer Graphics
2nd Sem	Chemistry –1; Engg Drawing & Computer Graphics	Physics-I; Workshop Practice

Syllabus
First Semester
Theory

HU

English
PAPER CODE: HU 101
CONTACT: 2L
CREDIT: 2
PAPER NAME: ENGLISH   LANGUAGE & TECHNICAL   COMMUNICATION

Guidelines for Course Execution:
Objectives of the Course: This Course has been designed

1. To impart advanced skills of Technical Communication in English through Language Lab. Practice Sessions to 1st Semester UG students of Engineering &Technology.
2. To enable them to communicate confidently and competently in English Language in all spheres.

Desired Entry Behaviour:
    The students must have basic command of English to
 Talk about day-to-day events and experiences of life.
Comprehend Lectures delivered in English.
Read and understand relevant materials written in English.
Write grammatically correct English.

Strategies for Course Execution:
1. It is a Course that aims to develop Technical Communication Skills. It is, therefore*, Lab-* based and practical in orientation. Students should be involved in Practice Sessions.
2. The content topics should be conveyed through real-life situations. Lecture classes should be conducted as Lecture cum Tutorial classes.
3.   Keeping in view the requirements of students, the teachers may have to prepare some learning aids task materials.
4. Some time should be spent in teaching stress and intonation.
5. In teaching 'Speaking skill,' emphasis should be on *clarity, intelligibility, fluency,(as well as accepted pronunciation).*
6. Micro Presentation and Group Discussion Sessions should be used for developing Communicative Competence
7. The Language Lab, device should be used for giving audio-visual inputs to elicit students' responses by way of Micro-Presentation, Pair Conversation, Group Talk and Class Discussion.
8. The teacher must function as *a creative monitor in the Language Lab for the following:*

 A.   Developing Listening   Comprehension   Skill;

1. Developing Listening Comprehension through Language Lab Device
2. Developing sub skills of the Listening Skill by Conversational Practice Sessions
3. Focusing on intelligent and advanced Listening Sessions e.g. Seminars, Paper Presentation, Mock Interviews etc.
4. Conducting Conversational Practice: Face to Face & Via Media (Telephone, Audio, Video + Clips)

 B.   Developing Speaking Competence:

a) Helping students in achieving *clarity and fluency* ; manipulating paralinguistic features of speaking (*voice modulation ,pitch , tone stress , effective pauses)*
    Conducting *Task oriented interpersonal ,informal and semiformal Speaking / Classroom Presentation*

b) *Teaching strategies for Group Discussion*
Teaching Cohesion and Coherence
Teaching effective communication & strategies for handling criticism and adverse remarks
Teaching strategies of Turn- taking, effective intervention, kinesics (use of body language) and courtesies and all componentss of softskills.

C. Developing Reading Comprehension Skill:

   a) Developing Reading Skill through Non Technical (Literary) Texts
    (See Recommended Book 5)
   1. The Thief   by   Ruskin Bond
   2. The Open Window   by   Saki
   3. Marriage is a private Affair   by   Chinua Achebe
   4. The Moon in the Earthen Pot   by   Gopini Karunakar

   b) Developing Reading Skill through Radio Commentary, Technical Texts and Case Studies (Refer to Recommended Book 1.)
    * Freedom   by G. B. Shaw (Radio Commentary)
   a)   Guiding students for Intensive & Extensive Reading(See Recommended Book 1)

D.   Developing Writing Competence:

a) Teaching all varieties of Technical Report, Business Letters and Job Application (Expressing Ideas within restricted word limit through paragraph division, Listing Reference Materials through Charts , Graphs ,Tables and Diagrams);

 b) Teaching correct Punctuation & Spelling, Semantics of Connectives, Modifiers and Modals, variety of sentences and paragraphs

c) Teaching   Organizational   Communication: Memo, Notice, Circular, Agenda / Minutes   etc.

SYLLABUS -- DETAILED   OUTLINES

 A. ENGLISH   LANGUAGE   GRAMMAR: 5L
Correction of Errors in Sentences
 Building Vocabulary
 Word formation
 Single Word for a group of Words
Fill in the blanks using correct Words
 Sentence Structures and Transformation
Active & Passive Voice
 Direct & Indirect Narration
        (MCQ Practice during classes)

B. READING COMPREHENSION:
 Strategies for Reading Comprehension   1L
Practicing Technical & Non Technical Texts for   Global/Local/Inferential/Referential comprehension; 3L
Précis Writing

 C.   TECHNICAL COMMUNICATION
 The Theory of Communication –Definition & Scope
 Barriers of Communication
 Different Communication Models
 Effective Communication (Verbal / Non verbal)
 Presentation / Public Speaking   Skills   5L
         (MCQ Practice during classes)

D. MASTERING TECHNICAL COMMUNICATION

Technical Report (formal drafting)	3L
Business Letter (formal drafting)	4L
Job Application (formal drafting)	3L
Organizational Communication (see page 3)	3L
Group Discussion –Principle & Practice	3L

Total Lectures   30

MARKS   SCHEME (Written Examination)   Total Marks 70

1. 10 Multiple Choice Questions(Communication & Eng. Language-Vocabulary & Syntax)

          Marks 10

2.   Short Questions & Précis writing   on unseen passages   Marks 15 (10+5)

3.   3 Essay type Questions on Technical Communication   (Technical Report / Business Letter / Job Application /

     Organizational Communication etc,)   Marks 45-15*3

MARKS   SCHEME (Internal   Examination)   Total Marks   30

1. Attendance	Marks 5
2. Testing Speaking Ability	Marks 5
3. Testing Listening Ability	Marks 5
4. 2 Unit Tests	Marks 15

BOOKS -- RECOMMENDED:
1. Board of Editors: Contemporary Communicative English
                   for Technical Communication
                        Pearson Longman,2010
2. Dr. D. Sudharani: Manual for English Language Laboratory
                 Pearson Education (W.B. edition), 2010
3. Technical Communication Principles and Practice by Meenakshi Raman, Sangeeta Sharma(Oxford Higher Education)
4. Effective Technical Communication by Barun K.Mitra(Oxford Higher Education)
5. V. Sashikumar (ed.): Fantasy- A Collection of Short Stories
                   Orient Black swan (Reprint 2006)

References:
1. D. Thakur: Syntax   Bharati Bhawan , 1998
2. Longman Dictionary of Contemporary English
             (New Edition) for Advanced Learners
3. Internet

Chemistry-1(Gr-A/Gr-B)
Code: CH101
Contacts: 3L + 1T = 4
Credits: 4

Module 1

Chemical Thermodynamics -I

Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: different statements, mathematical form.

Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.

Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas.   3L

Heat Capacity: Definition, Classification of Heat Capacity (C_p and C_V): Definition and General expression of C_p - C_V. Expression of C_p - C_V for ideal gas.

Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas,

Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process.

Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchoff's law.   3L

2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature.

Evaluation of entropy: characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases.

2L

Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation.

Condition of spontaneity and equilibrium reaction.   2L

Module 2

Reaction Dynamics

Reaction laws: rate and order; molecularity; zero, first and second order kinetics. Pseudounimolecular reaction, Arrhenius equation.

Mechanism and theories of reaction rates (Transition state theory, Collison theory:).

Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). 3L

Solid state Chemistry

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).

Role of silicon and germanium in the field of semiconductor. 2L

Module 3

Electrochemistry

Conductance

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte).

Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions.

Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs $AgNO_3$. 2L

Electrochemical cell

Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quinhydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, Discussion, Application)

Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application).

Application of EMF measurement on a) Ascertain the change in thermodynamic function (ΔG, ΔH, ΔS) b) ascertain the equilibrium constant of a reversible chemical reaction c) ascertain the valency of an ion.

3L

Module 4

Structure and reactivity of Organic molecule

Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals.

Brief study of some addition, eliminations and substitution reactions. 3L

Polymerization

Concepts, classifications and industrial applications.

Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly dispersity index (PDI).

Polymerization processes (addition and condensation polymerization), degree of polymerization, Co-polymerization, stereo-regularity of polymer, crystallinity (concept of T_m) and amorphicity (Concept of T_g) of polymer.

Preparation, structure and use of some common polymers: plastic (**PE**: HDPE, LDPE, LLDPE, UHMWPE)), rubber (natural rubber, SBR), fibre(nylon 6.6). Vulcanization.

Conducting and semi-conducting polymers.   5L

Module 5

Industrial Chemistry

Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Coal analysis: Proximate and ultimate analysis.

Liquid fuel: Petroleum, classification of petroleum, Refining, Petroleum distillation, Thermal cracking, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Bio-diesel.

Gaseous fuels: Natural gas, water gas, Coal gas, bio gas.   5L

Reference Books

1.   P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
2.   S. Glasston, Text Book of Physical Chemistry, Macmillan India Limited.
3.   S. Pahari, Physical Chemistry, New Central Book Agency.
4.   S. Sarkar, Fuels and Combustion, Taylor & Francis (3rd Edition), 2009
5.   P. Ghosh, Polymer Science and Technology of Plastics and Rubbers, Tata McGraw Hill Publishing Company Limited.
6.   F.W.Billmeyer : Textbook of Polymer Science is published by Wiley India (is now an Indian Imprint.)
7.   Joel R. Fried, Polymer Science and Technology, Pearson Education (2nd Edition).
8.   I. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc.
9.   Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
10.   Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers.

Or

Physics-1(Gr-B/Gr-A)
Code: PH-101
Contacts: 3+1
Credit: 4L

Module 1:

Oscillation:

1.1 Simple harmonic motion: Preliminary concepts,   Superposition of S. H. Ms in two mutually perpendicular directions: Lissajous figure   2L

1.2 Damped vibration: Differential equation and its solution, Logarithmic decrement, Quality factor.
3L

1.3 Forced vibration: Differential equation and its solution, Amplitude and Velocity resonance, Sharpness of resonance. Application in L-C-R Circuit
3L

Module 2:
Optics 1:

2.1 Interference of electromagnetic waves: Conditions for sustained interference, double slit as an example. Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring
3L

2.2 Diffraction of light: Fresnel and Fraunhofer class. Fraunhofer diffraction for single slit and double slits. Intensity distribution of N-slits and plane transmission grating (No deduction of the intensity distributions for N-slits is necessary), Missing orders. Rayleigh criterion, Resolving power of grating and microscope. (Definition and formulae)
5L

Module 3:
Optics 2

3.1 Polarization: General concept of Polarization, Plane of vibration and plane of polarization, Qualitative discussion on Plane, Circularly and Elliptically polarized light, Polarization through reflection and Brewster's law, Double refraction (birefringence) -Ordinary and Extra-ordinary rays . Nicol's Prism, Polaroid. Half wave plate and Quarter wave plate
4L

3.2 Laser : Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient (derivation of the mutual relation), Optical resonator and Condition necessary for active Laser action, Ruby Laser, He-Ne Laser- applications of laser.
4L

3.3 Holography: Theory of holography, viewing the hologram, Applications
3L

Module 4:
Quantum Physics:

4.1 Concept of dependence of mass with velocity, mass energy equivalence, energy- momentum relation (no deduction required). Blackbody radiation: Rayleigh Jeans' law (derivation without the calculation of number of states), Ultraviolet catastrophe, Wien's law, Planck's radiation law (Calculation of the average energy of the oscillator), Derivation of Wien's displacement law and Stephan's law from Planck's radiation law. Rayleigh Jean's law and Wien's law as limiting cases of Planck's law. Compton Effect (calculation of Compton wavelength is required).
5L

4.2 Wave-particle duality and de Broglie's hypothesis, Concept of matter waves, Davisson-Germer experiment, Concept of wave packets and Heisenberg's uncertainty principle.

4L

Module 5:

Crystallography:

5.1 Elementary ideas of crystal structure : lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, f.c.c. and b.c.c. lattices, (use of models in the class during teaching is desirable] Miller indices and miller planes, Co-ordination number and Atomic packing factor.   4L

5.2 X-rays : Origin of Characteristic and Continuous X-ray, Bragg's law (No derivation), Determination of lattice constant.   2L

Recommended Text Books and Reference Books:

For Both Physics I and II

1. B. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
4. Arthur Baiser (Perspective & Concept of Modern Physics)

Physics I (PH101/201)

Vibration and Waves
   c) Kingsler and Frey
   d) D.P. Roychaudhury
   e) N.K. Bajaj (Waves and Oscillations)
   f) K. Bhattacharya
   g) R.P. Singh (Physics of Oscillations and Waves)
   h) A.B. Gupta (College Physics Vol.II)
   i) Chattopadhya and Rakshit (Vibration, Waves and Acoustics)

Optics
10 Möler (Physical Optics)
11 A.K. Ghatak
12 E. Hecht (Optics)
13 E. Hecht (Schaum Series)
14 F.A. Jenkins and H.E. White
15 6. Chita Ranjan Dasgupta (Degree Physics Vol 3)

Quantum Physics
2 Eisberg & Resnick is published by Wiley India
3 A.K. Ghatak and S. Lokenathan
4 S.N. Ghoshal (Introductory Quantum Mechanics)
5 E.E. Anderson (Modern Physics)
6 Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India
7 Binayak Dutta Roy [Elements of Quantum Mechanics]

Crystallography
1.   S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)
2.   A.J. Dekker
3.   Aschroft and Mermin
4.   Ali Omar
5.   R.L. Singhal
6.   Jak Tareen and Trn Kutty (Basic course in Crystallography

Laser and Holography
    1   A.K. Ghatak and Thyagarajan (Laser)
    2   Tarasov (Laser)
    3   P.K. Chakraborty (Optics)
    4   B. Ghosh and K.G. Majumder (Optics)
    5   B.B. Laud (Laser and Non-linear Optics)
    6   Bhattacharyya [Engineering Physics] Oxford

Mathematics
Code: M101
Contacts: 3L + 1T = 4
Credits: 4

Note 1: The whole syllabus has been divided into five modules.

Note 2: U Structure of the question paper**U**

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the three modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have three parts covering not more than two topics (marked in bold italics face). Sufficient questions should to be set covering all modules.

Module I

Matrix: Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoint of a determinant, Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, orthogonal matrix and its properties, Trace of a matrix.

        Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Eigen values and eigen vectors of a square matrix (of order 2 or 3), Eigen values of A^{TP}, kA, A^{-1P}, Caley-Hamilton theorem and its applications.   **9L**

Successive differentiation: Higher order derivatives of a function of single variable, Leibnitz's theorem (statement only and its application, problems of the type of recurrence relations in derivatives of different orders and also to find $(y_n)_0$). **2L**

Mean Value Theorems & Expansion of Functions: Rolle's theorem and its application, Mean Value theorems – Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem, Maclaurin's infinite series expansion of the functions: $\sin x$, $\cos x$, e^x, $\log(1+x)$, $(a+x)^n$, n being an integer or a fraction (assuming that the remainder $R_n \to 0$ as $n \to \infty$ in each case). **5L**

Reduction formula: Reduction formulae both for indefinite and definite integrals of types $\int \sin^n x$, $\int \cos^n x$, $\int \sin^m x \cos^n x$, $\int \cos^m x \sin nx$, $\int \dfrac{dx}{\left(x^2 + a^2\right)^n}$, m,n are positive integers.

2L

Module III

Calculus of Functions of Several Variables: Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives and related problems, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems, Concept of line integrals, Double and triple integrals. **9L**

Module IV

Infinite Series: Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test and Raabe's test (statements and related problems on these tests), Alternating series, Leibnitz's Test (statement, definition) illustrated by simple example, Absolute convergence and Conditional convergence. **5L**

Module-V

Vector Algebra and Vector Calculus: Scalar and vector fields – definition and terminologies, dot and cross products, scalar and vector triple products and related problems, Equation of straight line, plane and sphere, Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions,

Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative. Related problems on these topics. Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications).   **8L**

Total 40 Lectures
Suggested Reference Books

1. Advanced Engineering Mathematics 8e by Erwin Kreyszig is published by Wiley India

2. **Engineering Mathematics**: B.S. Grewal (S. Chand & Co.)

3. **Higher Engineering Mathematics**: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)

4. **Mathematics Handbook**: for Science and Engineering, L. Rade and B. Westergren (5PthP edition, 1PstP Indian Edition 2009, Springer)

5. **Calculus**: M. J. Strauss, G. L. Bradley and K. L. Smith (3PrdP Edition, 1PstP Indian Edition 2007, Pearson Education)

6. **Engineering Mathematics**: S. S. Sastry (PHI, 4PthP Edition, 2008)

7. **Advanced Engineering Mathematics, 3E**: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition.

Engineering Science

Basic Electrical and Electronics Engineering-I
Code: ES101
Contacts: 3L + 1T = 4
Credits: 4

Basic Electrical Engineering-I

DC Network Theorem: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, Kirchhoff's law,   Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, star-delta conversion. Maximum power transfer theorem with proof.   7L

Electromagnetism: Biot-savart law, Ampere's circuital law, field calculation using Biot-savart & ampere's circuital law. Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faraday's law, Self and mutual inductance. Energy stored in a magnetic field, B-H curve, Hysteretic and Eddy current losses, Lifting power of Electromagnet.   5L

AC fundamental: Production of alternating voltage, waveforms, average and RMS values, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behavior of AC series , parallel and series parallel circuits, Power factor, Power in AC circuit, Effect of frequency variation in RLC series and parallel circuits, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit.   9L

Basic Electronics Engineering-I

Instruction: 1 credit means 1 hour; 1 lecture means a lecture of 1 hour duration.

Basic Electronics Engineering - I: 18L + 2L = 20L

Pre-requisites: Knowledge of Class XII level electronics, Physics & Mathematics.

Recapitulation and Orientation lectures: 2L

Module – 1: Semiconductors: 4L
Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Module – 2: Diodes and Diode Circuits: 3L+3L = 6L
Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode.
Simple diode circuits, load line, linear piecewise model;
Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module – 3: Bipolar Junction Transistors: 6L+2L = 8L
Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes.
Biasing and Bias stability: calculation of stability factor;

Outcome:
Students will be able to identify semiconductor materials, draw band-diagrams, distinguish between intrinsic and extrinsic semiconductors, n- and p- type semiconductors, calculate drift and diffusion current components.

Students must be able to explain the junction properties and the phenomenon of rectification, draw the I-V characteristics and identify operating points; Calculate ripple factors, efficiency of power supplies.

Students will be able to draw and explain the I-V characteristics of BJTs – both input and output; learn to bias transistors, both as amplifiers and switches; identify operating points.

Recommended Books:
Text:
   9. Sedra & Smith: Microelectronics Engineering.
   10. Millman & Halkias: Integrated Electronics.
References:
               b) Malvino: Electronic Principle.
               c) Schilling & Belove: Electronics Circuits.
               d) Millman & Grabal: Microelectronics.
               e) Salivahanan: Electronics Devices & Circuits.
               f) Boylestad & Nashelsky: Electronic Devices & Circuit Theory

Engineering Mechanics
Code: ME101
Contacts: 3L + 1T = 4
Credits: 4

Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice
Mod-1	Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector).	2L	Meriam & Kraig: Vol-I Chapt: 1/1, 2/2,1/3
	Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications.	4L+1T	1. Meriam & Kraig: Vol-I Chapt: 1/3, 2/4, 2/7 2. I.H. Shames Chapt: 2.1 to 2.8 Probs: 2.1, 2.2, 2.3,2.6, 2.10, 2.48, 2.52, 2.54, 2.64, 2.68
	Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces.	4L+2T	1. Meriam & Kraig: Vol-I Chapt: 2/3, 2/4, 2/5, 2/6, 2/9 Probs: 2/1 to 2/8; 2/13, 2/16, 2/20; 2/27, 2/31 to 2/33, 2/35, 2/37, 2/39; 2/53, 2/55, 2/57, 2/61, 2/66; 2/75, 2/77, 2/79, 2/78 to 2/82; 2/135 to 2/137, 2/139, 2/141, 2/146, 2/147,2/151, 2/157
Mod-II	Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium.	3L+1T	Meriam & Kraig: Vol-I Chapt: 3/2, 3/3 Probs: 3/1, 3/3, 3/4 to 3/7, 3/11, 3/13, 3/15, 3/21, 3/25, 3/27, 3/31,3/39
	Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.	3L+1T	Meriam & Kraig: Vol-I Chapt: 6/1, 6/2, 6/3 Probs: 6/1 to 6/6, 6/13, 6/15, 6/17; 2. I.H. Shames; Chapt: 7.1,7.2
Mod-III.	Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadralateral, composite areas consisting of above figures.	4L+1T	1. Meriam & Kraig: Vol-I Chapt: 5/1, 5/2, 5/3 Sample probs: 5/1 to 5/5 Probs: 5/2, 5/5, 5/7, 5/9, 5/12, 5/20, 5/25, 5/30, 5/43,5/47
	Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone.	3L+1T	1. Meriam & Kraig: Vol-I Chapt: Appendix A/1, A/2 Sample Probs: A/1 to A/5; Probs: A/1, A/5, A/9, A/15, A/20

Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice
	Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.	2L+1T	1.Elements of strength of Materials by Timoshenko & Young Chapt: 1.1,1.2,1.3, 2.2 Prob set 1.2 : Prob: 3,4,5,8,9,10 Prob set 1.3: Prob: 1,3,5,7 2. Nag & Chanda -3rd Part Chapt: 1.1, 1.2.1 to 1.2.3, 1.2.6, 1.2.7
Mod-IV	Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs.	3L+1T	Meriam & Kriag: Vol-II Chapt: 1/3, 1/5,1/7, 2/1,2/2 Probs: 1/1 to 1/10; 2/1 to 2/14; 2/15, 2/17, 2/19, 2/25, 2/27;
	Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion).	3L+1T	Meriam & Kraig: Vol-II Chapt: 2/3, 2/4, 2/5, Probs: 2/59 to 2/65, 2/67, 2/71, 2/81, 2/84, 2/89; 2/97, 2/99 to 2/103;
Mod-V.	Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency.	5L+2T	Meriam & Kraig: Vol-II Chapt: 3/2, 3/3, 3/4,3/6, 3/7; Probs: 3/1, 3/3, 3/4,3/7, 3/11, 3/12; 3/17, 3/19, 3/23; 3/103 to 3/107, 3/113, 3/115, 3/116; Sample probs: 3/16, 3/17; Probs: 3/143,3/145, 3/158

Books Recommended

1. Engineering Mechanics [Vol-I & II]by Meriam & Kraige, 5th ed. – Wiley India
2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI
3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. – TMH
4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P
5. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani
6. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
7. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson

Sessional

HU

HU 181 (Practical)
LANGUAGE LABORATORY
CONTACTS: 2P
CREDIT: 1
LANGUAGE   LABORATORY   PRACTICE

a) Honing 'Listening Skill' and its sub skills   through Language Lab Audio device;   3P

b) Honing 'Speaking Skill' and its sub skills;   2P
c) Helping them master Linguistic/Paralinguistic features   (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech;   2P

j) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone & Role Play Mode);   2P

k) Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success;   2P

f) G D Practice Sessions for helping them internalize basic   Principles (turn- taking, creative intervention, by using correct body language, courtesies & other   soft skills) of GD;   4P

  g) Honing 'Reading Skills' and its sub skills using Visual /   Graphics/Diagrams /Chart Display/Technical/Non Technical Passages;
    Learning Global / Contextual / Inferential Comprehension;   2P

h) Honing 'Writing Skill' and its sub skills by using   Language Lab Audio –Visual input; Practice Sessions   2P

                                Total Practical Classes   17

Books Recommended:
Dr. D. Sudharani: Manual for English Language Laboratory
                        Pearson Education (WB edition),2010
Board of Editors: Contemporary Communicative English
        for Technical Communication
                        Pearson Longman, 2010

Wxtra Curricular Activities(NSS/NCC/NSO etc)
Code: XC181
Code Credits: 1

a) Creating awareness in social issues
b) Participating in mass education programmes
c) Proposal for local slum area development
d) Waste disposal
e) Environmental awareness
f) Production Oriented Programmes
g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:
    1. Women's development – includes health, income-generation, rights awareness.
    2. Hospital activities – Eg. writing letters for patients, guiding visitors
    3. Old age home – visiting the aging in-mates, arranging for their entertainment.
    4. Children's Homes - visiting the young in-mates, arranging for their entertainment
    5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
    6. Gender issues- Developing an awareness, to link it with Women's Cell of college

Participating in mass education programmes
1.Adult education
2. Children's education

Proposal for local slum area development
One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness
• Resource conservation – Awareness to be developed on water, energy,soil.
• Preservation of heritage monuments- Marches, poster campaigns

- Alternative energy consciousness amongst younger school-children.
- Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
- Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

5. Working with people and explaining and teaching improved agricultural practices
6. Rodent control land pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;
9. Work for the promotion and strengthening of cooperative societies in villages;
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
11. Popularization of small savings and
12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
j) Assisting and working with local authorities in relief and rescue operation;

Collection of clothes and other materials, and sending the same to the affected areas;

Practical
Basic Science

Chemistry-1(Gr-A/Gr-B)
Code: CH191
Contacts:
Credits: 2

1. To Determine the alkalinity in a given water sample.

2. Red-ox titration (estimation of iron using permanganometry)

3. To determine calcium and magnesium hardness of a given water sample separately.

4. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.

5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water)

6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)

7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.

8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

9. Determination of dissolved oxygen present in a given water sample.

10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

At least **Six** experiments must perform in a semester out of above **Ten** experiments.

<div align="center">

Or

</div>

Physics-1(Gr-B/Gr-A)
Code: PH191
Contacts: 3P
Credits: 2

Group 1: Experiment from Higher Secondary knowledge of Physics
  13. Determination of thermal conductivity of a good conductor by Searle's method.
  14. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
  15. Determination of dispersive power of the material of given prism.
  16. Use of Carry Foster's bridge to determine unknown resistance.
Group 2: Experiments on General Properties of matter

  17. Determination of Young's modulus by Flexure method and calculation of bending moment and shear force at a point on the beam.
  18. Determination of modulus of rigidity by static/ dynamic method.
  19. Determination of co-efficient of viscosity by Poiseulle's capillary flow method.
Group 3: Optics
  7. Determination of wavelength of light by Newton's ring method.
  8. Determination of wavelength of light by Fresnel's bi-prism method
  9. Determination of wavelength of light by Laser diffraction method.
  10. Determination of numerical aperture and the energy losses related to optical fibre experiment

  a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

  b) In addition, a student should perform one more experiments where he/she will have to convert the non-electrical signals (viz. Temperature, Intensity of Light, Pressure etc.) present in an Experiment into electrical signals and measure them with the help oh Multi-meters/ Oscilloscopes. Student should calibrate the Sensor for Experiment before use.

  c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:

    i.   Failure to perform each experiment mentioned in b] and c] should be compensated by *two* experiments from two different groups mentioned in the above list.

    ii.   At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] and c]

    iii.   Experiment in b] and c] can be coupled and can be parts of a single experiment.

Engineering Science

Basic Electrical and Electronics Engineering-I
Code: ES191
Contacts:
Credits: 2

Basic Electrical Engineering Laboratory-I

List of Experiments:
Sl. No Name of the Experiments
1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
   (b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit

Basic Electronics Engineering Laboratory-I

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given. Lectures on measurement techniques and error calculation will also have to be organized.

3 hours per week must be kept, initially for practical lectures, and later for tutorials.

List of Experiments:

Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
Study of I-V characteristics of Junction diodes.
Study of I-V characteristics of Zener diodes.
Study of Half and Full wave rectifiers with Regulation and Ripple factors.
Study of I-V characteristics of BJTs.

Engineering Drawing & Computer Graphics(Gr-A/GrB)
Code: ME191
Contacts: 1L+3P
Credits: 3

A. THEORETICAL PART

1. Introduction to Lines, Lettering, Dimensioning, Scales.   - 1L

2. Geometrical Construction and Curves   - 1L

3. Projection of Points, Lines and Surfaces   - 2L

4. Projection of Solids   - 2L

5. Isometric Views   - 1L

6. Sectional Views   - 1L

7. Development of Surfaces   - 1L

8. Introduction to Computer Aided Drafting   - 3L

B. PRACTICAL PART

1. LINES, LETTERING, DIMENSIONING, SCALES; Plain scale, Diagonal scale.

- 6hrs

2. GEOMETRICAL CONSTRUCTION AND CURVES; Construction of polygons, Parabola, Hyperbola, Ellipse. - 6hrs

3. PROJECTION OF POINTS, LINES, SURFACES; Orthographic projection- 1st and 3rd angle projection, Projection of lines and surfaces– Hexagon. - 3hrs

4. PROJECTION OF SOLIDS; Cube, Pyramid, Prism, Cylinder, Cone. - 6hrs

5. DRAWING ISOMETRIC VIEW FROM ORTHOGONAL/ SECTIONAL VIEWS OF SIMPLE SOLID OBJECTS. - 3hrs

6. FULL AND HALF SECTIONAL VIEWS OF SOLIDS. - 3hrs

7. DEVELOPMENT OF SURFACES; Prism, Cylinder, Cone. - 3hrs

8. COMPUTER AIDED DRAFTING (Using AutoCAD and/or similar softwares); Introduction: Cartesian and Polar coordinate system, Absolute and Relative coordinates; Basic editing commands: Line, Point, Trace, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline; Editing methods; Basic object selection methods, Window and crossing window, Erase, Move, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror; Display commands: Zoom, Pan, Redraw, Regenerate; Simple dimensioning and text, Simple exercises. - 6hrs

References / Books:

- Narayana, K.L. and Kannaiah, P. Text Book of Engineering Drawing"Engineering Graphics", Scitech Publication

- Bhatt, N.D. "Elementary Engineering Drawing", Charotar Book Stall, Anand, 1998

- Lakshminarayanan, V. and Vaish Wanar, R.S., "Engineering Graphics", Jain Brothers, New Delhi, 1998

- Chandra, A.M. and Chandra Satish, "Engineering Graphics", Narosa, 1998

- Jolhe, "Engineering Graphics", Tata McGraw-Hill- WBUT Series

- Gill, P.S., "A Text Book of Engineering Drawing", Katson Publishing House (Kataria and Sons)

- Venugopal, K., "Engineering Drawing & Graphics + AutoCAD", New Age International

- Ventaka Reddy K., "Text Book of Engineering Drawing (2nd Edition)", BS Publication.

Or

Workshop Practice(Gr-B/GrA)
Code: ME192
Contacts:
Contact Hours Per week: 1L+3P= 4
Credits: 3

A. THEORETICAL PART

1. INTRODUCTION TO MANUFACTURING; Socio-economic role, Definition, Major grouping and Examples.   - 1L

2. ENGINEERING MATERIALS; Classification / Major grouping, Physical, Chemical and Mechanical properties, Applications   - 1L

3. DIFFERENT CONVENTIONAL MANUFACTURING PROCESSES MAINLY COVERING BASIC PRINCIPLES, DIFFERENT METHODS AND GENERAL APPLICATIONS; Manufacturing by forming /shaping from solid (input) to solid (product); Forging, Rolling, Drawing, Extrusion; Press tool work- Bending, Shearing, Drawing and Coining.   - 3L

4. FORMING / SHAPING FROM LIQUID TO SOLID- CASTING; General principles, General classification or Types of casting; Sand mould casting- procedural steps and requirements; Pattern, Mould, Melting, Pouring, Solidification, Extracting and Fettling. Other casting processes (for larger volume and quality); Centrifugal casting, Investment casting, Die casting.   -3L

5. JOINING PROCESSES; Welding (Permanent Joining)- General classification and basis; Gas welding, Arc welding, Friction welding and Resistance welding, w.r.t. Principle, Requirements, Relative Advantages and Applications; Brazing and soldering.

- 2L

6. REMOVAL (MACHINING) PROCESS; Principle and purpose of machining, Machining requirements, Machine tools- Definition, General classification w.r.t, functional principles and applications; Major machining parameters (and responses)- Speed, Feed and Depth of cut; Tool geometry (Rake, Clearance and Cutting angles), Cutting fluid application; Elementary machining operations- Facing, Centering, Turning, Threading, Drilling, Boring, Shaping and Milling.

-2L

B. SCHEDULE OF PRACTICAL CLASSES

Suggested apportionment / weigtage:

- Machining (and fitting)- 50% (6 days) 18 hrs
- Casting (including pattern making molding and preparation) - 25% (3 days 9hrs)
- Welding (gas, arc and resistance) (2 days 6hrs) and Sheet Metal Working (1 day 3hr)- 25% (3 days 9hrs)

FEASIBLE TYPES / MODELS OF ASSIGNMENTS

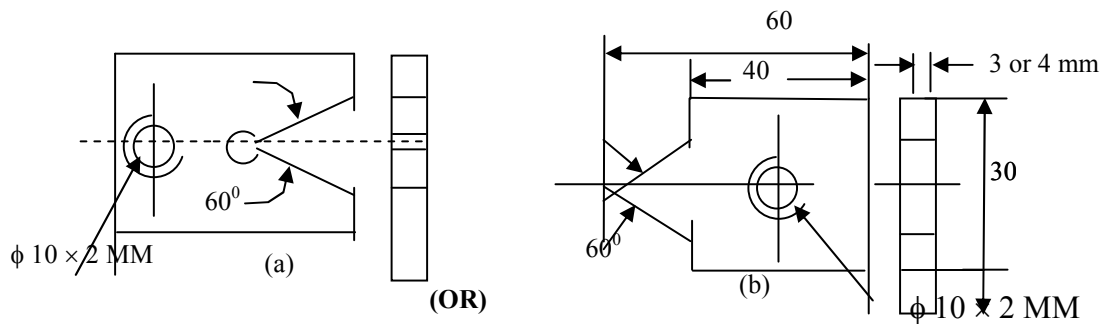i) FITTING (in 2 days or 6 hours); Making a gauge from MS plate as shown in Fig.1.

Fig.1: Job for fitting practice

Operations required:

11.   Squaring and finishing of the blank by filing
12.   Making the Vee-portion by sawing and filing
13.   Drilling (in machine) and tapping (hand)

ii) MACHINING (in 3 days or 9 hours); To make a pin as shown in Fig.2 from a □20mm mild steel rod in a lathe.
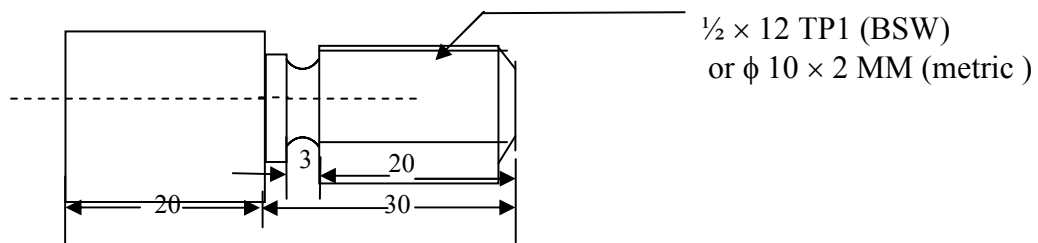
Fig.2: Job for practice on a lathe

23

iii) MACHINING (in 1 day or 3 hours); To make a MS prism as shown in Fig.3 from a ⬜20mm mild steel rod in a shaping and / or milling machine.
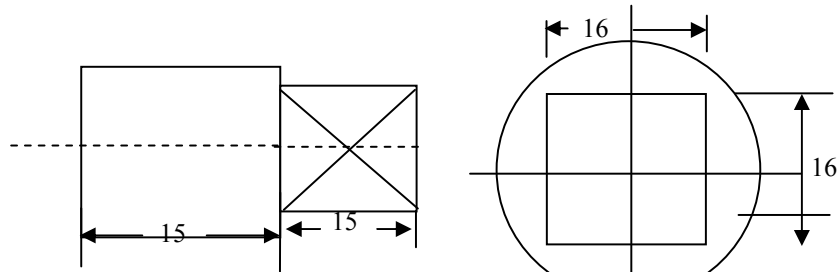
Fig.3: Job for practice on a shaping and/or milling machine

iv) PATTERN MAKING, SAND MOULDING AND CASTING (in 3 classes or 9 hours); To make a wooden pattern and a sand mould with that pattern for casting a cast iron block as shown in Fig.4.
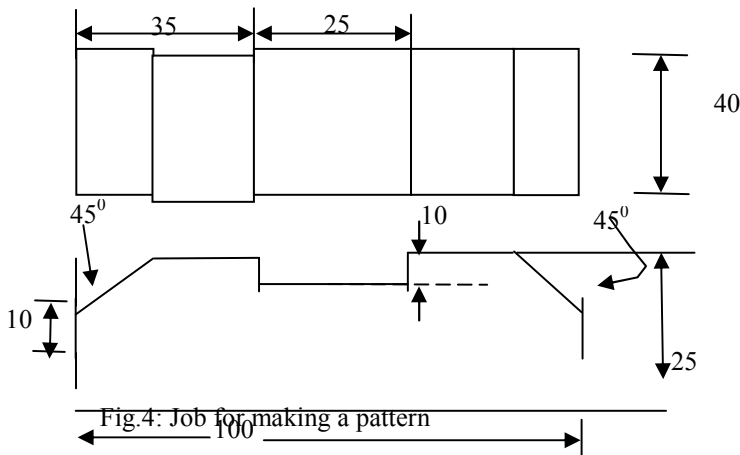

Fig.4: Job for making a pattern

v) WELDING (GAS WELDING) (in 1 class or 3 hours); To join two thin mild steel plates or sheets (1 to 3 mm thick) as shown in Fig. 5 by gas welding.
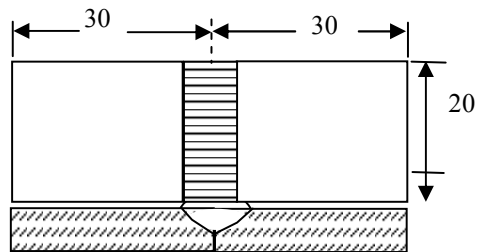
Fig.5: Welding specimen for practice

vi)　　　WELDING (ARC WELDING) (in 1 day or 3 hours); To join two thick (6mm) MS plate as shown in Fig. 5 by arc welding.

vii)　　　SHEET METAL WORK (in 1 day or 3 hours); Forming a cone, for example.

Second Semester

Theory

Basic Science

Basic Computation & Principles of Computer Programming
Code: CS 201
Contacts: 3L + 1T = 4
Credits: 4

Fundamentals of Computer:
History of Computer, Generation of Computer, Classification of Computers   2L

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output
devices   3L

Binary & Allied number systems representation of signed and unsigned numbers. BCD, ASII. Binary
Arithmetic & logic gates   6L

Assembly language, high level language, compiler and assembler (basic concepts)

2L

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Algorithm & flow chart

2L

C Fundamentals:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements   3L
Operators & Expressions:
Arithmetic operators, relational and logical operators, type, conversion, increment and decrement
operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation.
Input and Output: Standard input and output, formatted output -- printf, formatted input scanf.

5L

Flow of Control:
Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels

2L

Fundamentals and Program Structures:
Basic of functions, function types, functions returning values, functions not returning values, auto,
external, static and register variables, scope rules, recursion, function prototypes, C preprocessor,
command line arguments.   6L
Arrays and Pointers:
One dimensional arrays, pointers and functions, multidimensional arrays.   6L
Structures Union and Files:
Basic of structures, structures and functions, arrays of structures, bit fields, formatted and unformatted
files.   5L
Recommended reference Books:
Introduction To Computing (TMH WBUT Series), E. Balagurusamy,TMH

Kerninghan, B.W.	The Elements of Programming Style
Yourdon, E.	Techniques of Program Structures and Design
Schied F.S.	Theory and Problems of Computers and Programming
Gottfried	Programming with C Schaum
Kerninghan B.W. & Ritchie D.M.	The C Programming Language
Rajaraman V.	Fundamental of Computers
Balaguruswamy	Programming in C
Kanetkar Y.	Let us C
M.M.Oka	Computer Fundamentals,EPH

Leon	Introduction to Computers,Vikas
Leon-	Fundamental of Information Technology,Vikas
Ram B.	Computer Fundamentals, New Age International
Ravichandran D.	Programming in C, New Age International
Xavier C.	C Language & Numerical Methods, New Age Inter.
Xavier C.	Introduction to Computers, New Age International
Rao S.B.	Numerical Methods with Programs in Basic Fortran Pascal & C++, Universities Press
Dutta N.	Computer Programming & Numerical Analysis, Universities Press
Bhanu Pratap	Computer Fundamentals
Rajaram	Computer Concepts & C Program, Scitech

Chemistry-1(Gr-B/Gr-A)
Code: CH201
Contacts: 3L + 1T = 4
Credits: 4

<div align="center">Or</div>

Physics-1(Gr-A/Gr-B)
Code: PH201
Contacts: 3L + 1T = 4
Credits: 4

Mathematics
Code: M201
Contacts: 3L + 1T = 4
Credits: 4

Note 1: The whole syllabus has been divided into five modules.

Note 2: U**Structure of the question paper**U

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the three modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have three parts covering not more than two topics (marked in bold italics faces). Sufficient questions should to be set covering all modules.

<div align="center">Module I</div>

***Ordinary differential equations (ODE)- First order and first degree*:** Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation).   **5L**

<div align="center">Module II</div>

***ODE- Higher order and first degree*:** General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations,Solution of simultaneous linear differential equations.   **6L**

Module III

Basics of Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph,; Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph.   **10L**

Module IV

Tree: Definition and properties, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using DFS, BFS, Kruskal's and Prim's algorithms.   **6L**

Module V

Improper Integral: Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations.   **3L**

Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of $\dfrac{f(t)}{t}$, LT of $t^n f(t)$, LT of derivatives of $f(t)$, L.T. of $\int f(u)du$. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT**:** Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT.   **10L**

                                                                                Total 40 Lectures

Suggested Reference Books:

1**. Advanced Engineering Mathematics**, Erwin Kreyszig, (Wiley Eastern)

2. **Graph Theory**: V. K. Balakrishnan, (Schaum's Outline, TMH)

3. **A first course at Graph Theory**: J. Clark and D. A. Holton (Allied Publishers LTD)

4. **Introduction to Graph Theory**: D. B. West (Prentice-Hall of India)

5. **Graph Theory**: N. Deo (Prentice-Hall of India)

6. **Engineering Mathematics:** B.S. Grewal (S. Chand & Co.)

7. **Higher Engineering Mathematics**: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)

8**. Calculus**: Strauss, Bradley and Smith (3P^{rdP} edition, Pearson Education)

9. **Engineering Mathematics (Volume 2):** S. S. Sastry (Prentice-Hall of India)

10. **Advanced Engineering Mathematics, 3E**: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition

11. **An Introduction to Differential Equations**, R.K. Ghosh and K.C.Maity (New Central Book Agency)

Basic Electrical and Electronics Engineering-II
Code: ES201
Contacts: 3L + 1T = 4
Credits: 4

Basic Electrical Engineering-II

Electrostatics: Coulomb's law, Electric Field Intensity, Electric field due to a group of charges, continuous charge distribution, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, proof of gauss's law, its applications to electric field and potential calculation, Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors. Energy stored in a capacitor.   5L

DC Machines: Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control)   6L

Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.   4L

3 phase induction motor: Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control, resistance control)   5L

Three phase system: Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method.   3L

General structure of electrical power system: Power generation to distribution through overhead lines and under ground cables with single lone diagram.   1L

Text books:
1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
3. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

Reference books:
1. Basic Electrical Engineering(TMH WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education,
Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

Basic Electronics Engineering - II: 20L

Pre-requisites: Knowledge of Basic Electronics Engineering – I.

Module – 1: Field Effect Transistors: 5L
Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

Module – 2: Feed Back Amplifier, Oscillators and Operational Amplifiers: 5L+5L = 10L
Concept (Block diagram), properties, positive and negative feed back, loop gain, open loop gain, feed back factors; topologies of feed back amplifier; effect of feed back on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feed back: instability and oscillation, condition of oscillation, Barkhausen criteria.
Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

Module – 3: Digital Electronics: 5L
Introduction to binary number; Basic Boolean algebra; Logic gates and function realization with OPAMPs.

Outcomes:
Students will be able to distinguish the different Gate isolation techniques; draw and explain the I-V characteristics of FETs; Appreciate the utility of CMOS.

Student will analyse the different OPAMP circuits and apply the knowledge of network theory to OPAMP circuits.

Student must acquire the proficiency to express binary numbers, convert binary to decimal and vice versa, draw truth tables for different logic operations, design Gates and simple digital circuits using the Gates.

Recommended Books:

Text:
- Sedra & Smith: Microelectronics Engineering.
- Millman & Halkias: Integrated Electronics.

References:
- Malvino: Electronic Principle.
- Schilling & Belove: Electronics Circuits.
- Millman & Grabal: Microelectronics.
- Salivahanan: Electronics Devices & Circuits.
- Boyelstad & Nashelsky: Electronic Devices & Circuit Theory.

Engineering Thermodynamics & Fluid Mechanics
Code: ME201
Contacts: 3L + 1T = 4
Credits: 4

Module 1 :   8L+3T
 Basic Concepts of Thermodynamics
   Introduction: Microscopic and Macroscopic viewpoints
   Definition of Thermodynamic systems: closed, open and isolated systems
   Concept of Thermodynamics state; state postulate.

Definition of properties: intensive, extensive & specific properties.
Thermodynamic equilibrium
Thermodynamic processes; quasi-static, reversible & irreversible processes; Thermodynamic cycles.
Zeroth law of thermodynamics. Concept of empirical temperature.

Heat and Work
Definition & units of thermodynamic work.
Examples of different forms of thermodynamic works; example of electricity flow as work.
Work done during expansion of a compressible simple system
Definition of Heat; unit of Heat
Similarities & Dissimilarities between Heat & Work
Ideal Equation of State, processes; Real Gas
Definition of Ideal Gas; Ideal Gas Equations of State.
Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes.
Equations of State of Real Gases: Van der Waal's equation; Virial equation of state.
Properties of Pure Substances
p-v & P-T diagrams of pure substance like H_2O
Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status.
Definition of dryness fraction of steam, degree of superheat of steam.

Module 2 :   4L+3T
 1st Law of Thermodynamics
Definition of Stored Energy & Internal Energy
1st Law of Thermodynamics for cyclic processes
Non Flow Energy Equation
Flow Energy & Definition of Enthalpy
Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation

Module 3 :   6L+3T
 2nd Law of Thermodynamics
Definition of Sink, Source Reservoir of Heat.
Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators
Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics
Absolute or Thermodynamic scale of temperature
Clausius Integral
Entropy
Entropy change calculation for ideal gas processes.
Carnot Cycle & Carnot efficiency
PMM-2; definition & its impossibility

Module 4:   6L+3T
 Air standard Cycles for IC engines
Otto cycle; plot on P-V, T-S planes; Thermal efficiency
Diesel cycle; plot on P-V, T-S planes; Thermal efficiency
 Rankine cycle of steam
h-s chart of steam (Mollier's Chart)
Simple Rankine cycle plot on P-V, T-S, h-s planes
Rankine cycle efficiency with & without pump work
(Problems are to solved for each module)

Module 5:   9L+3T
 Properties & Classification of Fluids
Ideal & Real fluids
Newton's law of viscosity; Newtonian and Non-Newtonian fluids

Compressible and Incompressible fluids

Fluid Statics
  Pressure at a point
Measurement of Fluid Pressure
  Manometers : simple & differential
  U-tube
  Inclined tube
Fluid Kinematics
  Stream line
  laminar & turbulent flow
  external & internal flow
  Continuity equation
Dynamics of ideal fluids
  Bernoulli's equation
  Total head; Velocity head; Pressure head
  Application of Bernoulli's equation
Measurement of Flow rate : Basic principles
  Venturimeter
  Pilot tube
  Orifice meter

33L+15T =48P

(Problems are to be solved for each module)

Engineering Thermodynamics

Text :
1   Engineering Thermodynamics - P K Nag, 4th edn, TMH.

References :

  1   "Fundamentals of Thermodynamics" 6e by Sonntag & Van Wylin published by Wiley India.

  2   Engineering Thermodynamics – Russel & Adeliyi (Indian edition), OUP

  3   Engineering Thermodynamics – Onkar Singhh, New Age International Publishers Ltd.

  4   Basic Engineering Thermodynamics – R Joel, 5th Ed., Pearson

Fluid Mechanics

Text :
  1   Fluid Mechanics and Hydraulic Machines - R K Bansal

References :

  1   Introduction to Fluid Mechanics and Fluid Machines - S.K.Som and G.Biswas. 2nd edn, TMH

  2   Fluid Mechanics by A.K.Jain.

Basic Science

Basic Computation & Principles of Computer Programming Lab
Code: CS 291
Contacts: Credits: 2

Exercises should include but not limited to:

1. DOS System commands and Editors (Preliminaries)
2. UNIX system commands and vi (Preliminaries)
3. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number , generate Pascal's triangle, find roots of a quadratic equation
4. Programs to demonstrate control structure : text processing, use of break and continue, etc.
5. Programs involving functions and recursion
6. Programs involving the use of arrays with subscripts and pointers
7. Programs using structures and files.

Chemistry-1(Gr-B/Gr-A)
Code: CH291
Contacts:
Credits: 2

Or

Physics-1(Gr-A/Gr-B)
Code: PH291
Contacts:
Credits: 2

Engineering Science

Basic Electrical and Electronics Engineering-II
Code: ES291
Contacts:
Credits: 2

Basic Electrical Engineering Laboratory-II

List of Experiments:
Sl. No Name of the Experiments
1. Calibration of ammeter and voltmeter.
2. Open circuit and Short circuit test of a single phase Transformer.
3. No load characteristics of D.C shunt Generators
4. Starting and reversing of speed of a D.C. shunt
5. Speed control of DC shunt motor.
6. Measurement of power in a three phase circuit by two wattmeter method.

Basic Electronics Engineering Laboratory-II

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled will be given.

3 hours per week must be kept, initially for practical lectures, and later for tutorials.

List of Experiments:

1. Study of I-V characteristics of Field Effect Transistors.
2. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
3. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
4. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
5. Study of Logic Gates and realization of Boolean functions using Logic Gates.
6. Study of Characteristic curves for CB, CE and CC mode transistors.

Engineering Drawing & Computer Graphics(Gr-B/Gr-A)
Code: ME291
Contacts:
Credits: 3

Or

Workshop Practice(Gr-A/Gr-B)
Code: ME292
Contacts:
Credits: 3

Syllabus for B.Tech(Civil Engineering) Up to Third Year

Revised Syllabus of B.Tech CE (for the students who were admitted in Academic Session 2010-2011)

Civil Engineering
Second Year – Third Semester

A. THEORY							
Sl. No	Field	Theory	Contact hours per week				Cr. Points
			L	T	P	Total	
1	HU301	Values & Ethics in Profession	3	0	0	3	3
2	PH301	Physics - 2	3	1	0	4	4
3	CH301	Basic Environmental Engineering & Elementary Biology	(2+1)	0	0	3	3
4	CE301	Solid Mechanics	3	0	0	3	3
5	CE302	Surveying	3	1	0	4	4
6	CE303	Building Material & Construction	3	1	0	4	4
Total Theory						21	21
B. PRACTICAL							
7	PH391	Physics - 2	0	0	3	3	2
8	CE391	Solid Mechanics	0	0	3	3	2
9	CE392	Surveying Practice I	0	0	3	3	2
10	CE393	Building Design & Drawing	0	0	3	3	2
Total Practical						12	8
Total of Semester						33	29

Second Year – Fourth Semester

A. THEORY							
Sl. No	Field	Theory	Contact hours per week				Cr. Points
			L	T	P	Total	
1	M(CS)401	Numerical Methods	2	1	0	3	2
2	M402	Mathematics - 3	3	1	0	4	4
3	CE401	Fluid Mechanics	3	0	0	3	3
4	CE402	Structural Analysis	3	1	0	4	4
5	CE403	Soil Mechanics	3	1	0	4	4
Total Theory						18	17
B. PRACTICAL							
6	HU481	Technical Report Writing & Language Lab Practice	0	0	3	3	2
7	M(CS)491	Numerical Methods	0	0	2	2	1
8	CE491	Fluid Mechanics	0	0	3	3	2
9	CE492	Surveying Practice -II	0	0	3	3	2
10	CE493	Soil Mechanics Lab - I	0	0	3	3	2
Total Practical						14	9
Total of Semester						32	26

Syllabus for B.Tech(Civil Engineering) Up to Third Year
Revised Syllabus of B.Tech CE (for the students who were admitted in Academic Session 2010-2011)

Third Year – Fifth Semester

Sl. No	Field	Theory	L	T	P	Total	Cr. Points
A. THEORY			Contact hours per week				Cr. Points
1	HU501	Economics for Engineers	3	0	0	3	3
2	CE501	Foundation Engineering	3	1	0	4	4
3	CE502	Design of RC Structures	3	1	0	4	4
4	CE503	Concrete Technology	3	0	0	3	3
5	CE504	Engineering Geology	3	0	0	3	3
Total Theory						17	17
B. PRACTICAL							
6	CE591	Soil Mechanics Lab – II	0	0	3	3	2
7	CE592	Concrete Laboratory	0	0	3	3	2
8	CE593.	Quantity Surveying, Specifications and Valuation	0	0	3	3	2
9	CE594	Engineering Geology Laboratory	0	0	3	3	2
Total Practical						12	8
Total of Semester						29	25

Third Year – Sixth Semester

Sl. No	Field	Theory	L	T	P	Total	Cr. Points
A. THEORY			Contact hours per week				Cr. Points
1	HU601	Principles of Management	2	0	0	2	2
2	CE601	Highway & Transportation Engineering	3	0	0	3	3
3	CE602	Design of Steel Structure	3	0	0	3	3
4	CE603	Construction Planning and Management	3	0	0	3	3
5	CE604	Professional Elective – I	3	0	0	3	3
6	CE605	Free Elective – I	3	0	0	3	3
Total Theory						17	17
B. PRACTICAL							
7	CE691	Highway & Transportation Engg Lab	0	0	3	3	2
8	CE692	Detailing of RC and Steel Structures	0	0	3	3	2
9	CE693	CAD Laboratory	0	0	3	3	2
10	CE681	Seminar	0	0	3	3	2
Total Practical						12	8
Total of Semester						29	25

Professional Elective – I

1. CE604A : Bridge Engineering
2. CE604B : Prestressed Concrete
3. CE604C : Structural Dynamics and Earthquake Engineering

Free Elective – I
1. CE605A : Operations Research(M)
2. CE605B : Human Resource Management(HSS)
3. CE6505C : Materials Handling(ME)

Syllabus for B.Tech(Civil Engineering) Up to Third Year

Revised Syllabus of B.Tech CE (for the students who were admitted in Academic Session 2010-2011)

Proposed Structure for Forthcoming Semester of B.Tech Courses on CE

Fourth Year – Seventh Semester

Sl. No	Field	Theory	L	T	P	Total	Cr. Points
A. THEORY			Contact hours per week				Cr. Points
1	CE701	Environmental Engineering	3	0	0	3	3
2	CE702	Water Resource Engineering	3	0	0	3	3
3	CE703	Professional Elective II	3	0	0	3	3
4	CE704	Professional Elective III	3	0	0	3	3
5	CE705	Free Elective II	3	0	0	3	3
Total Theory						15	15
B. PRACTICAL							
6	HU781	Group Discussion	0	0	3	3	2
7	CE791.	Environmental Engg Lab	0	0	3	3	2
8	CE792	Civil Engineering Practice Sessional	0	0	3	3	2
9	CE793	Free Elective Laboratory	0	0	3	3	2
10	CE782	Industrial Training	4 weeks duration during 6th-7th Semester break				2
11	CE783	Project Part I				6	2
Total Practical						18	12
Total of Semester						33	27

Fourth Year – Eighth Semester

Sl. No	Field	Theory	L	T	P	Total	Cr. Points
A. THEORY			Contact hours per week				Cr. Points
1	HU801A HU801B	Organisational Behaviour/ Project Management	2	0	0	2	2
2	CE801	Professional Elective IV	3	0	0	3	3
3	CE802	Professional Elective V	3	0	0	3	3
Total Theory						8	8
B. PRACTICAL							
4	CE891	Structural Engineering Design Practice	0	0	6	6	4
5	CE881	Project Part II	0	0	12	12	6
6	CE882	Grand – Viva					3
Total Practical						18	13
Total of Semester						26	21

Free Elective II
CE705A Engineering Materials (ME303)
CE705B Electrical and Electronic Measurement (EE402)

Free Elective Lab
CE793A Material Testing Lab (ME493)
CE793B Electrical and Electronic Measurement Laboratory (EE492)

List of Electives:

Professional Elective – II
1. CE703A Advanced Foundation Engineering
2. CE703B Soil Stabilization and Ground Improvement Techniques
3. CE703C Advanced Highway and Transportation Engineering

Professional Elective – III
1. CE704A Advanced Structural Analysis
2. CE704B Hydraulic Structures

Professional Elective – IV
1. CE801A Environmental Pollution and Control
2. CE801B Water Resource Management and Planning
3. CE801C Remote Sensing and GIS

Professional Elective – V
1. CE802A Finite Element Method
2. CE802B Dynamics of Soils & Foundations
3. CE802C Design of Tall Buildings
4. CE802D Pavement Design

III Semester
Theory
VALUES & ETHICS IN PROFESSION

HU-301
Contracts:3L
Credits- 3

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development
Energy Crisis: Renewable Energy Resources
Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics
Appropriate Technology Movement of Schumacher; later developments
Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.
Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals.
Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society
Nature of values: Value Spectrum of a good life
Psychological values: Integrated personality; mental health
Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.
Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity
Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

Physics 2
Code: PH-301
Contacts: 4L
Credit: 3+1

Module 1:
Vector Calculus:
1.1 Physical significances of grad, div, curl. Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism and statements of Stokes theorem and Gauss theorem [No Proof]. Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates. 2L

Module 2 :
Electricity
2.1 Coulumbs law in vector form. Electrostatic field and its curl. Gauss's law in integral form and conversion to differential form . Electrostatic potential and field, Poisson's Eqn. Laplace's eqn (Application to Cartesian, Spherically and Cylindrically symmetric systems – effective 1D problems) Electric current, drift velocity, current density, continuity equation, steady current. 5L
2.2 Dielectrics-concept of polarization, the relation $D=\varepsilon_0 E+P$, Polarizability. Electronic polarization and polarization in monoatomic and polyatomic gases. 3L

Module 3:

Magnetostatics & Time Varying Field:

3. Lorentz force, force on a small current element placed in a magnetic field. Biot-Savart law and its applications, divergence of magnetic field, vector potential, Ampere's law in integral form and conversion to differential form. Faraday's law of electro-magnetic induction in integral form and conversion to differential form.
        3L

Module 4:

Electromagnetic Theory:

4.1 Concept of displacement current Maxwell's field equations, Maxwell's wave equation and its solution for free space. E.M. wave in a charge free conducting media, Skin depth, physical significance of Skin Depth, E.M. energy flow, & Poynting Vector.

        6L

Module 5:

Quantum Mechanics:

5.1 Generalised coordinates, Lagrange's Equation of motion and Lagrangian, generalised force potential, momenta and energy. Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion.

                    4L

Course should be discussed along with physical problems of 1-D motion

5.2 Concept of probability and probability density, operators, commutator. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function ψ (normalization and probability interpretation), Expectation values, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels.   9L

Module 6:

Statistical Mechanics:

3.1 Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Calculation of Fermi level in metals, also total energy at absolute zero of temperature and total number of particles, Bose-Einstein statistics – Planck's law of blackbody radiation..

                7L

Basic Environmental Engineering & Elementary Biology
Code: CH301
Contacts: 3L = 3
Credits: 3

General

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.

                    1L

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.   2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function.
                    1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

2L

Ecology

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function.   1L

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web.   2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur].   1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.   2L

Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.

1L

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.   1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget. 1L

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).

2L

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model.   2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant.

Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN.   2L

Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification.   1L

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

1L

Water Pollution and Control

Hydrosphere, Hydrological cycle and Natural water.

Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds.   2L

River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH.
                            2L

Lake: Eutrophication [Definition, source and effect].   1L

Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only)   1L

Standard and control: Waste water standard [BOD, COD, Oil, Grease],

Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.
                            2L

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic
                                        1L

Land Pollution

Lithosphere; Internal structure of earth, rock and soil   1L

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling.

Solid waste management and control (hazardous and biomedical waste).   2L

Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]
                            1L

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level,

$L_{10} (18 \, \text{hr Index})$, Ld_n.

Noise pollution control.   1L

Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.   2L

References/Books

1.   Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.

De, A. K., "Environmental Chemistry", New Age International.

SOLID MECHANICS
Code: CE301
Contact: 3L
Credits: 3

Mod	Details of Course Content	Hours	Total
	Review of Basic Concepts of Stress and Strain: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.		

I	Beam Statics: Support reactions, concepts of redundancy, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams	9	
II	**Symmetric Beam Bending**: Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, Bending and shear stress for regular sections, shear centre	13	42
	Deflection of statically determinate beams: Fundamental concepts: Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions: Direct integration solution		
III	**Analysis of determinate plane trusses**: Concepts of redundancy, Analysis by method of joints, method of sections	10	
	Two Dimensional Stress Problems: Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle		
IV	**Introduction to thin cylindrical & spherical shells**: Hoop stress and meridonial - stress and volumetric changes.	10	
	Torsion: Pure torsion, torsion of circular solid shaft and hollow shafts, torsional equation, torsional rigidity, closed coil helical; springs		
	Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory – problems, eccentric load and secant formulae.		

References

Sl. No	Name	Author	Publishers
1	Elements of Strength of Material	S. P. Timoshenko & D. H. Young	EWP Pvt. Ltd
2	Engineering Mechanics of Solids	E. P. Popov	Pearson Education
3	Strength of Materials	R. Subramanian	OXFORD University Press
4	Strength of Material	Bansal	
5	Strength of Materials	S S Bhavikatti	Vikas Publishing House Pvt. Ltd
6	Strength of Material	A. Pytel & F. L. Singer	AWL Inc
7	Strength of Material	Ramamrutham	
8	Engineering Mechanics I by	J. L. Mariam	John Willey
9	Engineering Mechanics	I. H. Shames	PHI
10	Fundamentals of Strength of Material	Nag & Chandra	WIE

SURVEYING
Code: CE302
Contact: 3L + 1T
Credits: 4

Mod	Details of Course Content	Hours	Total
I	**Introduction:** Definition, classification of surveying, objectives, principles of surveying	12	42
	Chain surveying: Chain and its types, Optical square, Cross staff, Reconnaissance and site Location, Locating ground features by offsets – Field book. Chaining for obtaining the outline of structures, Methods for overcoming obstacles, Conventional symbols, Plotting chain survey and Computation of areas, Errors in chain surveying and their elimination: Problems		
	Compass Surveying: Details of prismatic compass, Use and adjustments, Bearings, Local attraction and its adjustments. Chain and compass surveying of an area, Booking and plotting, Adjustments of traverse, Errors in compass surveying and precautions: Problems.		
II	**Plane Table Surveying**: Equipment, Orientation, Methods of Plane Tabling, Three Point Problems.		
	Leveling: Introduction, Basic definitions, Detail of dumpy Level, Temporary adjustment of Levels, Sensitiveness of bubble tube; Methods of leveling – Differential, Profile & fly Leveling, Effect of curvature and refraction, Automatic levels, Plotting longitudinal sections and Cross sections; Measurement of area and volume	11	

	Contouring: Topographic Map, Characteristics of Contour, Contour Interval. Methods of Locating Contours, Interpolation of Contours		
III	**Theodolite Surveying:** Components of a Transit Theodolite, Measurement of horizontal and vertical Angles, Co-ordinates and traverse Table	11	
	Tacheometry: Definition, Details of stadia System, Determination of horizontal and vertical distance with Tacheometer- Staff held vertically and normal to the line of sight		
IV	**Simple & Transition Curves:** Definition, Degree of Curve, Elements of Simple Curve, Setting out by Linear method and Rankine's tangential method, Transition Curves.	8	
	Introduction to Total Station with Field applications		

References

Sl No.	Title	Author
1	Surveying:- Vol - I & II	B.C. Punmia
2	Surveying & Leveling	R. Subramanian (OXFORD)
3	Surveying& Leveling Vol - I [Part I & II]	T.P.Kanetkar & Kulkarni
4	Surveying:- Vol - I & II	S.K. Duggal
5	Fundamental of Engineering Survey	J.K. Ghosh (Studium Press, Roorkee)
6	Higher Surveying	Dr. A. M. Chandra
7	Surveying	R.B. Gupta & B.K. Gupta
9	Plane and Geodetic Surveying (Vol - I & II)	David Clark
10	Fundamental of Surveying	S. K. Roy
11	Surveying	Saikia & Das (PHI)

BUILDING MATERIAL AND CONSTRUCTION
Code: CE303
Contact: 3L + 1 T
Credits: 4

Mod	Details of Course Content	Hours	Total
	Material of Construction		
I	**Bricks:** Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick Earth, Different forms of bricks, Testing of bricks as per BIS. Defects of bricks.	13	
	Aggregates: Classification, Characteristics, Deleterious substances, Soundness, Alkali – aggregates reaction, Fine aggregates, Coarse aggregates, Testing of aggregates		
	Lime: Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling		
	Cement & Concrete: **Cement:** OPC: Composition, PPC, Slag cement, Hydration, setting time **Concrete**: Types, ingredients, W/C ratio, Workability, Different grades in cement concrete, Tests on cement concrete		
II	**Mortars**: Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars	10	
	Wood and Wood Products: Classification of Timber, Structure, Characteristics of good timber, Seasoning of timber, Defects in Timber, Diseases of timber, Decay of Timber, Preservation of Timber Testing of Timber, Veneers , Plywood, Fibre Boards, Particle Boards, Chip Boards , Black Boards, Button Board and Laminated Boards, Applications of wood and wood products		
	Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish , French Polish, Wax Polish		
	Miscellaneous Materials: Gypsum: Classification, Plaster of Paris, Gypsum wall Plasters, Gypsum Plaster Boards, Adhesives, Heat and sound insulating materials, Geo-synthetics		

Building Construction			42
III	**Foundations:** Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations		
	Brick masonry: Definitions, Rules for bonding, Type of bonds – stretcher bond, Header bond, English bond, Flemish Bond, Comparison of English Bond and Flemish Bond (one and one and half brick thick wall)	10	
	Wall, Doors and Windows: Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal		
IV	**Stairs:** Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case		
	Flooring: Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing	9	
	Plastering and Pointing: Plastering with cement mortar, Defects in plastering, pointing, white washing, colour washing, Distempering,		
	Roofs: Types, Pitched roofs and their sketches, Lean – to roof, King Post – Truss, Queen post truss and Simple steel Truss , Roof Covering materials: AC sheets GI sheet		

References

Sl. No	Name	Author	Publishers
1	1. Building Materials	S.K. Duggal	
2	2. Building Materials	P.C. Varghese	PHI
3	Engineering Materials	S.C. Rangwala	
4	Concrete Technology	M. S. Shetty	
5	Concrete Technology[	A.M. Nevile & J.J. Brooks	Pearson Education
6	Building Construction	B.C. Punmia	
7	Building Construction and Foundation Engineering	Jha and Sinha	

Practical

Code: PH-391
Contacts: (3P)
Credit: (2)

Group 1: Experiments on Electricity and Mangentism

1. Determination of dielectric constant of a given dielectric material.
3. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
4. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
5. Determination of specific charge (e/m) of electron by J.J. Thomson's method.

Group 2: Quantum Physics
6. Determination of Planck's constant using photocell.
7. Determination of Lande'g factor using Electron spin resonance spetrometer.
8. Determination of Stefan's radiation constant
9. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
10. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum

Group 3: Modern Physics
11. Determination of Hall co-efficient of semiconductors.
12. Determination of band gap of semiconductors.

13. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

b) In addition a student should perform one more experiments where he/she will have to transduce the output of any of the above experiments or the experiment mentioned in c] into electrical voltage and collect the data in a computer using phoenix or similar interface.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:
  i. Failure to perform each experiment mentioned in b] and c] should be compensated by two experiments mentioned in the above list.
  ii. At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] and c]
  iii. Experiment in b] and c] can be coupled and parts of a single experiment.

Recommended Text Books and Reference Books:
 For Both Physics I and II
1. B. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
4.. Arthur Baiser (Perspective & Concept of Modern Physics)
Physics I (PH101/201)
Vibration and Waves
3.   Kingsler and Frey
4.   D.P. Roychaudhury
5.   N.K. Bajaj (Waves and Oscillations)
6.   K. Bhattacharya
7.   R.P. Singh (Physics of Oscillations and Waves)
8.   A.B. Gupta (College Physics Vol.II)
9.   Chattopadhya and Rakshit (Vibration, Waves and Acoustics)
 Optics
1.   Möler (Physical Optics)
2.   A.K. Ghatak
3.   E. Hecht (Optics)
4.   E. Hecht (Schaum Series)
5.   F.A. Jenkins and H.E. White
6.   6. Chita Ranjan Dasgupta (Degree Physics Vol 3)
Quantum Physics
1.   Eisberg and Resnick
2.   A.K. Ghatak and S. Lokenathan
3.   S.N. Ghoshal (Introductory Quantum Mechanics)
4.   E.E. Anderson (Modern Physics)
5.   Haliday, Resnick and Crane (Physics vol.III)
6.   Binayak Dutta Roy [Elements of Quantum Mechanics]
Crystallography
1.   S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)
2.   A.J. Dekker
3.   Aschroft and Mermin
4.   Ali Omar
5.   R.L. Singhal
6.   Jak Tareen and Trn Kutty (Basic course in Crystallography
Laser and Holography
1.   A.K. Ghatak and Thyagarajan (Laser)
2.   Tarasov (Laser)
3.   P.K. Chakraborty (Optics)
4.   B. Ghosh and K.G. Majumder (Optics)
5.   B.B. Laud (Laser and Non-linear Optics)
6.   Bhattacharyya [Engineering Physics] Oxford

Physics II(PH 301)

Classical Mechanics (For Module 5.1 in PH 301)
H. Goldstein
A.K. Roychaudhuri
R.G. Takwal and P.S. Puranik
Rana and Joag
M. Speigel (Schaum Series)
J.C. Upadhya (Mechanics)
Electricity and Magnetism
2.   Reitz, Milford and Christy
3.   David J. Griffith
4.   D. Chattopadhyay and P.C. Rakshit
5.   Shadowitz (The Electromagnetic Field)
Quantum Mechanics
7.   Eisberg and Resnick
8.   A.K. Ghatak and S. Lokenathan
9.   S.N. Ghoshal (Introductory Quantum Mechanics)
10.   E.E. Anderson (Modern Physics)
11.   Haliday, Resnick and Crane (Physics vol.III)
12.   Binayak Dutta Roy [Elements of Quantum Mechanics]
Statistical Mechanics
1.   Sears and Sallinger (Kinetic Theory, Thermodynamics and   Statistical Thermodynamics)
2.   Mondal (Statistical Physics)
3.   S.N. Ghoshal (Atomic and Nuclear Physics)
4.   Singh and Singh
5.   B.B. Laud (Statistical Mechanics)
6.   F. Reif (Statistical Mechanics)
Dilectrics
7.   Bhattacharyya [Engineering Physics] Oxford

Solid Mechanics Lab
Code:CE391
Contact – 3 P
Credits – 2

1.   Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars)
2.   Compression Test on Structural Materials: Timber, bricks and concrete cubes
3.   Bending Test on Mild Steel
4.   Torsion Test on Mild Steel Circular Bar
5.   Hardness Tests on Ferrous and Non-Ferrous Metals: Brinnel and Rockwell Tests
6.   Test on closely coiled helical spring
7.   Impact Test: Izod and Charpy
8.   Demonstration of Fatigue Test

Surveying Practice I
Code:CE392
Contact- 3P
Credits -2

Chain surveying
Preparing index plans, Location sketches, Ranging, Preparation of map, Heights of objects using chain and ranging rods, Getting outline of the structures by enclosing them in triangles/quadrilaterals, Distance between inaccessible points, Obstacles in chain survey.

Compass surveying
Measurement of bearings, Preparation of map, Distance between two inaccessible points by chain and compass, Chain and compass traverse

Plane Table survey
 Temporary adjustments of plane table and Radiation method, Intersection, Traversing and Resection methods of plane tabling, Three-point problem

Leveling

Temporary adjustment of Dumpy level, Differential leveling, Profile leveling and plotting the profile, Longitudinal and cross sectioning, Gradient of line and setting out grades, Sensitiveness of Bubble tube

Contouring

Direct contouring, Indirect contouring – Block leveling, Indirect contouring – Radial contouring, Demonstration of minor instruments

Building Design and Drawing
Code:CE 393
Contact- 3P
Credits: 2;

Foundations

Spread foundation for walls and columns; Footing for a RCC column, raft and pile foundations;

Doors and Windows

Glazed and paneled doors of standard sizes; Glazed and paneled windows of standard sizes; special windows and ventilators

Stairs

Proportioning and design of a dog-legged, open well RCC stair case for an office / Residential building; Details of reinforcements for RCC stair cases; Plan and elevation of straight run, quarter turn, dog-legged and open well stair cases.

Roofs and Trusses

Types of sloping roof, lean-to roofs, RCC roof with details of reinforcements, King post and Queen post trusses.

Functional Design of Buildings

To draw the line diagram, plan, elevation and section of the following:

Residential Buildings (flat, pitched and combined roofs), Office Buildings (flat roof), School

The designs must show positions of various components including lift well and their sizes.

Introduction to drawing by using software package

References

Sl No.	Title	Author
1	Principles of Building Drawing	Shah & Kale
2	Text Book of Building Construction	Sharma & Kaul
3	Building Construction	B C Punmia

Semester: IV

NUMERICAL METHODS
Code: M (CS) 401
Contacts: 2L+1T
Credits: 2

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.   (4)

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.
                                                                                           (5)
Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.
(3)

Numerical solution of a system of linear equations:
Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.
                                                                                           (6)
Numerical solution of Algebraic equation:
 Bisection method, Regula-Falsi method, Newton-Raphson method.   (4)

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.   (6)

Text Books:
1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

References:
1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.

Subject Name : MATHEMATICS

Code: M 402

Contacts: 3L +1T = 4

Credits: 4

Note 1: The entire syllabus has been divided into four modules.
Note 2: Structure of Question Paper
        There will be two groups in the paper:

Group A: Ten questions, each of 2 marks, are to be answered out of a total of 15 questions, covering the entire syllabus.

Group B: Five questions, each carrying 10 marks, are to be answered out of (at least) 8 questions.
  Students should answer at least one question from each module.
  [At least 2 questions should be set from each of Modules II & IV.
   At least 1 question should be set from each of Modules I & III. Sufficient
   questions should be set covering the whole syllabus for alternatives.]

Module I: Fourier Series & Fourier Transform [8L]
Topic: Fourier Series:
Sub-Topics: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave.
(1)
Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period 2l, Dirichlet's conditions, Sum of Fourier series. Examples.   (1)

Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only). Examples. (2)

Topic: Fourier Transform:
Sub-Topics: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. (1)

Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Examples. Fourier Transform of Derivatives. Examples. (1)

Convolution Theorem (statement only), Inverse of Fourier Transform, Examples. (2)

Module II : Calculus of Complex Variable [13L]

Topic: Introduction to Functions of a Complex Variable.

Sub-Topics: Complex functions, Concept of Limit, Continuity and Differentiability. (1)

Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. (1)

Construction of Analytic functions: Milne Thomson method, related problems**.** (1)

Topic: Complex Integration.

Sub-Topics: Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples. (2)

Cauchy's theorem (statement only). Cauchy-Goursat theorem (statement only). Examples. (1)

Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function. Examples. (2)

Taylor's series, Laurent's series. Examples (1)

Topic: Zeros and Singularities of an Analytic Function & Residue Theorem.

Sub-Topics: Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m.
Examples on determination of singularities and their nature. (1)

Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, evaluation of

definite integrals: $\int_0^\infty \frac{\sin x}{x}dx$, $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta+c\sin\theta}$, $\int_C \frac{P(z)}{Q(z)}dz$ (elementary cases, P(z) & Q(z) are

polynomials of 2nd order or less). (2)

Topic: Introduction to Conformal Mapping.

Sub-Topics: Concept of transformation from z-plane to w-plane. Concept of Conformal Mapping. Idea of some standard transformations. Bilinear Transformation and determination of its fixed point. (1)

Module III: Probability [8L]
Topic: Basic Probability Theory
Sub-Topics: Classical definition and its limitations. Axiomatic definition.
Some elementary deduction: i) P(O)=0, ii) 0≤P(A)≤1, iii) P(A')=1-P(A) etc. where the symbols have their usual meanings.
Frequency interpretation of probability. (1)

15

Addition rule for 2 events (proof) & its extension to more than 2 events (statement only). Related problems.
Conditional probability & Independent events. Extension to more than 2 events (pairwise & mutual independence).
Multiplication Rule. Examples. Baye's theorem (statement only) and related problems.
(3)

Topic: Random Variable & Probability Distributions. Expectation.
Sub-Topics: Definition of random variable. Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof). Examples. Definitions of Expectation & Variance, properties & examples.
(2)

Some important discrete distributions: Binomial & Poisson distributions and related problems.
Some important continuous distributions: Uniform, Exponential, Normal distributions and related problems. Determination of Mean & Variance for Binomial, Poisson & Uniform distributions only.

(2)

Module IV: Partial Differential Equation (PDE) and Series solution of
Ordinary Differential Equation (ODE) [13L]

Topic: Basic concepts of PDE.
Sub-Topics: Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transform methods.   (1)

Topic: Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace & Fourier transform methods.

Sub-Topics:
 PDE I: One dimensional Wave equation.   (2)
PDE II: One dimensional Heat equation.   (2)
PDE III: Two dimensional Laplace equation.   (2)

Topic: Introduction to series solution of ODE.

Sub-Topics: Validity of the series solution of an ordinary differential equation.
General method to solve $P_o y''+P_1 y'+P_2 y=0$ and related problems.   (2)
Topic: Bessel's equation.

Sub-Topics: Series solution, Bessel function, recurrence relations of Bessel's
Function of first kind.   (2)
Topic: Legendre's equation.
Sub-Topics: Series solution, Legendre function, recurrence relations and
orthogonality relation.   (2)
TOTAL LECTURES : 42

Text Books:
   2.   Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
   3.   Das N.G.: Statistical Methods, TMH.
   4.   Grewal B S: Higher Engineering Mathematics, Khanna Publishers.
   5.   James G.: Advanced Modern Engineering Mathematics, Pearson Education.
   6.   Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.
References:
   1.   Bhamra K. S.: Partial Differential Equations: An introductory treatment with applications, PHI
   2.   Dutta Debashis: Textbook of Engineering Mathematics, New Age International Publishers.
   3.   Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
   4.   Potter M.C, Goldberg J.L and Aboufadel E.F.: Advanced Engineering Mathematics, OUP.
   5.   Ramana B.V.: Higher Engineering Mathematics, TMH.
   6.   Spiegel M.R. , Lipschutz S., John J.S., and Spellman D., : Complex Variables, TMH.

Fluid Mechanics
Code:CE401
Contact: 3L

Credits: 3

Sl. No	Details of Course Content	Hours	Total
1	Fluid statics: Forces on plane and curved surfaces, Center of pressure. Stability of floating bodies, Metacentre,	4	
2	**Weirs and Notches:** Rectangular, triangular, Cippoletti, sharp crested and broad crested weirs, submerged weirs	3	
3	**Turbulent flow in circular pipes:** Fluid friction in pipes, head loss due to friction. Darcy-Weisbach equation, Variation of friction factor with wall roughness – Moody's chart. Minor losses in pipes	5	
4	**Water Hammer:** Speed of pressure wave, slow and rapid closure, use of surge tank.	3	
5	**Steady uniform flow in open channel:** Characteristics, Chezy's, Manning's and Bazin's formulae. Hydraulically efficient cross sections. Flow through channels of circular cross sections – depths for maximum velocity and discharge.	5	
6	Varied flow through open channel: Gradually varied and rapidly varied flows. Definition, Specific Energy, Critical, Sub-critical and Super-critical flows. Channel transitions - constricted or raised bed. Establishment of critical flow, Venturi flume and Parshall flume. Definition and diagram for Specific force, Hydraulic Jump	10	42
7	Dimensional Analysis and Model studies: Dimensions and dimensional homogeneity, Importance and use of dimensional analysis. Buckingham's Pi theorem with applications. Geometric, Kinematic and Dynamic similarity. Non Dimensional Numbers.	4	
8	**Introduction to Hydraulic Turbines:** Working Principles of Pelton, Francis and Kaplan turbines	3	
9	**Pumps:** Centrifugal pumps, performance characteristic graph – design flow rate. Working principles of positive displacement pumps, gear, reciprocating and vane pumps. Hydraulic Ram	5	

References

Sl. No	Name	Author	Publishers
1	Fluid Mechanics	Modi & Seth	Standard Book House, New Delhi
2	Fluid Mechanics	A.K.Jain	Khanna Publishers, New Delhi
3	Fluid Mechanics & Machinery	H. M. Raghunath	CBS Publishers, New Delhi
4	Fluid Mechanics and Fluid Machines	S. K. Som & G. Biswas	Tata McGraw Hill.
5	Fluid Mechanics, Hydraulics and Fluid Machines	S. Ramamrutham	Dhanpat Rai
6	Basic Fluid Mechanics	C. P. Kothandaraman & R. Rudramoorthy	New Age International
7	Open Channel Hydraulics	Van te Chow	McGraw Hill
8	Fluid Mechanics	John F. Douglas, Gasiorek & Swaffield,	Pearson Education
9	Introduction to Fluid Mechanics	Fox, Pritchand	
10	Fundamental of Fluid Mechanics	Munsen, Young	WIE

STRUCTURAL ANALYSIS
Code: CE402
Contact: 3L + 1 T
Credits: 4

Sl. No	Details of Course Content	Hours	Total
1	Review of basic concept of mechanics: Equilibrium, Free body diagram, Determinate and Indeterminate structures, Degree of indeterminacy for different types of structures: Beams, Frames, Trusses	4	
2	**Analysis of determinate structures**: Portal frames, arches, cables	4	
3	**Strain energy**: Due to axial load, bending and shear, Torsion; Castigliano's theorems, theorem of minimum potential energy, principle of virtual work, Maxwell's theorem of reciprocal deflection, Betti's law	4	
4	**Deflection determinate structures:** Moment area and Conjugate beam method, Energy methods, Unit load method for beams, Deflection of trusses and simple portal frames.	8	

6	**Influence line diagrams**: Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shears.	6	42
6	Analysis of statically Indeterminate beams: Theorem of three moments, Energy methods, Force method (method of consistent deformations) [for analysis of propped cantilever, fixed beams and continuous beams (maximum two degree of indeterminacy) for simple loading cases], Analysis of two-hinged arch.	8	
7	Analysis of statically Indeterminate structures: Moment distribution method - solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway. Slope Deflection Method – Method and application in continuous beams and Frames. Approximate method of analysis of structures: Portal & Cantilever methods	8	

References

Sl. No	Name	Author	Publishers
1	Engineering Mechanics of Solids	By E. P. Popov	Pearson Education
2	Basic structural Analysis	C.S. Reddy	TMH
3	Statically indeterminate structures	C. K. Wang	McGraw-Hill
4	Elastic analysis of structures	Kennedy and Madugula	Harper and Row
5	Structural Analysis (Vol I & Vol II)	S S Bhavikatti	Vikas Publishing House Pvt. Ltd
6	Structural Analysis	Ramammurtham	
7	Structures	Schodek & M. Bechhold	Pearson Education

SOIL MECHANICS
Code:CE403

CONTACT-3L+1T

CREDITS-4

Sl. No	Details of Course Content	Hours	Total
1	Introduction: Origin & formation of Soil: Types, Typical Indian Soil, Fundamental of Soil Structure, Clay Mineralogy	2	
2	**Physical & Index properties of soil**: Weight- Volume Relationships, Insitu Density, Moisture Content, Specific Gravity, Relative Density, Atterberg's Limits, Soil Indices, consistency of soil , Particle Size Distribution of soil: Sieving, Sedimentation Analysis	6	
3	**Identification & Classification of soil**: Field identification of soil, Soil Classification: as per Unified Classification System, IS Code Recommendation, AASHTO Classification	4	
4	**Flow through soil:** Darcy's Law, Coefficient of permeability, laboratory and field determination of coefficient of permeability, Permeability for Stratified Deposits, Laplace's Equations, Flow nets, Flow Through Earthen Dam, Estimation of Seepage, Uplift due to seepage	6	
5	**Effective Stress Principles**: Effective Stress, Effective pressure due to different conditions, Seepage force, Critical hydraulic gradient, Quick sand condition, Design of filters, Capillarity in soil	4	42
6	Stress Distribution In Soil: Normal and shear stresses, Stress due to point loads, Stress beneath Line, strip & uniformly loaded circular area & rectangular area, pressure bulbs, Newmark's charts- Use for determination of stress due to arbitrarily loaded areas b	4	
7	Compaction of soil: Principles of Compaction, IS Light & Heavy Compaction Test, Field Compaction, Various methods of field compaction and control	4	
8	**Compressibility & Consolidation of Soil**: Terzaghi's theory of one dimensional consolidation, Compressibility characteristics of soils: Compression index, Coefficient of compressibility & volume change, Coefficient of consolidation, Degree & rate of consolidation, Laboratory method of one dimensional consolidation test, Determination of consolidation parameters, Secondary consolidation	6	
9	**Shear Strength of Soil**: Basic concepts, Mohr- Columb's Theory, Laboratory Determination of soil shear parameter- Direct Shear, Tri-axial Test, Unconfined Compression, Vane Shear Test, Sensitivity & thixotropy of clay.	6	

References

Sl.	Name	Author	Publishers

No			
1	Principles of Geotechnical Engineering	B. M. Das	Thomson Book Store
2	Text book of Soil Mechanics & Foundation Engineering	V.N.S. Murthy	CBS Publisher's & Distributors
3	Geotechnical Engineering – Principles and Practice	Coduto	Pearson Education
4	Soil Mechanics	Lambe & Whitman.	WIE
5	Basic & Applied Soil Mechanics	Gopal Ranjan & A.S.R.Rao	Willes EasternLtd
6	SP 36 (Part I) Numerical Problems – Geotechnical Engineering	Rao & Venkatramaiah	University Press

Practical

Technical Report Writing & Language Lab Practice
Code: HU481
Cr-2

Guidelines for Course Execution:

Objectives of this Course: This course has been designed:
1. **To inculcate a sense of confidence in the students.**
2. **To help them become good communicators both socially and professionally.**
3. **To assist them to enhance their power of Technical Communication.**

Detailed Course Outlines:
A. *Technical Report Writing* : 2L+6P

1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)

B. *Language Laboratory Practice*

I. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory
Practice Sessions 2L
2. Conversation Practice Sessions: (To be done as real life interactions)
2L+4P
a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed
b) Introducing Role Play & honing over all Communicative Competence
3. Group Discussion Sessions: 2L+6P
a) Teaching Strategies of Group Discussion
b) Introducing Different Models & Topics of Group Discussion
c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure
Interview Sessions; 2L+6P
a) **Training students to face Job Interviews confidently and successfully**
b) **Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication**

4. **Presentation:** 2L+6P
a) **Teaching Presentation as a skill**
b) **Strategies and Standard Practices of Individual /Group Presentation**
c) **Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids**

5. **Competitive Examination:** 2L+2P
a) **Making the students aware of Provincial /National/International Competitive Examinations**
b) **Strategies/Tactics for success in Competitive Examinations**
c) **SWOT Analysis and its Application in fixing Target**

Books – Recommended:
Nira Konar: English Language Laboratory: A Comprehensive Manual

PHI Learning, 2011

D. Sudharani: Advanced Manual for Communication Laboratories &
Technical Report Writing
Pearson Education (W.B. edition), 2011
References:
Adrian Duff et. al. (ed.):   Cambridge Skills for Fluency
A)   Speaking (Levels 1-4 Audio Cassettes/Handbooks)
B)   Listening (Levels 1-4 Audio Cassettes/Handbooks)
Cambridge University Press 1998
Mark Hancock: English Pronunciation in Use
4 Audio Cassettes/CD'S   OUP 2004

NUMERICAL METHODS LAB
Code: M(CS)491
Contact: 2L
Cr:1
1.   Assignments on Newton forward /backward, Lagrange's interpolation.

2.   Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.

3.   Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel

     iterations.

4.   Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.

5.   Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.

6.   Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

Fluid Mechanics Lab

Code: CE491
Contact- 3P
Credits-2
1.   Determination of Orifice co-efficient

2.   Calibration of Orifice meter
3.   Calibration of V- Notch
4.   Measurement of velocity of water in an open channel using a pitot tube
5.   Measurement of water surface profile for flow over Broad crested weir
6.   Preparation of discharge rating curve for a sluice
7.   Measurement of water surface profile for a hydraulic jump
8.   Determination of efficiency of a Centrifugal pump

9.   Determination of efficiency of a Reciprocating pump

10.   Determination of efficiency of a Pelton wheel Turbine

11.   Determination of efficiency of a Francis Turbine

12.   Determination of efficiency of a Hydraulic Ram

Note: Students will have to study the Layout experimental units in the laboratory

Surveying Practice II
Code:CE492
Contact – 3 P
Credits – 2

1.   Traversing by Using Theodolite: Preparation of Gales Table from field data
2.   Traversing by using Total Station
3.   Use of Total Station for leveling and Contouring
4.   Setting out of Simple Curves

Soil Mechanics Lab. – I
Code:CE493
Contact – 3 P
Credits – 2

1. Field identification of different types of soil as per Indian standards [collection of field samples and identifications without laboratory testing], determination of natural moisture content.

2. Determination of specific gravity of i) Cohesionless ii) cohesive soil

3. Determination of Insitu density by core cutter method & sand replacement method.

4. Grain size distribution of cohessionless soil by sieving & finegrained soil by hydrometer analysis.

5. Determination of Atterberg's limits (liquid limit, plastic limit & shrinkage limit).

6. Determination of co- efficient of permeability by constant head pemeameter (coarse grained soil) & variable head parameter (fine grained soil).

7. Determination of compaction characteristics of soil.

References:

1. Soil Testing by T.W. Lamb (John willey)

2. 2. SP-36 (Part I- & Part – II)

3. Soil Mechanics Laboratory Manual by Braja Mohan Das, OXFORD UNIVERSITY PRESS

4. Measurement of Engineering properties of soil by E Saibaba Reddy & K. Rama Sastri. (New age International publication.

SEMESTER - V
Theory

Economics for Engineers
HU-501
Contracts: 3L
Credits- 3

Module-I
1. Economic Decisions Making – Overview, Problems, Role, Decision making process.
2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.

Module-II
3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.
4. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.

Module-III
5. Inflation And Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.
6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.
7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.

Module-IV
8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.
9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.
10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct   and   Indirect   Costs,   Indirect   Cost   Allocation.

Readings
1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

The hours allotted are lecture hours, the tutorial classes should be held accordingly to contact hours allotted subject wise
FOUNDATION ENGINEERING
Code: CE501
Contact: 3L + 1T
Credits: 4

Sl.No	Details of Course Content	Hours	Total
1	**Earth pressure theories**: Plastic equilibrium of soil, Earth pressure at rest, Active & passive earth pressure, Rankine's & Coulomb's earth pressure theories, wedge method of analysis, estimation of earth pressure by graphical construction (Culmann Method).	4	
2	**Retaining wall & sheet pile structures**: Proportions of retaining walls, stability checks, cantilever and anchored sheet piles, free earth and fixed earth method of analysis of anchored bulk heads	6	
	Stability of slopes: Analysis of finite and infinite slopes, Swedish And friction circle		

3	method, Taylor's stability number, Bishop's method of stability analysis	4	36 + 12 for tutorial
4	**Site investigation & soil exploration**: Planning of sub-surface exploration, methods, sampling, samples, Insitu tests: SPT, SCPT, DCPT, Field vane shear, Plate load test	6	
5	**Shallow foundations** : Safe bearing capacity, Terzaghi's bearing capacity theory, effect of depth of embedment, water table, eccentricity of load, foundation shape on bearing capacity, Bearing capacity as per 1S 6403.	6	
6	**Settlement analysis of shallow foundation**: Immediate and consolidation settlement, correction for rigidity and dimensional effects, settlement in various types of soil, IS-1904 and 8009 recommendations, Allowable bearing capacity	4	
7	**Deep foundations**: Pile: Types, load transfer mechanism, Determination of load carrying capacities of piles by static and Dynamic formulae, Recommendations of IS 2911, Pile group: Group efficiency, Negative skin friction, pile load test	6	

Text & References

Sl. No	Name	Author	Publishers
1	Principles of Geotechnical Engineering	B.M. Das	Thomson
2	Principles of soil Mechanics & Foundation Engineering	VNS Moorthy	UBS Publication
3	Principles of Foundation Engineering	B.M. Das	Thomson
4	Foundation Analysis & Design	J.E. Bowels	Mc Graw Hill
5	Basic & Applied Soil Mechanics	Gopal Ranjan & A.S.R. Rao	Wiley Eastern Ltd
6	SP-36 (Part-I & Part-II)		
7	Relevant latest IS Codes (IS 6403, IS 1904, IS 8009, IS 2911)	Bureau of Indian Standard	

DESIGN OF RC STRUCTURES
Code: CE502
Contact: 3L + 1T
Credits: 4

Sl.No	Details of Course Content	Hours	Total
1	Introduction: Principles of design of reinforced concrete members - Working stress and Limit State method of design	2	
2	Working stress method of design: Basic concepts and IS code provisions (IS: 456 2000)for design against bending moment and shear forces - Balanced, under reinforced and over-reinforced beam/ slab sections; design of singly and doubly reinforced sections	5	
3	Limit state method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces; concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP:16).	5	
4	Analysis, design and detailing of singly reinforced rectangular, 'T', 'L' and doubly reinforced beam sections by limit state method.	5	36 + 12 for tutorial
5	Design and detailing of one-way and two-way slab panels as per IS code provisions	6	
6	Design and detailing of continuous beams and slabs as per IS code provisions	3	
7	Staircases: Types; Design and detailing of reinforced concrete doglegged staircase	3	
8	Design and detailing of reinforced concrete short columns of rectangular and circular cross-sections under axial load. Design of short columns subjected to axial load with moments (uniaxial and biaxial bending) – using SP 16.	3	
9	Shallow foundations: Types; Design and detailing of reinforced concrete isolated square and rectangular footing for columns as per IS code provisions by limit state method	4	

- **Limit state method should be followed for serial number 4 to 9 as above as per IS 456 - 2000**

Text & References

Sl. No	Name	Author	Publishers
1	IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice"	Bureau of Indian Standard	
2	SP:16 Design Aid to IS 456		

3	Reinforced Concrete Design by	Pillai and Menon	TMH
4	Reinforced concrete Limit state design	Ashok K. Jain	
5	Reinforced concrete	S.N.Sinha	TMH
6	Fundamentals of reinforced concrete		S.Chand &Co
		N.C.Sinha and S.K. Roy	
7.	Limit State Design of Reinforced Concrete		
		P. C. Varghese	PHI
8.	Reinforced Concrete		
		S. K. Mallick and A. P. Gupta	Oxford IBH

CONCRETE TECHNOLOGY
Code: CE503
Contact: 3L
Credits: 3

Sl.No	Details of Course Content	Hours	Total
1	Concrete as a Structural Material, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration and Strength, Tests on Cement and Cement Paste – fineness, consistency, setting time, soundness, strength Quality of Water – Mixing Water, Curing Water, Harmful Contents	6	
2	Types of Portland Cement – ordinary, Rapid hardening, low-heat, sulphate resisting, Portland slag, Portland pozzolana, super sulphated cement, white cement	4	
3	Aggregates – Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction, Sieve Analysis, Grading Curves, Fineness modules, Grading Requirements. Testing of Aggregates – Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value	8	
4	Properties of Fresh Concrete – Workability, Factors Affecting Workability, Slump Test Compacting Factor Test, Flow Table Test, Segregation, Bleeding, Setting Time, Mixing and Vibration of Concrete, Mixers and Vibrators, Curing methods, Maturity.	6	36
5	Strength of Concrete – Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress Strain Relation and Modulus of Elasticity, Poisson's Ratio, Shrinkage and Creep, Compression Test on Cubes, Cylinders, Introduction to Non-Destructive Tests (Rebound hammer & Ultrasonic pulse velocity)	6	
6	Admixtures – different types, effects, uses, Retarders and Super plasticizers. Mix Design by I.S. 20262 (2009). Light-weight, Polymer and Fibre-reinforced concrete	6	

Text & References

Sl. No	Name	Author	Publishers
1	Concrete Technology	Neville	Pearson Education
2	Concrete Technology	M.S. Shetty	S.Chand
3	Concrete Technology	A. R. Santakumar	OXFORD University Press
4	Concrete Technology	M.L. Gambhir	Tata McGraw Hill
5	Text book of Concrete Technology	P.D. Kulkarni	Tata McGraw Hill

Engineering Geology

CE-504
Contracts: 3L
Credits- 3

Module no.	Topic	Hrs
1.	Geology and its importance in Civil Engineering.	2
2.	Mineralogy: Definition, internal and external structure of minerals, study of crystals, Classification and physical properties of minerals.	3
3.	Classification of rocks: Igneous rocks: Origin, mode of occurrence, forms & texture, classification and engineering importance. Sedimentary rocks: Process of sedimentation, classification and engineering importance. Metamorphic rocks: Agents and types of metamorphism, classification and engineering importance.	4
4.	Weathering of rocks: Agents and kinds of weathering, soil formation & classification based on origin.	2
5.	Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition.	1
6.	Structural geology: Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints, importance of geological structures in Civil Engineering.	4
7.	Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercelli's intensity scale and Richter's scale of magnitude.	3
8.	Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strength and abrasive resistance.	3
9.	Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing.	3
10.	Geophysical exploration: Methods of Geophysical Exploration, electrical resistivity method field procedure – sounding and profiling, electrode configuration, and interpretation of resistivity data. Geophysical surveys in ground water and other Civil Engg. Projects.	4
11.	Applied Geology: Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations.	4
12.	Landslides: Types of landslides, causes, effects and prevention of landslides.	3

Text & References

Sl. No	Name	Author	Publishers
1	Engineering and General Geology	Parvin Singh	Katson publishing house Delhi 1987
2	Engineering Geology for Civil Engineers	D. Venkat Reddy,	Oxford, IBH, 1995.
3	Principles of petrology	Tyrell	Asia, Bombay
4	Structural Geology	Marland P. Billings	Wiley eastern Prentice-Hall, U.S.A.
5	Ground Water hydrology	Todd D.K.	John Wiley & Sons, Second edition, 1980.

Practical

Soil Mechanics Lab.-II
Code-CE591
Contact: 3P
Credit –2

Determination of compressibility characteristics of soil by Oedometer test (co-efficient of consolidation & compression Index)
Determination of unconfined compressive strength of soil
Determination of Shear parameter of soil by Direct shear test
Determination of undrained shear strength of soil by Vane shear test.
Determination of shear parameter of soil by Triaxial test (UU)
Standard Penetration Test
Expt No. 6 by large groups in the field.

References

1.   Soil testing by T.W. Lamb (John Willey)
2.   SP-36 (Part-I & Part –II)
3.   Soil Mechanics Laboratory Manual by B. M. Das, OXFORD UNIVERSITY PRESS
4.   Measurement of engineering properties of soil by E.Jaibaba Reddy & K. Ramasastri.

CONCRETE LABORATORY

Code CE 592
Contact: 3P
Credits: 2

1.   Tests on cement – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes
2.   Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modules, moisture content , bulk density and deleterious materials.
3.   Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
4.   Tests on Fresh Concrete: Workability : Slump, Vee-Bee, Compaction factor tests
5.   Hardened Concrete: Compressive strength on Cubes, Split tensile strength, Static modulus of elasticity, Flexure tests , Non destructive testing (Rebound hammer & Ultrasonic pulse velocity)
6.   Mix Design of Concrete.

References:

1.   Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009), SP23]
2.   Laboratory manual of concrete testing by V.V. Sastry and M. L. Gambhir

Quantity Surveying, Specification and Valuation
Code-CE593
Contact: 3P
Credits- 2

Quantity Surveying: Types of estimates, approximate estimates, items of work, unit of measurement, unit rate of payment.

Quantity estimate of a single storied building
Bar bending schedule.
Details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities.

Estimate of quantities of road, Underground reservoir, Surface drain, Septic tank.

Analysis and schedule of rates: Earthwork, brick flat soling, DPC, PCC and RCC, brick work, plastering, flooring and finishing,
Specification of materials: Brick, cement, fine and coarse aggregates
Specification of works: Plain cement concrete, reinforced cement concrete, first class brickwork, cement plastering, pointing, white washing, colour washing, distempering, lime punning, painting and varnishing

Valuation: Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalised value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table .

References:

1. Estimating, costing, Specification and Valuation in Civil Engineering by M..Chakroborty
2. Estimating and Costing in Civil Engineering" by B.N.Dutta, USB Publishers & Distributers
3. Civil Estimating, Costing and Valuation by Agarwal / Upadhay

Engineering Geology Lab
Code-CE593
Contact: 3P
Credits- 2

Serial No	Experiment on
1.	Study of crystals with the help of crystal models
2.	Identification of Rocks and Minerals [Hand Specimens]
3.	Microscopic study of Rocks and minerals
4.	Study of Geological maps, interpretation of geological structures Thickness problems, Bore-hole Problems

Syllabus for B.Tech(Civil Engineering) Up to Third Year

Revised Syllabus of B.Tech CE (for the students who were admitted in Academic Session 2010-2011)

Theory

Principles of Management
Code: HU601
Contact: 2L
Credits: 2
Module-I

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.

Module-II

3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module-III

6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.

Module-IV

9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Readings:

1. Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management – Stoner, James A. F. (Pearson)
4. Management - Ghuman, Tata McGraw Hill(TMH)

Highway & Transportation Engineering
Code: CE601
Contact: 3L
Credits: 3

Sl.No	Details of Course Content	Hours	Total
1	**Introduction to Highway Engineering**: Scope of highway engineering; Jayakar Committee Report; saturation system; highway financing ('pay as you go method and credit financing method) and highway economics (quantifiable and non quantifiable benefits to highway users, cost of vehicle operation, annual cost method, and benefit-cost ratio method)	2	
2	**Highway Alignment: Requirements**: factors controlling alignment; engineering surveys for highway alignment and location.	2	36
3	**Highway Geometric Design**: Cross-sectional elements; design speed, passing and non-passing sight distances; PIEV theory, requirements and design principles of horizontal alignment including radius of curvature, super elevation, extra-widening, design of transition curves, curve resistance, set back distance, grade compensation and vertical alignment.	12	
4	**Pavement design**: Evaluation of soil subgrade, sub-base, base and wearing courses; design factors for pavement thickness (including design wheel load and ESWL, strength of pavement materials and plate load tests, and effect of climatic variations) Group Index and CBR, IRC method of flexible pavement design; Westergaards analysis of wheel load stresses in rigid pavements; frictional stresses and warping stresses; IRC recommendations for design of rigid pavements;	8	

	design of expansion and contraction joints. Benkelmen Beam Test, Fialure of flexible and rigid pavements.		
5	**Pavement construction Technique**: Types of pavement; construction of earth roads, gravel roads, WBM, bitumen and cement concrete roads; joints in cement concrete pavements.	4	
6	**Traffic Engineering**: Traffic characteristics, theory of traffic flow, intersection design, traffic sign and signal design, highway capacity	8	
7	**Road Materials and Testing** : Soil, Stone Aggregate, Bitumen, Marshal Stability Test	**	

** To be covered in CE 691 (Highway and Transportation Engineering Lab)

Text & References

Sl.No	Name	Author	Publishers
1	High Way Engineering	Khanna& Justo	Nemchand& Brothers, Roorkee
2	Principles of Transportation Engineering	P. Chakraborty& A. Das	PHI
3	Transportation Engineering-	C.J Khisty& B.K Lall.	
4	I.S Specifications on Concrete , Aggregate & Bitumen	Bureau of Indian Standard	
5	Relevant latest IRC Codes (IRC-37 – 2001, IRC 58 – 2002, IRC 73 - 1980, IRC 86 - - 1983, IRC 106 – 1990, IRC 64 – 1990, IRC 15- 2002	Indian Road Congress	

Design of Steel structure
Code: CE602
Contact: 3L
Credits: 3

Sl. No	Details of Course Content	Hours	Total
1	Materials and Specification :-Rolled steel section, types of structural steel , specifications	2	
2	Structure connections: Riveted, welded and bolted including High strength friction grip bolted joints. – types of riveted & bolted joints, assumptions, failure of joints ,efficiency of joints, design of bolted ,riveted & welded joints for axial load. ii) Eccentric connection:- Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection.	8	
3	Tension members: Design of tension members, I.S code provisions. Permissible stresses, Design rules, Examples.	3	
4	Compression members: Effective lengths about major & minor principal axes, I.S code provisions. Permissible stresses, Design rules, Design of one component, two components and built up compression members under axial load. Examples. Built up columns under eccentric loading: Design of lacing and batten plates, Different types of Column Bases- Slab Base , Gusseted Base, Connection details	8	36
5	Beams: Permissible stresses in bending, compression and tension. Design of rolled steel sections, plated beams. simple Beam end connections, beam -Column connections. I.S code provisions	4	
6	Plate girders: Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded& bolted.	6	
7	Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions.	5	

Text & References:

Sl. No	Name	Author	Publishers
1	Design of Steel structures	N. Subramanian	Oxford University Press
2	Design Of Steel Structures -	S.K.Duggal	Tata Mc-Graw Hill , New Delhi New Delhi
3	Design of steel structures	A.S.Arya and J.L.Ajmani	Nemchand& Bros.,

4	Design of steel structures, Vol. I & II	Ramachandra	
5	Design of steel structures	PasalaDayaratnam –	A.H.Wheeler& Co Ltd. 1990
6	Design of steel structures	B.S.Krishnamachar and D.AjithaSinha –	Tata McGraw – Hill publishing Co. Delhi.
7	Design of steel structures	Ramamurtham	
8	IS 800 – 2007(Latest Revised code)	Bureau of Indian Standard	
9	S.P.: 6(1) – 1964 Structural Steel Sections	Bureau of Indian Standard	

Construction Planning &Management
Code :–CE603
Contact : 3L
Credits : 3

Sl. No	Details of Course Content	Hours	Total
1	**Planning**: General consideration, Definition of aspect, prospect, roominess, grouping, circulation privacy, acclusion	2	
2	**Regulation and Bye laws** : Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks , ventilation, Requirements for stairs, lifts in public assembly building, offices	4	
3	**Fire Protection**: Fire fighting arrangements in public assembly buildings, planning , offices, auditorium	2	
4	**Construction plants & Equipment**: Plants & equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants &Equipment for concrete construction: Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control	8	36
5	**Planning &Scheduling of constructions Projects:** Planning by CPM &PERT,Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration .expected mean time , probability of completion of project, Estimation of critical path, problems.	8	
6	**Management**: Professional practice, Defination, Rights and responsibilities of owner, engineer, Contractors, types of contract	4	
7	**Departmental Procedures:** Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbritation	8	

* Serial 1, 2, 3 are as per National Building Code
Text & References:

Sl. No	Name	Author	Publishers
1	Construction Planning, Equipments and methods	Puerifoy, R.L.	McGraw Hill.
2	Management in construction industry	P.P.Dharwadkar	Oxford and IBH Publishing company New Delhi
3	Construction Management, Critical path Methods in Construction,	J.O.Brien	Wiley Interscience
4	PERT and CPM	L.S. Srinath	
5	Project planning and control with PERT and CPM' Construction equipments and its management	B.C.Punmia and K.K.Kandelwal S.C.Sharma	
6	National Building code	BIS	

Syllabus for B.Tech(Civil Engineering) Up to Third Year
Revised Syllabus of B.Tech CE (for the students who were admitted in Academic Session 2010-2011)

Professional Elective

Bridge Engineering
Code : CE 604A
Contact : 3L
Credits :3

Sl. No	Details of Course Content	Hours	Total
1	**Introduction, -** Definition and Basic Forms, Component of bridge, classification of bridge, short history of bridge development. I.R.C Loads. Analysis of IRC Loads, Impact factors, Other loads to be considered, Importance of Hydraulic factors in Bridge Design.	4	
2	**Reinforced concrete solid slab bridge**: Introduction, General design features, Effective width method. Simply supported and cantilever Slab Bridge, analysis and design	8	
3	**Box Culvert:** Introduction, Design method and Design example	2	
4	**Beam and Slab Bridges** Introduction, Design of interior panel of slab. Pigeauds method, Design of longitudinal girder, Calculation of longitudinal moment, design example.	6	36
5	**Balanced Cantilever Bridges:** General Features, Arrangement of supports, design features Articulation, Design example.	5	
6	**Steel Bridges:** General features, types of stress, Design example.	3	
7	**Plate Girder Bridge**: Elements, design, lateral bracing, Box- girder Bridges.	3	
8	**Composite Bridges:** General aspects, method of construction, analysis of composite section, shear connectors, design of composite beam.	3	
9	**Cable Stayed Bridge:** General features, Philosophy of design.	2	

References:

Sl. No	Name	Author	Publishers
1	Principle & Practice of Bridge Engineering	S.P. Bindra–	DhanpatRai Pub
2	Essentials of bridge engineering	D.J. Victor	
3	Bridge engineering	Ponnuswamy	
4	Design of Bridge Structures	T.R. Jagadesh, M.A. Jayaram	
5	Bridge engineering	by Krishnaraju	
6	Design of concrete bridges	by Aswani, Vizirani , Ratwani	
7	Design of steel structures	Arya&Ajmani	
8	Concrete Structures	Vaziram&Ratwani	
9	Structures design and drawing	Krishnamurthy	
10	Relevant IS & IRC codes		

Prestressed Concrete
Code : CE604B
Contact :– 3L
Credits :3

Sl. No	Details of Course Content	Hours	Total
1	**Introduction of Prestressed concrete**: Materials, prestressing system, analysis of prestress and bending stress, losses. Shear and torsional resistance: design of shear reinforcement, design of reinforcement for torsion shear and bending. Deflections of prestressed concrete members: Importance, factors, short term and long term deflection	7	
2	**Limit state design criteria**: Inadequacy of elasticand ultimate load method, criteria for limit states, strength and serviceability. Design of sections for flexure: methods by Lin and Magnel	6	36
3	**Anchorage Zone stresses in post tensioned members**: Stress distribution in end block, anchorage zone reinforcement	5	
4	**Composite construction of prestressed and in-situ concrete**: Types, analysis of stresses. **Statically Indeterminate structures**: advantages of continuous member, effect of prestressing, methods of achieving continuity and method of analysis of secondary moments	8	
5	**Prestressed concrete poles and sleepers**: Design of sections for compression and bending	5	

31

6	**Partial prestressing and non prestressed reinforcement**	5	

References:

Sl. No	Name	Author	Publishers
1	Prestressed Concrete, Fourth Edition,	N Krishna Raju	McGraw Hill
2	Design of Prestressed Structures,	T.Y.Lin and N.H.Burns,	Wiley Eastern Ltd
3	Fundamentals of Prestressed Concrete,	N.C.Sinha and S.K.Roy	
4	Prestressed Concrete,	S.Ramamurthan	

Structural Dynamics & Earthquake Engineering
Code :CE 604C
Contact : 3L
Credits : 3

Sl. No	Details of Course Content	Hours	Total
1	**Theory of vibrations**: Degrees of freedom, Undamped single degree freedom system, Damped single degree freedom system, Natural frequency, modes of vibration, Introduction to multiple degree freedom system	6	
2	**Response of single degree freedom system due to harmonic loading**: Undamped harmonic excitation, Damped Harmonic excitation	8	
3	**Response due to Transient loading**: Duhamel's Integral, Response due to constant force, Rectangular load, Introduction to numerical evaluation of Duhamel's integral of undamped system.	6	
4	**Elements of seismology**: Fundamentals: Elastic rebound theory, Plate tectonics, Definitions of magnitude, Intensity, Epicenter etc., Seismographs, Seismic zoning, Response of Simple Structural Systems	4	
5	**Principles of earthquake resistant design**: Terminology, General principles and Design criteria, Methods of Analysis, Equivalent lateral force method of Analysis for multistoried building as per Indian Standard Code of Practice, Introduction to Response Spectrum Method, Fundamental concepts of Ductile detailing	12	36

References:

Sl. No	Name	Author	Publishers
1	Structural Dynamics (Theory and Computation)	Mario Paz.	CBS Publishers and Distributor
2	Dynamics of Structure (Theory and Application to Earthquake Engineering)	A.K.Chopra	Pearson Education
3	Elements of Eathquake Engineering	Jai Krishna, A. R. Chandrashekhar and Brijesh Chandra	South Asian Publishers
4	Earthquake Resistant Design	D. J. Dowrick	John Willey & Sons
5	IS 1893 (Part 1): 2002, IS 3920, IS 4326	--------	Bureau of Indian Standard

Free Elective

Operation Research
CE605A
Contact: 3L
Credits: 3

Module I

Linear Programming Problems (LPP):

Basic LPP and Applications; Various Components of LP Problem Formulation.

Solution of Linear Programming Problems:
Solution of LPP: Using Simultaneous Equations and Graphical Method;
Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples.   **5L**
Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory.Transportation Problems and Assignment Problems.   **12L**

Module II

Network Analysis:
Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded).   **6L**

Inventory Control:
Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.
                                                                                        3L

Module III

Game Theory:
Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.
                                                5L

Module IV

Queuing Theory:
Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems.
                                                5L

Text Books:

1.   H. A. Taha, "Operations Research", Pearson
2.   P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3.   Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4.   Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA

References:

1.   KantiSwaroop — "Operations Research", Sultan Chand & Sons
2.   Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI
3.   R. Panneerselvam - "Operations Research", PHI
4.   A.M. Natarajan, P. Balasubramani and A. Tamilarasi - "Operations Research", Pearson
5.   M. V. Durga Prasad – "Operations Research", CENGAGE Learning
6.   J. K. Sharma - "Operations Research", Macmillan Publishing Company

Human Resource Management (HSS)
CE605B
Contact: 3L
Credits: 3

Introduction : HR Role and Functions, Concept and Significance of HR, Changing role of HR managers - HR functions and Global Environment, role of a HR Manager.

Human Resources Planning : HR Planning and Recruitment: Planning Process - planning at different levels - Job Analysis - Recruitment and selection processes - Restructuring strategies - Recruitment-Sources of Recruitment-Selection Process- Placement and Induction-Retention of Employees.

Training and Development : need for skill upgradation - Assessment of training needs - Retraining and Redeployment methods and techniques of training employees and executives - performance appraisal systems.
Performance Management System : Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating

Errors-Competency management.

Industrial Relations : Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management.
Case study.

Books :
1. Gary Dessler, Human Resource Management - (8th ed.,) Pearson Education, Delhi

2.Decenzo& Robbins, Personnel / Human Resource Management, 3rd ed., John Wiley & Sons (Pvt.) Ltd.
3. BiswajeetPatanayak, Human Resource Management, PHI, New Delhi
4. Luis R. Gomez, Mejia, Balkin and Cardy, Managing Human Resources PHI, New Delhi.

Materials Handling
CE605C
Contacts: 3L
Credits- 3

Module	Syllabus	Contact Hrs
1.	**Introduction:** Definition, importance and scope of materials handling (MH); classification of materials; codification of bulk materials ; utility of following principles of MH – (i) materials flow, (ii) simplification, (iii) gravity, (iv) space utilization, (v) unit size, (vi) safety, (vii) standardization, (viii) dead-weight, (ix) idle time, (x) motion.	4
2A.	**Unit load:** Definition; advantages & disadvantages of unitization; unitization by use of platform, container, rack, sheet, bag and self contained unit load; descriptive specification and use of pallets, skids, containers, boxes, crates and cartons; shrink and stretch wrapping.	3
2B	**Classification of MH Equipment :** Types of equipment – (i) industrial trucks & vehicles, (ii) conveyors, (iii) hoisting equipment, (iv) robotic handling system and (v) auxiliary equipment; Independent equipment wise sub classification of each of above type of equipment.	3
3.	**Industrial trucks & vehicles :** Constructional features and use of the following equipment – (i) wheeled hand truck, (ii) hand pallet truck, (iii) fork lift truck; Major specifications, capacity rating and attachments of fork lift truck.	5
4.	**Conveyors :** Use and characteristics of belt conveyor, constructional features of flat and troughed belt conveyor; Use and constructional features of Flg. types of chain conveyors – (i) apron, car and trolley type; Construction of link-plate chains; Dynamic phenomena in chain drive; Use and constructional features of roller conveyors; Gravity and powered roller conveyor; Pneumatic conveyor-use and advantages; Positive, negative and combination system of pneumatic conveyors; constructional feature, application and conveying capacity of screw conveyor.	8
5.	**Hoisting Equipment :** Advantage of using steel wire rope over chain; constructional features of wire ropes; Rope drum design; Pulley system-simple vs. multiple pulley; Load handling attachments : hooks, grabs, tongs, grab bucket; Arrangement of hook suspension with cross piece and pulleys (sheaves); Use and constructional features of (i) hand operated trolley hoist , (ii) winch; (iii) bucket elevator, (iv) Jib crane, (v) overhead traveling crane and (vi) wharf crane; Level luffing system of a wharf crane; Utility of truck mounted and crawler crane.	8
6A.	**Robotic handling :** Materials handling at workplace; Major components of a robot; Applications of robotic handling.	2
6B.	**Auxiliary Equipment :** Descriptive specification and use of – (i) Slide and trough gates, (ii) belt, screw and vibratory feeders, (iii) Chutes, (iv) positioners like elevating platform, ramps, universal vise; (v) ball table.	3

Books Recommended :
1. S. Ray, Introduction to Materials Handling, New Age Int. Pub.
2. T. K. Ray, Mechanical Handling of Materials, Asian Books Pvt. Ltd.
3. T.H. Allegri, Materials Handling: Principles and Practices, CBS Publishers and Distributors.
4. J.A. Apple, Material Handling System Design, John Wiley & Sons.

Practical

Highway Engineering Lab.
Code :CE691

Contact: 3P
Credits :2

Tests on highway materials – Aggregates- Impact value, Los-Angeles Abrasion value water absorption , Elongation & Flakiness Index.
Bitumen & bituminous materials: Specific gravity, penetration value, softening point, loss on heating, Flash & Fire point test.
Stripping value test
Design of B.C. & S.D.B.C. Mix
CBR Test
Marshal Stability Test
Benkelman beam Test.
References:
BIS codes on Aggregates & Bituminous materials
Highway material testing(Laboratory Manual)by S.K. Khanna and CE.G. Justo
Relevant IS & I.R.C. codes.

Detailing of RCC & steel structures
Code : CE692
Contact :3P
Credits: 2

RCC structures
General considerations: Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provision.

Design & detailing of a i) simply supported R.C.C Beam ii) Continuous T- Beam.

Design & Detailing of columns, isolated and combined footing

Design & detailing of a i) simply supported one way slabii) One way Continuous slab.

Design of different units: Slab, beam column, roofing and staircase from floor plan of a multistoried frame building, typical detailing of a two way floor slab.

Steel structures
Problems on general consideration and basic concepts
Discussion on different loads (i.e. wind load, Dead load, live load and others) as per IS875
Design & drawing of the following components of a roof truss:
1. Members of the roof truss.
2. Joints of the roof truss members
3. Purlins
4. Gable bracings
5. Column with bracings
6. Column base plate
7. Column foundation
References:
  I.S- 456-2000, SP 34, SP 16,I.S. 875, I.S. Code 800 – 2007, Standard text books on RCC & Steel Design

CAD Laboratory
Code CE: 693
Contact 3P
Credits: – 2
Introduction and important features ofa software dealing with analysis and design of structures

Analysis and design of a multistoried building using software, Preparation of detailed drawings of different structural elements including ductility detailing
RCC Slab, beam, column and footing design.

VII SEMESTER SYLLABUS

Environmental Engineering
Code – CE 701
Contact – 3L
Credits- 3

Module	Broad Topic	Details of Course Content	Hours	Total
1	Water Demand	Water demands; Per capita demand; Variations in demand; Factors affecting demand;Design period; Population forecasting	3	
2	Sources of Water	Surface water sources; ground water sources	2	
3	Water Quality	Impurities in water; Water quality parameters; Standards for potable water	2	
4	Conveyance of water	Hydraulic design of pressurepipes	2	
5	Water Treatment	Typical flow chart for surface and ground water treatments; Aeration, Plain sedimentation, Sedimentation with coagulation, Water Softening, Filtration,Disinfection.	8	
6	Water Distribution	Analysis of distribution network;Storage and distribution reservoirs; Capacity of reservoirs	4	36
7	Sewage and Drainage	Definition of Common Terms, Quantity estimation for sanitary sewage and storm sewage	3	
8	Sewer Design	Hydraulic design of sewers, Partial flow diagrams and Nomograms	3	
9	Wastewater Characteristics	Physical, chemical and biological characteristics, DO, BOD and COD	3	
10	Wastewater Treatment	Typical flow chart for wastewater treatment; Primary Treatments; Secondary Treatments: Activated Sludge Process, Trickling Filter Process, Septic Tank	6	

References:

Sl. No	Name	Author	Publishers
1	Environmental Engineering,	S.K .Garg,	Khanna Publishers
2	Water Supply, Waste Disposal and Environmental Pollution Engineering, ,	A.K.Chatterjee	Khanna Publishers.
3	Environmental Engineering, Vol.II,	P. N. Modi,	
4	Environmental Modelling, ,	Rajagopalan	Oxford University Press.
5	Environmental Engineering	P. V. Rowe	TMH

Water Resource Engineering
Code – CE 702
Contact – 3L
Credits- 3

Module	Details of Course Content	Hours	Total
1	Catchment area and Hydrologic cycle, Measurement of rainfall – Rain gauges, Estimation of missing rainfall data, checking of consistency, Optimum number of Rain gauges. Calculation of average rainfall over area – different methods, Frequency analysis of rainfall intensity duration curve. Rainfall mass curve, hyetograph, Examples	4	
2	Evaporation, evapo-transpiration and infiltration: Processes, Factors affecting run off, estimation of run-off, rainfall run off relationship	4	
3	Stream flow measurement: Direct and indirect methods, Examples. Stage-discharge relationships	4	
4	Hydrographs; characteristics: Base flow separation. Unit Hydrographs. Derivation of unit hydrographs, S-curve, flood routing.	4	
5	Types of Irrigation systems, methods of irrigation: Water requirements of crops: Crop period or Base period, Duty & Delta of a crop, relation between Duty & Delta, Duty at various places, flow Duty & quantity Duty, factors affecting Duty, measures for improving Duty of water, crop seasons	4	
6	Canal Irrigation: Introduction, classification of irrigation canals, Efficient section, certain important definitions, Time factor, Capacity factor, full supply co-efficient, Nominal duty, Channel losses, Examples.	2	36
7	Design of unlined alluvial channels by silt Theories: Introduction, Kennedy's theory, procedure for design of channel by Kennedy's method, Lacey's theory, concept of True regime Initial regime and final regime, design procedure using Lacey's theory, examples	4	
8	Water logging and drainage: Causes, effects and prevention of waterlogging. Type of drains-open drains and closed drains (introduction only), Discharge and spacing of closed drains. Examples. Lining of Irrigation Canals : Objectives, advantages and disadvantages of canal lining, economics and requirements of canal lining, Design of lined Canals-examples	6	
9	Introduction to ground water flow, Darcy law; Wells: Definition, Types-open well or Dug well, Tube well, open well-shallow open well, deep open well, cavity formation in open wells, construction of open wells, Yield of an open well – Equilibrium pumping test, Recuperating test, examples, Tube wells - Strainer type, cavity type, slotted type. Examples.	4	

References

Sl. No	Name	Author	Publishers
1	Engineering Hydrology	K. Subramanya	Tata McGraw-Hill
2	A Text Book of Hydrology-	P. Jaya Ram Reddy	Laxmi Publications-New Delhi
3	Hydrology & Water Resource Engineering-	S.K Garg	Khanna Publishers.
4	Hydrology Principles, Analysis and Design	H. M. Raghunath.	.
5	Hydraulics of Groundwater	J. Bear	McGraw-Hill
6	Water Resources Engineering Through Objective Questions	K. Subramanya	Tata McGraw-Hill
7	Irrigation & Water Power Engineering-	B.C Purnia, S Pande-	Standard Publication-New Delhi.
8	Irrigation Engineering	G.L Aswa	Wiley Eastern-New Delhi
9	Irrigation, Water Resource & Water Power Enginee ring-.	Dr. P.N Modi-	Standard Book House-New Delhi

Professional Elective II

Advanced Foundation Engineering
Code – CE 703A
Contact – 3L
Credits- 3

Module	Details of Course Content	Hours	Total
1	**Soil Exploration and Site Investigation** Planning of soil exploration programme, Field testing, Preparation of bore-log and soil investigation report Geo-physical exploration: Seismic refraction survey electrical resistively method	4	
2	**Shallow Foundations** Bearing Capacity from SPT and SCPT and Plate load Test data, Proportioning of footing based on settlement criteria. Beams on elastic foundation: Infinite beam, Finite beam, Modulus of sub-grade reaction and effecting parameters. Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950.	10	
3	**Deep Foundations** Pile: Tension piles, Laterally loaded piles: Elastic continuum approach, Ultimate load Analysis, Deflection and maximum moment as per IS 2911, Pile load test Drilled Shaft: Construction procedures, Design Considerations, Load Carrying Capacity and settlement analysis Caissons: Types, Sinking and control.	8	36
4	**Retaining walls and sheet pile structures** Gravity, cantilever and counter fort retaining walls: Stability checks and design Sheet Pile Structures: Cantilever sheet piling, Anchored sheet piling: Free and fixed earth support methods of Analysis, Braced Excavation	8	
5	**Design of foundation for vibration control** Elements of vibration theory, Soil- springs and damping constants, dynamic soil parameters, Types of Machine foundations, General consideration in designing dynamic bases.	4	
6	**Foundations on expansive soils**: Problems and Remedies	2	

References:

Sl. NO	Name	Author	Publishers
1	Foundation Analysis & Design	J.E. Bowels	McGraw Hill
2	Principles of Foundation Engineering	B.M. Das	Thomson Book
3	Foundation Design Manual	N. V. Nayak	Dhanpat Rai Publication Pvt. Ltd
4	Foundations for Machines: Analysis and design	ShamsherPrakash, Vijay K Puri	Wiley Series in Geotechnical Engineering
5	Advance Foundation Engineering	N. Som& S. C. Das	
6	Hand Book of Machine Foundation	P. Sirinivashalu& C.V. Vaiddyanathan	Tata McGraw Hill
7	IS –1904, 6403, 8009, 2950, 2911 etc	-	Bureau of Indian Standard

Soil Stabilisation & Ground Improvement Technique
Code – CE 703B
Contact – 3L
Credits- 3

Module	Details of Course Content	Hours	Total
1	**Soil Stabilization**: Introduction, Stabilization of soil with granular skeleton and soil without granular skeleton, common nomenclature of stabilized soil systems and stabilization methods, specific methods of soil stabilization: Stabilization with cement, lime fly-ash	8	
2	**Insitu densification**: Introduction, Compaction: methods and controls *Densification of granular soil*: Vibration at ground surface, Impact at ground surface, Vibration at depth (Vibroflotation), Impact at depth. *Densification of Cohesive Soils*: Preloading and dewatering, Design of Sand drains and Stone columns, Electrical and thermal methods.	12	
3	**Geo-textiles**: Over view: Geotextiles as separators, reinforcement. Geotextiles in filtration and drainage, geotextiles in erosion control.	6	

| 4 | **Grouting**: Over view: Suspension and Solution grout, Grouting equipment and methods, Grout design and layout, Grout monitoring schemes. | 6 | |
| 5 | **Soil stability**: Reinforced earth fundamentals, Soil nailing, Soil and Rock Anchors, Underpinning | 4 | 36 |

References:

Sl. No	Name	Author	Publishers
1	Foundation Analysis & Design	J.E. Bowels	McGraw Hill
2	Principles of Foundation Engineering	B.M. Das	Thomson Book
3	Foundation Design Manual	N. V. Nayak	Dhanpat Rai Publication Pvt. Ltd
4	Construction and Geotechnical methods in foundation engineering	R.M. Koener	McGraw Hill
5	Technology in tunnelling and dam construction	A.V. Shroff. & D.L. Shah	Oxford and IBH Publishing Co.Pvt.Ltd
6	Reinforced Earth	T S Ingold	Thoam Telford
7	Designing with Geosynthetics	R M Koerner	Prentice Hall

Advanced Highway &Transportation Engineering
Code – CE 703C
Contact – 3L
Credits- 3

Module	Details of Course Content	Hours	Total
1	Traffic Engineering : Road user and vehicle characteristics; Traffic flow characteristics – Traffic Volume, Speed, Headway, Concentration and Delay; Traffic surveys & studies; Traffic estimation; Statistical applications in traffic engineering analysis; Parking; Road intersections – Basic traffic conflicts, classification of at-grade intersections, channelization, rotaries, traffic signals, signs and marking; Road Safety; Traffic System Management.	12	36
2	Transportation planning : Transportation planning at different levels; Transport Project planning – Planning studies and investigation; Elements of Urban Transportation Planning; Transport Demand Analysis; Preparation of Project Report	8	
3	Railway Engineering : Location surveys & alignment, Permanent way components, Gauges, Geometric Design, Points & crossings, Stations & Yards, Signalling, Track Maintenance	8	
4	Airport Engineering : Functional areas of airports: Runways, Taxiways, , Aprons, Terminal buildings; Classification of Airports; Airport site selection; Design of Runway, Runway orientation, Wind Rose diagram; Design of Taxiway and Terminal Building	8	

References

Sl. No	Name	Author	Publishers
1	Transportation Engineering	Khisty and Lal	PHI
2	A Text Book of Railway Engineering	S.P. Arora& S.C. Saxena	
3	**Railway Engineering**	Satish Chandra	Oxford University press
4	**Transportation Engineering**	**Vazirani&Chandola**	
5	Airport planning and Design	S.K.Khanna&M.G.Arora	
6	Airport Transportation Planning & Design-.	Virendra Kumar &Satish Chandra	Galgotia Publication Pvt. Ltd. New Delhi

Professional Elective III

Advanced Structural Analysis
Code – CE 704A
Contact – 3L
Credits- 3

Sl. No	Details of Course Content	Hours	Total

1	Review of analysis of indeterminate structures; Force methods: Statically indeterminate structures (method of consistent deformations; theorem of least work) Displacement Methods: Kinematically indeterminate structures (slope-deflection method; moment distribution method). Matrix concepts and Matrix analysis of structures: Introduction; coordinate systems; displacement and force transformation matrices; Contra-gradient principle; element and structure stiffness matrices; Element and structure flexibility matrices; equivalent joint loads; stiffness and flexibility approaches. Matrix analysis of structures with axial elements: Plane Truss; Analysis by flexibility method Space trusses: Matrix analysis of beams and grids: Flexibility method for fixed and continuous beams: Stiffness method for grids: Matrix analysis of plane and space frames: Flexibility method for plane frames: Stiffness method for space frames:	18	36
2	Theory of Elasticity : Three dimensional stress and strain analysis, stress - strain transformation, stress invariants; equilibrium and compatibility equations, boundary conditions; Two dimensional problems in Cartesian, polar and curvilinear co-ordinates, bending of a beam, thick cylinder under pressure, complex variable, harmonic and bi-harmonic functions; Torsion of rectangular bars including hollow sections, bending problems; Energy principles, variational methods and numerical methods.	18	

References:

Sl. No	Name	Author	Publishers
1	Matrix Methods of Structural Analysis	M.B. Kanchi.	
2	Analysis of Structures	T.S. Thandavamoorthy	Oxford University Press
3	Intermediate Structural Analysis	C.K. Wang	Mc Graw Hill
4	Theory of Elasticity	Timoshenko & Goodier	McGraw-Hill

Hydraulic Structures
Code – CE 704B
Contact – 3L
Credits- 3

Module	Details of Course Content	Hours	Total
1	Diversion Head works: Necessity, Difference between weir and Barrage, Type of Weirs, Selection of site, layout and description of each part, Effects of construction of a weir on the river regime, causes of failure of weirs on permeable foundation and their remedies	4	
2	Theories of seepage and Design of weirs and Barrages: Failure of Hydraulic Structures Founded on Pervious foundations: i) By piping ii) By Direct uplift, Bligh's creep theory of seepage flow, Khosla's theory & concept of flownets, concept of exit gradient and critical exit gradient, Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage, necessary corrections, examples.	6	
3	Hydraulic structures for canals: Canal falls – necessity, locations, types and description of Ogee fall, Trapezoidal-notch fall, Syphon well drop. Examples.	4	
4	Cross-Drainage Works: Necessity, types, selection of a suitable type (Introduction only)	4	
5	Dam (General): Definition, classification of Dams, factors governing selection of type of dam, selection of suitable site for a dam.	2	36
	Earthen Dams: Introduction, Types of Earthen Dams, Methods of Construction, Causes of failure, Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam, seepage control in Earthen Dam, Examples.	6	
6	Gravity Dam: Definition, Typical cross- section, Forces acting on Gravity Dam, Combination of forces for design, Mode of failure and criteria for structural stability of Gravity Dams, Principal and shear stresses. Elementary profile of a Gravity Dam, Concept of High and low Gravity Dam, Examples.	6	

	Spillways: Types, Location, Essential requirements, spillway capacity. Components of spillway, Energy Dissipators, Stilling basins (Indian standard).	4	

References

Sl. No	Name	Author	Publishers
1	Irrigation Engineering and hydraulic structures.	Santosh Kumar Garg	Khanna Publishers.
2	Irrigation, water Resources and Water Power Engg.	Dr.P.N. Modi,	Standard Book House, Delhi-6
3	Water Resources Engineering Principle and practice	By SatyaNarayana Murthy Challa.	New Age Internation (P) Ltd. Publishers. New delhi,
4	Design of Small Dams.	US Department of the Interior Bureau of Reclamation.	McGraw Hill
5	Concrete Danms	R.S. Varsney,	Oxford & I & H Publishing Co. New Delhi

Free Elective II

Engineering Materials
Code – CE 705A
Contact – 3L
Credits- 3

Sl.No.	Syllabus	Contact Hrs.
1.	**Introduction:** Material Science―its importance in engineering; Classification of Materials―metals, polymers, ceramics, composites; Advanced materials―semiconductors, smart materials, nano-materials; Review atomic structure, Atomic bonding in solids―bonding forces and energies; ionic/covalent/metallic bonding.	2
2.	**Crystal Structure:** Fundamental concepts; Unit cells; seven crystal systems; single crystal, polycrystalline and non-crystalline materials; Metallic crystal structures―FCC, atomic packing factor, BCC & HCP structures.	2
3.	**Imperfections in Metals:** Point defects due to vacancy & impurities, alloys, solid solutions; Dislocations―linear defects, interfacial defects, grain boundaries.	2
4.	**Phase Diagrams:** Definition and basic concepts; solubility limit; Phase equilibria, one-component phase diagram, binary phase diagram, interpretation of phase diagrams.	3
5.	**Iron-carbon System:** allotropy of iron, iron-iron carbide phase diagram, properties and uses of plain carbon steel	2
6.	**Classification of Metals and Alloys- compositions, general properties and uses:** **6.1 Ferrous alloys:** Classification –low carbon steels, medium carbon steels, high carbon steels, stainless steels, alloy steels, tool and die steel, cast irons. **6.2 Non-ferrous alloys:** Copper & Copper alloys; Aluminum alloys; Zinc alloys; Nickel alloys; Lead & Tin alloys;	6
7.	**Mechanical Properties of Materials:** Elastic properties of materials―tensile and compressive stress and strain, stress-strain behaviour, modulus of elasticity (Young's modulus), yield strength, tensile strength, plastic deformation, true stress and strain; Ductility; Resilience; Toughness, impact tests; Hardness- Brinell, Rockwell and Vickers hardness and their testing procedures, correlation between hardness and tensile strength; Fatigue strength; Effect of temperature on tensile strength & impact properties, creep failure.	6
8.	**Heat Treatment:** Definition and purposes; Heat treatment processes for steels―Hardening, structural change during heating and cooling, factors affecting hardening; Tempering; Austempering; Normalizing; Annealing―full annealing, spheroidising annealing, stress–relieving, recrystallisation annealing; Preciptation or Age Hardening of non-ferrous alloys.	4
9.	**Polymers & Elastomers:** Definition; How polymers are made- polymerization; Polymer molecular structures; Thermoplastics & Thermosets; Special characteristics	2

Sl.No.	Syllabus	Contact Hrs.
	like low sp. gravity, optical, electrical & thermal property, decorative color, easy formability, low corrosion etc; Uses of polymers and elastomers.	
10.	**Ceramic Materials:** What is ceramics; common ceramic materials and their characteristics; How ceramics are made—sintering and vitrification process; Ceramic structures; Properties and applications.	2
11.	**Composite materials:** What is composites; Polymers matrix and their applications; Metal matrix and ceramic matrix composites and their applications; How composites are made.	2
12.	**Corrosion and Degradation of Engineering Materials:** Definition; Types of corrosion—uniform, pitting, crevice, galvanic, stress corrosion cracking and erosion; Corrosion control — material selection, environment control, proper design.	2
13.	**Materials Selection Methodology:** Selection of material based on required properties, availability and cost of material, environmental issues.	1

Books Recommended

1. Materials Science and Engineering by W.D. Callister and adapted by R. Balasubramaniam, Willey India, 2010 Ed.
2. Engineering Materials: properties and selection by Budinski & Budinski, 9th Ed., Prentice Hall India
3. Engineering Materials and Metallurgy by R.Srinivasan, 2nd Ed., Tata McGraw Hill.
4. Materials & Processes in Manufacturing by E.P.Degarmo and adapted by Black & Kosher, 10th Ed., Wiley India.
5. Materials Science and Engineering by V.Raghavan, 5th Ed., Prentice Hall India.

Electrical & Electronic Measurement
Code – CE 705B
Contact – 3L
Credits- 3

Topic	No of periods

Module-I

Measurements:	
• Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments.	3
Analog meters:	
• General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments	3
• Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.	3

Module-II

Instrument transformer:	
• Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current & Potential transformer, errors.	4
Measurement of Power:	3
• Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors.	
Measurement of resistance:	4

• Measurement of medium, low and high resistances, Megger.	

Module-III

Measurement of Energy: • Construction, theory and application of AC energy meter, testing of energy meters.	3
Potentiometer: • Principle of operation and application of Crompton's DC potentiometer, Polar and Co-ordinate type AC potentiometer. Application.	4
AC Bridges: • Measurement of Inductance, Capacitance and frequency by AC bridges.	4

Module-IV

Cathode ray oscilloscope (CRO): • Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO.	3
Electronic Instruments: • Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator.	4
Sensors & Transducers: • Introduction to sensors & Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.	3

Numerical Problems to be solved in the tutorial classes.

Text Books:
1. A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai & sons.
2. Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing.
3. Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.

Reference Books:
1. Sensors & Transducers, D. Patranabis, PHI, 2nd edition.
2. Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill.
3. Modern Electronic instrumentation & Measuring instruments, A.D. Heltric & W.C. Copper, Wheeler Publication.
4. Instrument transducers, H.K.P. Neubert, Oxford University press.

Practical

Group Discussion
Code – HU
Contact – 3L
Credits- 2

Will be implemented latter

ENVIRONMENTAL ENGINEERING LAB
CODE: CE-791
CRDIT-2

Experiment No.	Experiment Name	Type of Test
1.	Determination of turbidity for a given sample of water	Physical
2.	Determination of color for a given sample of water	
3	Determination of solids in a given sample of water: Total Solids, Suspended Solids and Dissolved Solids	
4	Determination of pH for a given sample of water	Chemical
5	Determination of concentration of Chlorides in a given sample of water	
6	Determination of carbonate, bi-carbonate and hydroxide alkalinity for a given sample of water	
7	Determination of hardness for a given sample of water	
8	Determination of concentration of Fluorides in a given sample of water	
9	Determination of concentration of Iron in a given sample of water	
10	Determination of the Optimum Alum Dose for a given sample of water through Jar Test	
11	Determination of the Residual Chlorine in a given sample of water	
12	Determination of the Chlorine Demand for a given sample of water	
13	Determination of the Available Chlorine Percentage in a given sample of bleaching powder	
14	Determination of amount of Dissolved Oxygen (DO) in a given sample of water	
15	Determination of the Biochemical Oxygen Demand (BOD) for a given sample of wastewater	
16	Determination of the Chemical Oxygen Demand (COD) for a given sample of wastewater	
17	Determination of bacteriological quality of water: presumptive test, confirmative test and Determination of MPN	Bacteriological

CIVIL ENGINEERING PRACTICE SESSIONAL
CE 792
CREDIT 2

Course Content
Foundation Engineering

Stability Analysis of Slopes, Preparation of typical soil test report, Estimation of bearing capacity and settlement of foundation from typical field data, Structural design and detailing of isolated rectangular footing and combined footing.
Water Resource Engineering

Estimation of runoff, Field capacity and permanent wilting point Construction of hydrograph& S curve, efficient section of canal, Design of lined canals, Determination of yield of wells, flood routing

Environmental Engineering

Population forecasting, Analysis and design of water distribution network, Hydraulic design of sewer

Transportation Engineering

Determination of highway capacity, Highway geometric design, Design of flexible and rigid pavement, Traffic Signal Design

Material Testing lab
CE 793A
CREDIT 2

Impact tests: Charpy and Izod tests;
    Test for drawability of sheet metals through cupping test;
    Fatigue test of a typical sample.
    Sample preparation and etching of ferrous and non-ferrous metals and alloys for metallographic observation;
    Experiments on heat treatment of carbon steels under different rates of cooling including quenching, and testing for the change in hardness and observing its microstructural changes through metallographic studies.
    Observation of presence of surface/ sub-surface cracks using different non-destructive techniques, such as dye penetration (DP) test, magnaflux test, ultrasonic or eddy current test.
(At least six experiments must be conducted)

Electrical & Electronics Measurement lab
CE 793B
CREDIT 2
List of Experiments:

1. Instrument workshop- Observe the construction of PMMC, Dynamometer, Electrothermal and Rectifier type of instruments, Oscilloscope and Digital multimeter.
2. Calibrate moving iron and electrodynamometer type ammeter/voltmeter by potentiometer.
3. Calibrate dynamometer type wattmeter by potentiometer.
4. Calibrate AC energy meter.
5. Measurement of resistance using Kelvin double bridge.
6. Measurement of power using Instrument transformer.
7. Measurement of power in Polyphase circuits.
8. Measurement of frequency by Wien Bridge.
9. Measurement of Inductance by Anderson bridge
10. Measurement of capacitance by De Sauty Bridge.
11. Measurement of capacitance by Schering Bridge.

VIII Semester

Organisational Behaviour
HU801A
Contracts: 2L
Credits- 2

1. Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB.   [2]
2. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction. [2]
3. Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making.   [2]
4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.   [4]
5. Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. [2]
6. Communication: Communication Process, Direction of Communication, Barriers to Effective Communication.   [2]
7. Leadership: Definition, Importance, Theories of Leadership Styles.   [2]
8. Organizational Politics: Definition, Factors contributing to Political Behaviour. [2]
9. Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process.   [2]
10. Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.   [4]

References:
1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.
3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

Or
Project Management
HU801B
Contracts: 2L
Credits- 2

1. Project Management Concepts: Concept and Characteristics of a Project, Importance of Project Management.[1]
2. Project Planning: Project Evaluation, Financial Sources, Feasibility Studies. [4]
3. Project Scheduling: Importance of Project Scheduling, Work Breakdown Structure and Organization Breakdown Structure, Scheduling Techniques – Gantt Chart and LOB, Network Analysis – CPM/PERT. [6]

4. Time Cost Trade-off Analysis – Optimum Project Duration. [2]
5. Resource Allocation and Leveling. [2]
6. Project Life Cycle. [2]
7. Project Cost – Capital & Operating Costs, Project Life Cycle Costing, Project Cost Reduction Methods. [2]
8. Project Quality Management: Concept of Project Quality, TQM in Projects, Project Audit. [1]
9. Software Project Charateristics and Mangement [2]
10. IT in Projects: Overview of types of Softwares for Projects, Major Features of
    Project Management Softwares like MS Project, Criterion for Software Selection. [2]

References
1. Gopalkrishnan P. and Rama Mmoorthy: Text Book of Project Management, Macmillan
2. Nicholas John M.: Project Management for Business and Technology – Principles and Practice, Prentice Hall India, 2nd Edn.
3. Levy Ferdinand K., Wiest Jerome D.: A Management Guide to PERT/CPM with GERT/PDM/DCPM and other networks, Prentice Hall India, 2nd Edn.
4. Mantel Jr., Meredith J. R., Shafer S. M., Sutton M. M., Gopalan M. R.: Project Management: Core Text Book, Wiley India, 1st Indian Edn.
5. Maylor H.: Project Management, Pearson, 3rd Edn.
6. Nagarajan K.: Project Management, New Age International Publishers, 5th Edn.
7. Kelkar. S.A, Sotware Project Management: A concise Study, 2nd Ed., PHI

Professional Elective IV

Environmental Pollution and Control
Code – CE 801A
Contact – 3L
Credits- 3

Sl. No	Details of Course Content	Hours	Total
1.	**Introduction**: Environment. Pollution, Pollution control	2	
2.	**Air Pollution**: Air Pollutants: Types, Sources, Effects; Air Pollution Meteorology: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.	8	
3.	**Air pollution Control**: Self cleansing properties of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles.	8	
4.	**Noise Pollution:** Definition; Sound Pressure, Power and Intensity; Noise Measurement: Relationships among Pressure, Power and Intensity, Levels, Frequency Band, Decibel Addition, Measures of community Noise i.e. L_N, L_{eq}, L_{dn}, L_{NP}; Sources, ; Effects; Control.	4	36
5.	**Water pollution**: Pollution Characteristics of Typical Industries, Suggested Treatments.	4	
6.	**Global Environmental Issues**: Ozone Depletion, Acid Rain, Global Warming-Green House Effects	4	
7.	**Administrative Control on Environment:** Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects	4	
8.	**Environmental Laws:** Water Act, Air Act, Motor Vehicle Act	2	

References:

Sl. No	Name	Author	Publishers
1.	Introduction to Environmental Engineering and Science	G. Masters, W. Ela	PHI
2	Environmental Engineering: A Design Approach	A. Sincero, G. Sincero	PHI
3	Environmental Engineering	P. V. Rowe	TMH
4	Environmental Engineering,	S.K . Garg,	Khanna Publishers
5	Air Polution	Rao and Rao	TMH
4	Water Supply, Waste Disposal and Environmental Pollution Engineering, ,	A.K.Chatterjee	Khanna Publishers.
5	Environmental Engineering, Vol.II,	P. N. Modi,	
6	Environmental Modelling, ,	Rajagopalan	Oxford University Press.

Water Resources Management & Planning
Code – CE 801B
Contact – 3L
Credits- 3

Module	Details of Course Content	Hours	Total
1	**Planning and analysis of Water Resource Systems**: Introduction, System Analysis, Engineers and Policymakers	3	
2	**Methods of Analysis:** Introduction, Evaluation of Time streams of Benefits and Costs. Plan formulation, Planning models and solution procedures, Lagranges Multipliers, Dynamic Programming, Recursive equations, Bellmans' principle of optimality. Curse of dimensionality of discrete dynamic programming. Examples	8	
3	**Reservoir Operation:** Sequential process, single Reservoir problem - with release as decision variable, with storage as decision variable (deterministic approach). Examples, Related Computer Programming. Multi–reservoir problems (Deterministic approach)	6	36
4	**Water Resources Planning under Uncertainty:** Introduction, probability concepts and Methods – Random variable and Distributions, Univariate probability Distributions ,properties of Random variable – Moment and Expectation (Univariate Distributions) , Moment Generating Functions, Measures of Central tendency, Measures of Dispersion, Measures of symmetry (Skewness), measures of peakedness (kurtosis), examples	10	
5	**Stochastic River Basin Planning Model:** Introduction, Reservoir operation, Stochastic, Dynamic programming, Operating Model, Probability Distribution of Storage volumes and Releases, examples	6	
6	**Water quality Management:** Prediction and Simulation, Water quality Management Modeling	3	

References:

Sl. No	Name	Author	Publishers
1	Applied Hydrology	V.T. Chow	
2	Hydrology	Raudkivi	
3	Stochastic Hydrology	Jayarami Reddy	
4	Water Resources Engg.	M.C. Chaturvedi	
5	Water Resources Systems Planning & Analysis	Ddenice P Loucks, Jery R Stedinger& Douglas A Heinth	Prentice Hall, Inc New Jersy.
6	Water Resources Engineering	Larry W Mays	John Wiley & Sons(Asia)

Remote Sensing and GIS
Code – CE 801C
Contact – 3L Credits: 3

Sl. No	Details of Course Content	Hours	Total
1	**Introduction:** Definition and types of remote sensing, Tacheometry (Planimetry/ altimetry), Triangulation (Frame work / adjustment), Trilateration (EDM/ Total Station), Geodetics (physical/ geometrical geodesy), Error Analysis (causes / law of weights), Numerical example	7	
2	**Photogrammetry:** Camera System (phototheodolite/ aircraft), Ground photograph (oblique/orthogonal streophoto), Aerial photograph (perspective scale/ flight planning), distortion (relief / tilt), Geometrix (parallax / mapping), application (topographics / interpretation), Numerical examples	7	36
3	**Satellite survey:** Satellite Sensing (Sensors / platforms), energy sources (electromagnetic / atmospheric interaction), visual interpretation (Band width), digital processing (imageries / enhancement), data integration (multi-approach / GIS), microwave imaging (active system / radars), applications	7	
4	**Astronomy:** Celestial sphere (star-coordinates / transformation), field astronomy (azimuth, solar and polar method), 3D computation (local vs global), spherical trigonometry, Multilateration, Observation, Corrections in astronomy, Correlation of low, medium, remote objects, Global Positioning Systems	7	

| 5 | **Geoinformatics:** GIS concept (Introduction/ definition), planning and management, spatial data model, database and DBMS, linking of attributes, geospatial analysis, modern trends | 8 | |

References:

Sl. No	Name	Author	Publishers
1	Surveying (Volume 2):	Duggal S.K.	Tata McGraw Hill
2	Remote Sensing & GIS:	Bhatta B.	Oxford Univ Press
3	Geographic Information System:	Tor Bern Herdgen	Wiley
4	Surveying:	Bannister, Raymond & Baker	Pearson Education
5	Remote Sensing & Image Interpretation:	Lilesand, Kiefer and Chipman	Wiley
6	Surveying (Volume 2):	Kanetker.&Kulkarni	
7	Remote Sensing & Geographical information System	Reddy M.A.	(BS publication).
8	Advanced Surveying	Rampal K.K.	
9	Fundamantals of Geographic Information System:	Demers M.N.	(Wiley)

Professional Elective V

Finite Element Method
Code – CE 802A
Contact – 3L Credits: 3

No	Details of Course Content	Hours	Total
1	Introduction to Finite ElementAnalysis: Introduction, Basic Concepts of Finite Element Analysis, Steps in Finite Element Analysis, Fundamental concepts of Elasticity	4	
2	Finite Element Formulation Techniques: Virtual Work and Variational Principle, GalerkinApproach, Displacement Approach, Stiffness Matrix and Boundary Conditions	4	
3	Element properties: Concepts of shape functions: Natural Coordinates, one dimensional, Triangular, Rectangular Elements, Lagrange and Serendipity Elements Isoparametric Formulation: Isoparametric Elements, Stiffness Matrix of Isoparametric Elements, Numerical Integration: One Dimensional, Two Dimensional	8	36
4	Formation of stiffness matrices and analysisofTruss, Continuous Beam and Simple Plane Frame	6	
5	FEM for two dimensional analysis: Constant Strain Triangle, Linear Strain Triangle, Rectangular Elements, Numerical Evaluation of Element Stiffness, Computation of Stresses	6	
6	FEM for Plates : Introduction to Plate Bending Problems, Finite Element Analysis of Thin Plate	4	
7	Introduction to application of standard FEM software in civil Engineering	4	

References:

Sl. No	Name	Author	Publishers
1	Finite Element Method with Applications in Engineering	Y. Desai et. al	Pearson
2	Introduction to Finite Element in Engineering	Chandrapatla&Belegundu	Pearson Education
3	A First Course in Finite Element Method	D. L. Logan	Thomson
4	Surveying:	Bannister, Raymond & Baker	Pearson Education
5	Concepts and Applications of Finite Element Analysis	R. D. Cook et. al	Wiley India
6	Finite Element Analysis – Theory and Programming	C. S. Krishnamoorthy	Tata Mcgraw Hill
7	Matrix, Finite Element,Computer and Structural Analysis	M. Mukhopadhyay	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India
8	Finite Element Procedures	K. J. Bathe	PHI, New Delhi, India

Dynamics of Soils and Foundations
Code – CE 802B
Contact – 3L Credits: 3

No	Details of Course Content	Hours	Total
1	Introduction: Types of Machine Foundations, General requirement of Machine foundations, Dimensional criteria, Design data, Permissible amplitude, Permissible Bearing pressure	2	
2	**Fundamental of vibrations**: Degrees of freedom, Natural frequency, Undamped single degree freedom system, Damped single degree freedom system, Transmissibility, Response to ground motion, Introduction to multiple degree freedom system	8	36
3	Dynamic properties of Soil, Laboratory and field evaluation of soil properties as per IS codes;	8	
4	Analysis and design of Block type Machine Foundation: Modes of Vibrations, Methods of Dynamic Analysis, Design considerations for dynamically loaded foundations and constructional features; Design procedures for foundations for hammers, reciprocating engines , Vibration Isolation and damping	10	
5	Liquefaction of soils: Definition, Causes and effects of Liquefaction, Evaluation of Liquefaction potential, Mitigation of Liquefaction Hazards	6	
6	Propagation of elastic waves in soils: Mechanism of wave propagation, Body waves, Surface waves, Rayleigh waves	2	

Sl. No	Name	Author	Publishers
1	Hand Book of Machine Foundation	Srinivasalu & Vaidyanathan	TMH
2	Dynamics of Bases and Foundations	D. D. Barkan	Mc-Graw Hill
3	Geotechnical Earthquake Engineering	S. L. Kramer	Printice Hall
4	Earthquke Resistant Design	D. J. Dorwick	Wiley
5	Fundamentals of Soil Dynamics & Earthquake Engineering	B. B. Prasad	PHI

Design of Tall Buildings
Code – CE 802C
Contact – 3L
Credits: 3

Sl. No	Details of Course Content	Hours	Total
1	Introduction : Necessity of Tall Buildings, Design Philosophy, Strength and Stability, Creep, Shrinkage and Temperature Effects, Fire, Foundation Settlement and Soil-Structure Interaction	6	
2	Loadings : Gravity loading, Wind loading, Earthquake Loading, Combination of Loadings	6	
3	Structural Forms : Braced-Frame Structures, Rigid Frame Structures, Infilled-Frame Structures, Shear Wall Structures, Wall Frame Structures, Tubular Structures, Core Structures, Floor Systems – Reinforced Concrete : One-Way slab, Two-way slab, Floor Systems – Steel Framing, One-way Beam System, Two-Way Beam System, Three-Way Beam System, Composite Steel-Concrete Floor Systems	12	36
4	Modelling for Analysis : Approaches to analysis, Highrise behaviour, Modeling for approximate analysis, Modelling for Accurate Analysis	4	
5	Stability of High-rise buildings, Buckling analysis of Frames	4	
6	Dynamic Analysis : Dynamic Response to Wind Loading, Dynamic Response to Earthquake Loading	4	

*The objective of this course is to introduce basic principles and design philosophy of tall buildings. Detail analytical treatment is not required.

Sl. No	Name	Author	Publishers
1	Tall Building Structures: Analysis and Design	Bryan S. Smith and Alex Coull	John Wiley & Sons, Inc, New York, 1991
2	Designing Tall Buildings	Mark Sarkinsian,	Routledge, New York, 2012
3	Structural Frameworks	Clyde T. Morris and Samuel T. Carpenter	John Wiley

Pavement Design
Code – CE 802D
Contact – 3L
Credits: 3

Sl. No	Details of Course Content	Hours	Total
1	Principles of Pavement Design : Types of Pavements, Concept of pavement performance, Structural and functional failure of pavement, Different types of pavement performance, Different pavement design approaches	6	
2	Traffic Consideration in Pavement Design : Vehicle types, Axle configurations, Contact shapes and contact stress distribution, Concept of standard axle load, Vehicle damage factor, Axle load surveys, Estimation of design traffic	6	36
3	Pavement Material Characterization : Identification of different type of materials Field and laboratory methods for characterization of pavement materials	8	
4	Analysis and Design of Flexible Pavements : Selection of appropriate theoretical model for flexible pavements, Analysis of different layers of flexible pavements based on linear elastic theory, Different methods of design of flexible pavements, IRC guidelines(IRC-37)	6	
5	Analysis and Design of Rigid Pavements : Selection of appropriate theoretical models for rigid pavements, Analysis of wheel load stresses, curling, temperature differential, Critical stress combinations, Different methods of design of rigid pavements, IRC guidelines (IRC-58)	6	
6	Pavement Overlay Designs : Overlay design as per Indian Roads Congress guidelines (IRC-81) Overlay design as per AASHTO-1993 guidelines	4	

References :

Sl. No	Name	Author	Publishers
1	Principles of Pavement Design	E.J.Yoder and M.W. Witczak	Wiley
2	Pavement Analysis and Design	Y. H. Huang	Prentice-Hall
3	Highway Engineering	Khanna and Justo	Nem Chand
4	IRC-37, IRC-58, IRC-73, IRC-81, IRC-106 and other relevant IRC codes	Indian Roads Congress	

Structural Engineering Design Practice
Code – CE 891
Contact – 6P Credits: 4

Sl. No	Details of Course Content	Hours	Total
1	Water Tanks : Beams curved in plan, Domes, Circular and Intze Tanks, Rectangular Tanks, Underground Tanks	8	
2	Pipes, Silos & Chimneys : Reinforced concrete pipes, Bunkers and Silos, Chimeneys	8	
3	Aqueducts and Box Culverts, Concrete Bridges : Type of load, Impact Effect, Design of T-beam bridge	20	72
4	Plate Girders : Design of Web, Design of flanges, Intermediate Vertical Stiffners, Horizontal Stiffners, Bearing Stiffners, Horizontal Stiffners	12	
5	Roof trusses : General, Roof and Side Coverings, Design Loads, Purlins, Members, End Bearings, Industrial Building Frames, Framing, Bracing, Crane Girders and Columns	12	
6	Steel Bridges : Plate girder bridges	12	