Civil Engineering

B.TECH. PROGRAMME

Effective from: June, 2017

B.TECH. IN CIVIL ENGINEERING

FIRST YEAR - FIRST SEMESTER

Theory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	HMTS1101	Business English	2	0	0	2	2
2	PHYS1001	Physics I	3	1	0	4	4
3	MATH1101	Mathematics I	3	1	0	4	4
4	ECEN1001	Basic Electronics Engineering	3	1	0	4	4
5	MECH1101	Engineering Mechanics	3	1	0	4	4
Total Theory			**14**	**4**	**0**	**18**	**18**

Laboratory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	PHYS1011	Physics I Lab	0	0	3	3	2
2	ECEN1011	Basic Electronics Engineering Lab	0	0	3	3	2
3	MECH1011	Workshop Practice	1	0	3	4	3
4	HMTS1111	Language Practice Lab (Level 1)	0	0	2	2	1
Total Laboratory			**1**	**0**	**11**	**12**	**8**

Sessional							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	HMTS1121	Co curricular activities	0	0	2	2	1
Total Sessional			**0**	**0**	**2**	**2**	**1**
Total of Semester			**15**	**4**	**13**	**32**	**27**

B.TECH. IN CIVIL ENGINEERING

FIRST YEAR - SECOND SEMESTER

Theory							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CSEN1201	Introduction to Computing	3	1	0	4	4
2	CHEM1001	Chemistry I	3	1	0	4	4
3	MATH1201	Mathematics II	3	1	0	4	4
4	ELEC1001	Basic Electrical Engineering	3	1	0	4	4
5	MECH1201	Engineering Thermodynamics and Fluid Mechanics	3	1	0	4	4
Total Theory			**15**	**5**	**0**	**20**	**20**

Laboratory / Practical							
Sl. No	**Course Code**	**Course Name**	**Contact Hrs per Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	CSEN1211	Introduction to Computing Lab	0	0	3	3	2
2	CHEM1011	Chemistry I Lab.	0	0	3	3	2
3	ELEC1011	Basic Electrical Engineering Lab.	0	0	3	3	2
4	MECH1012	Engineering Drawing	1	0	3	4	3
Total Laboratory			**1**	**0**	**12**	**13**	**9**
Total of Semester			**16**	**5**	**12**	**33**	**29**

B.TECH. IN CIVIL ENGINEERING

SECOND YEAR - FIRST SEMESTER

A.THEORY							
Sl No	**Code**	**Subject**	**Contact Hours**				**Credit point**
			L	**T**	**P**	**Total**	
1	MATH 2001	Mathematical Methods	3	1	0	4	4
2	CIVL 2101	Surveying	3	1	0	4	4
3	CIVL 2102	Strength of Materials	3	1	0	4	4
4	CIVL 2103	Building Materials and Construction	3	1	0	4	3
5	CIVL 2104	Engineering Geology	3	0	0	3	2
6	HMTS 2002	Indian Culture and Heritage	2	0	0	2	1
Total Theory						**21**	**18**
B. PRACTICAL							
7	CIVL 2111	Strength of Materials Lab	0	0	3	3	2
8	CIVL 2112	Engineering Geology Lab	0	0	3	3	2
9	HMTS 2011	Language Practice Lab (Level 2)	0	0	3	3	2
Total Practical						**9**	**6**
C.SESSIONAL							
10	CIVL 2121	Building Planning and Drawing	0	0	3	3	2
11	CIVL 2122	CAD Lab	0	0	3	3	2
Total Sessional						**6**	**4**
Total of Semester						**36**	**28**

B.TECH. IN CIVIL ENGINEERING

SECOND YEAR - SECOND SEMESTER

A.THEORY								
Sl No	**Code Number**	**Subject**	**Contact Hours**				**Credit point**
			L	**T**	**P**	**Total**	
1	MATH 2002	Numerical and Statistical Methods	3	0	0	3	3
2	CIVL 2201	Analysis of Structures I	3	1	0	4	4
3	CIVL 2202	Soil Mechanics I	3	1	0	4	3
4	CIVL 2203	Concrete Technology	3	1	0	4	3
5	CIVL 2204	Fluid Mechanics	3	1	0	4	4
6	HMTS 2001	Human Values and Professional Ethics	2	0	0	2	2
Total Theory						**21**	**19**
B. PRACTICAL							
7	CIVL 2211	Fluid Mechanics Lab	0	0	3	3	2
8	CIVL 2212	Surveying Practice	0	0	3	3	2
9	MATH 2012	Numerical and Statistical Methods Lab	0	0	2	2	1
Total Practical						**8**	**5**
C.SESSIONAL							
10	CIVL 2221	Quantity Survey, Specification and Valuation	1	0	3	4	2
11	CIVL 2222	Seminar I	0	0	2	2	2
Total Sessional						**6**	**4**
Total of Semester						**35**	**28**

B.TECH. IN CIVIL ENGINEERING

THIRD YEAR - FIRST SEMESTER

A. THEORY							
Sl No	**Code Number**	**Subject**	**Contact Hours**				**Credit point**
			L	**T**	**P**	**Total**	
1	CIVL 3101	Analysis of Structures II	3	1	0	4	4
2	CIVL 3102	Soil Mechanics II	3	1	0	4	3
3	CIVL 3103	Highway & Traffic Engineering	3	1	0	4	3
4	CIVL 3104	Environmental Engineering	3	1	0	4	3
5	CIVL 3105	Design of R.C.C. Structures	3	1	0	4	4
6	HMTS 3101	Economics for Engineers	3	0	0	3	3
Total Theory						**23**	**20**
B. PRACTICAL							
7	CIVL 3111	Soil Mechanics Lab I	0	0	3	3	2
8	CIVL 3112	Concrete Technology Lab	0	0	3	3	2
9	CIVL 3113	Environmental Engineering Lab	0	0	3	3	2
Total Practical						**9**	**6**
C.SESSIONAL							
10	CIVL 3121	R. C. C. Design & Detailing	0	0	3	3	2
Total Sessional						**3**	**2**
Total of Semester						**35**	**28**

B.TECH. IN CIVIL ENGINEERING

THIRD YEAR - SECOND SEMESTER

A. THEORY								
Sl No	**Code Number**	**Subject**	**Contact Hours**				**Credit point**
			L	**T**	**P**	**Total**	
1	CIVL 3201	Design of Steel Structures	3	1	0	4	4
2	CIVL 3202	Foundation Engineering	3	1	0	4	3
3	CIVL 3203	Prestressed Concrete	3	1	0	4	3
4	CSEN 3206	Data Structure & RDBMS	3	0	0	3	3
5		Professional Elective I	3	1	0	4	3
	CIVL 3231	Railway & Airport Engineering					
	CIVL 3232	Advanced Surveying					
	CIVL 3233	Design of Tall Structures					
	CIVL 3234	Soil Stabilization & Ground Improvement Techniques					
6	HMTS 3201	Principles of Management	2	0	0	2	2
Total Theory						**21**	**18**

B. PRACTICAL							
7	CIVL 3211	Soil Mechanics Lab II	0	0	3	3	2
8	CIVL 3212	Transportation Engineering Lab	0	0	3	3	2
9	CSEN 3216	RDBMS Lab	0	0	3	3	2
Total Practical						**9**	**6**
C.SESSIONAL							
10	CIVL 3221	Steel Structure Design & Detailing	0	0	3	3	2
11	HMTS 3221	Personality Development	1	0	0	1	1
Total Sessional						**4**	**3**
Total of Semester						**34**	**27**

B.TECH. IN CIVIL ENGINEERING

FOURTH YEAR - FIRST SEMESTER

Sl No	Code Number	Subject	Contact Hours L	T	P	Total	Credit point
A.THEORY							
1	CIVL 4101	Water Resources Engineering	3	1	0	4	4
2		Professional Elective II	3	1	0	4	3
	CIVL 4141	Advanced Structural Analysis					
	CIVL 4142	Remote Sensing and GIS					
	CIVL 4143	Advanced Pavement Engineering					
	CIVL 4144	Hydraulics Structures					
3		Professional Elective III	3	1	0	4	4
	CIVL 4161	Soil Dynamics and Machine Foundations					
	CIVL 4162	Structural Dynamics & Earthquake Engineering					
	CIVL 4163	Environmental Pollution & Control					
	CIVL 4164	Advanced R.C.C. Design					
4		Free Elective I	3	0	0	3	3
	CIVL 4181	Building Materials					
	CIVL 4182	Hydrology					
	CIVL 4183	Environmental Pollution & Control					
Total Theory						**15**	**14**
B. PRACTICAL							
5	CIVL 4111	Computer Application in Civil Engg	0	0	3	3	2
Total Practical						**3**	**2**
C.SESSIONAL							
6	HMTS 4121	Professional Development	0	0	3	3	2
7	CIVL 4131	Industrial Training Evaluation	4 weeks during 6^{th} -7^{th} Sem. break				2
8	CIVL 4132	Seminar II	0	0	3	3	2
9	CIVL 4191	Project -I	0	0	6	6	4
Total Sessional						**12**	**10**
Total of Semester						**30**	**26**

Free Elective for Civil Engineering Students (4^{th} Year 1^{st} Semester):

MECH 4181: Quantitative Decision Making
CHEN 4181: Safety and Hazard Analysis
ELEC 4182: Circuit Theory Analysis

B.TECH. IN CIVIL ENGINEERING

FOURTH YEAR - SECOND SEMESTER

A.THEORY								
Sl No	**Code Number**	**Subject**	**Contact Hours**				**Credit point**
			L	**T**	**P**	**Total**	
1	CIVL 4201	Construction Planning and Project Management	3	0	0	3	3
2		Professional Elective IV	3	1	0	4	4
	CIVL 4241	Bridge Engineering					
	CIVL 4242	Traffic Engineering and Transportation Planning					
	CIVL 4243	Advanced Foundation Engineering					
	CIVL 4244	Finite Element Analysis					
3		Free Elective II	3	0	0	3	3
	CIVL 4281	Remote Sensing and GIS					
	CIVL 4282	Principles of Surveying					
	CIVL 4283	Project Planning and Management					
4	HMTS 4201	Organizational Behaviour	2	0	0	2	2
Total Theory						**12**	**12**
B. SESSIONAL							
5	CIVL 4231	Comprehensive Viva Voce	0	0	0	0	3
6	CIVL 4291	Project II	0	0	12	12	8
Total Sessional						**12**	**11**
Total of Semester					**24**		**23**

Free Elective for Civil Engineering Students (4th Year 2nd Semester):

MECH 4281: Mechanical Handling of Materials

MECH 4282: Aerodynamics

CHEN 4282: Total Quality Management and Assurance

ELEC 4282: Fundamentals of Illumination Engineering

HMTS 4281: Introduction to Industrial Sociology

HMTS 4282: Critical Gender Studies

HMTS 4283: Elementary Spanish for Beginners

BIOT 4282: Non-conventional Energy

Course Name : BUSINESS ENGLISH					
Course Code: HMTS1101					
Contact hrs per week:	L	T	P	Total	Credit points
	2	0	0	2	2

Course Outcome:

1. Analyse the dynamics of business communication and communicate accordingly.
2. Write business letters and reports
3. Learn to articulate opinions and views with clarity
4. Appreciate the use of language to create beautiful expressions
5. Analyse and appreciate literature.
6. Communicate in an official and formal environment.

Module I - [5L]

Communication Skill
Definition, nature & attributes of Communication
Process of Communication
Models or Theories of Communication
Types of Communication
Levels or Channels of Communication
Barriers to Communication

Module II - [12L]

Business Communication- Scope & Importance
Writing Formal Business Letters
Writing Reports
Organizational Communication: Agenda & minutes of a meeting, notice, memo, circular
Project Proposal
Technical Report Writing
Organizing e-mail messages
E-mail etiquette
Tips for e-mail effectiveness

Module III - [10L]

Language through Literature
Modes of literary & non-literary expression
Introduction to Fiction, (An Astrologer's Day by R.K. Narayan and Monkey's Paw by W.W. Jacobs), Drama (The Two Executioners by Fernando Arrabal) or (Lithuania by Rupert Brooke) & Poetry (Night of the Scorpion by Nissim Ezekiel and Palanquin Bearers by Sarojini Naidu)

Module IV-[3L]

Grammar in usage (nouns, verbs, adjectives, adverbs, tense, prepositions, voice change) - to be dealt with the help of the given texts.

References

1. Armand Matterlart and Michele Matterlart, Theories of Communication: A Short Introduction, Sage Publications Ltd., 1998.
2. Chan, Janis Fisher, and Diane Lutovich. Professional Writing Skills. San Anselmo, CA: Advanced Communication Designs, 1997.
3. Geffner, Andrew P. Business English. Hauppauge, New York: Barren's Educational Series, 1998.
4. Good, Edward C. Mightier Than the Sword. Charlottesville: Word Stone Publications, 1989.
5. Edward P.Bailey, Writing and Speaking at Work: A Practical Guide for Business Communication, Prentice-Hall, 7th edn, 2004.
6. Kitty O. Locker, Business and Administrative Communication, McGraw-Hill/ Irwin, 7th edn, 2004.
7. Lillian Chaney and Jeanette Martin, Intercultural Business Communication, Prentice Hall, 4th edn, 2005.
8. Yudkin, Marcia. Persuading on Course Name. Lansing, IL: Infinity Publishing, 2001.

Course Name : PHYSICS 1					
Course Code: PHYS 1001					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

1. Interpret oscillations under different conditions, with the understanding of Resonance phenomena followed by calculation of Q factor.
2. Analyze the Quantum phenomenon like Black body radiation, Compton effect and origin of X-ray spectrum.
3. Understand the wave character of light through the phenomenon of interference, diffraction and polarization.
4. Study of various crystal structures and classification of different crystal planes.
5. Explain the working principle of LASER, and apply the knowledge in different lasing system and their engineering applications in holography
6. Understand the dual nature of matter, Heisenberg's uncertainty relation and it's various application.

Module I: [22 L]

Optics

1. Interference:

The principle of superposition of waves, Superposition of waves: Two beam superposition, Multiple-beam superposition, coherent and incoherent superposition. Two source interference pattern (Young's double slit), Intensity distribution. Interference in thin films, wedge shaped films and Newton's rings, applications of interference. Newton's rings: Determination of wavelength of light, refractive index of liquid.

2. Diffraction:

Diffraction of light waves at some simple obstacles. Fraunhoffer diffraction through double slit and diffraction grating, grating spectra, resolving power of grating.

3. Polarisation & Fibre Optics:

Elementary features of polarization of light waves. Production and analysis of linearly, elliptic and Circularly polarized light, polaroids and application of polarizations, fibre optics - principle of operation, numerical aperture, acceptance angle

4. Laser:

Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

Module II: [8L]

Waves & Oscillation

Superposition of two linear SHMs (with same frequency), Lissajous' figures. Damped vibration - differential equation and its solution, Critical damping, Logarithmic decrement, Analogy with electric circuits. Forced vibration - differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance and Quality factor. Progressive wave- Wave equation and its differential form, Difference between elastic (mechanical) and electromagnetic waves.

Module III: [9L]

Quantum Mechanics

Need for Quantum physics-Historical overviews, Particle aspects of radiation-Black body radiation, Compton scattering, pair production. Origin of X-ray spectrum. Wave aspect of particles- matter wave, de Broglie Hypothesis, Heisenberg Uncertainty principles-Statement, Interpretation and application.

Module IV: [6L]

Introduction of Crystallography

Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Miller Indices and its applications, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC. Bragg's law and its applications.

Text Books

1. Atomic Physics Vol 1 - S.N. Ghoshal
2. Optics - Ajoy Ghak
3. Waves & Oscillation - N.K. Bajaj
4. Quantum Physics of Atoms , Molecules, Solids, Nuclei and particles - Eisberg and Resnick

Reference Books

1. Introduction to Special Relativity- Robert Resnick
2. Prospective on Modern Physics - Arthur Beiser
3. Optics - Jenkins and White
4. University Press - Sears & Zemansky
5. Introduction to modern Physics - Mani and Meheta
6. Optics - Brijlal and Subrahmanyam

Course Name : MATHEMATICS I					
Course Code: MATH1101					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

1. Apply the concept of rank of matrices to find the solution of a system of linear simultaneous equations.
2. Develop the concept of eigen values and eigen vectors.
3. Use Mean Value Theorems for power series expansions of functions of one variable.
4. Analyze the nature of sequence and infinite series.
5. Describe the concept of differentiation and integration for functions of several variables with their applications in vector calculus.
6. Combine the concepts of gradient, curl, divergence, directional derivatives, line integrals, surface integrals and volume integrals.

Module I [10L]

Matrix:

Matrices and their basic attributes, 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, Special Complex Matrices: Hermitian, Unitary, Normal(definition only), Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by :Cramer's Rule and Matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Characteristic Equation and computation of eigenvalues and eigenvectors of a square matrix (of order 2 or 3), Cayley-Hamilton theorem and its applications(with special reference to higher power of matrices, e.g. Idempotent and Nilpotent matrices)

Module II [10 L]

Mean Value Theorems & Expansion of Functions:
Rolle's theorem: its geometrical interpretation and its application, Concavity and Convexity of curves, 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).

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(statements and related problems on these tests), Raabe's test, Proof of e being irrational, Alternating series, Leibnitz's Test (statement, definition) illustrated by simple examples, Absolute convergence and Conditional convergence,

Module III [10 L]

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 $(y_n)_0$).

Calculus of Functions of Several Variables:

Recapitulation of some basic ideas of limit and continuity of functions of single variable, Introduction to functions of several variables with examples, Knowledge of limit and continuity, Determination of partial derivatives of higher orders with examples, 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.

Module-IV [10L]

Multiple Integration and Vector Calculus:

Concept of line integrals, Double and triple integrals. 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 Stake's theorem (Statements and applications).

Reduction formula:

Reduction formulae both for indefinite and definite integrals of types:

$\int \sin^n x$, $\int \cos^n x$, $\int \sin^m x \cos^n x$, $\int \cos^m x \sin nx$, $\int \frac{dx}{(x^2+a^2)^n}$, m, n are positive integers.

References

1. Advanced Engineering Mathematics: Erwin Kreyszig by Wiley India
2. Engineering Mathematics: B.S. Grewal (S. Chand &Co.)
3. Higher Engineering Mathematics: John Bird (Elsevier)
4. Advanced Engineering Mathematics: Wiley and Barrett (Tata McGraw-Hill)
5. Calculus: M. J. Strauss, G. L. Bradley and K. L. Smith (Pearson Education)
6. Engineering Mathematics: S. S. Sastry(PHI)
7. Advanced Engineering Mathematics: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP),lndian Edition.
8. Linear Algebra(Schaum's outline series): Seymour Lipschutz, Marc Lipson (McGraw Hill Education)
9. Vector Analysis(Schaum's outline series): M.R. Spiegel, Seymour Lipschutz, Dennis Spellman (McGraw Hill Education)
10. Introduction to Real Analysis: S.K.Mapa (Sarat Book Distributors)

Course Name : Basic Electronics Engineering					
Course Code: ECEN1001					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

1. Categorize different semiconductor materials based on their energy bands and analyze the characteristics of those materials for different doping concentrations based on previous knowledge on semiconductors acquired.
2. Describe energy band of P-N Junction devices and solve problems related to P-N Junction Diode both from device and circuit perspectives.
3. Design different application specific circuits associated with diodes operating both in forward and reverse bias.
4. Analyze various biasing configurations of Bipolar Junction Transistor and categorize different biasing circuits based on stability.
5. Categorize different field-effect transistors based on their constructions, physics and working principles and solve problems associated with analog circuits based on operational amplifiers.
6. Design and implement various practical purpose electronic circuits and systems meant for both special purpose and general purpose and analyze their performance depending on the type of required output and subsequently the applied input.

Module I [10 L]

Semiconductors:

Crystalline material, 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.

Diodes and Diode Circuits:

Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-l characteristics, Zener Diode and its Application, Zener and Avalanche breakdown.
Simple diode circuits, load line, piecewise linear model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module II [10 L]

Bipolar Junction Transistors:

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 modes of operation, transistor action, input & output characteristics, load line & amplifier operation and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor.

Module III [9 L]

Field Effect Transistors:

Junction field effect transistor (JEET): Principle of operation, JFET parameters, eqv. Circuit, JFET biasing, self bias, design of bias circuits, load line, amplifier characteristics.

MOSFETs:

Construction & principle of operation of p- & n-channel enhancement & depletion mode MOSFETs, drain & transfer characteristics, threshold voltage & its control.

Cathode Ray Osilloscope:

Construction and working principle of CRO, Lissajous pattern.

Module IV [9 L]

Feed Back Amplifier:

Concept-block diagram, properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, condition of oscillation, Barkhausen criteria.

Operational Amplifier:

Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; Concept of op-amp saturation, inverting and non-inverting mode of operation, Adders, Subtracters, Voltage follower, Integrator, Differentiator, Basic Comparator Circuit.

References:

1. Boylestad & Nashelsky:Electronic Devices & Circuit Theory
2. R.A Gayakwad:Op Amps and Linear IC's, PHI
3. D. Chattopadhvav. P. C Rakshit: Electronics Fundamentals and Applications
4. Adel S. Sedra. Kenneth Carless Smith: Microelectronics Engineering
5. Millman & Halkias: Integrated Electronics.
6. Salivahanan: Electronics Devices & Circuits.
7. Albert Paul Malvino: Electronic Principle.

Course Name : ENGINEERING MECHANICS					
Course Code: MECH 1101					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

Understand basic concepts of vector algebra as applied to engineering mechanics.

1. Analyze free body diagram of a system under equilibrium.
2. Understand friction phenomenon and calculate friction work loss.
3. Interpret dynamics of members/ links in a mechanism and understand inertia force with the help of D' Alembert's principle.
4. Know how to calculate the CG from the view point of mechanical stability.
5. Calculate MI values required for engineering design calculations.
6. Apply the principles of work - energy and impulse- momentum for analysis of dynamic systems.

Module – l : [10L]

Importance of Mechanics in Engineering; Definition of Mechanics; Concepts of particles & rigid bodies;

Vector and scalar quantities; Vector algebra - definition and notation; Types of vectors - equal , equivalent , free , bound , sliding ; Addition , subtraction of vectors ; Parallelogram law , triangle law , vector polygon ; Scalar multiplication of vectors ; Resolution of vectors in Cartesian co-ordinate system; Unit vector, unit co-ordinate vectors ($\bar{\imath}, \hat{\jmath}, k$) ; Direction cosines ; Addition/subtraction of vectors in components form.

Definition of force vector ; Dot product , cross product and the application ; Important vector quantities (position vector, displacement vector); Moment of a force about a point and about an axis , moment of a couple ;

Representation of force and moments in items of $\bar{\imath}, \hat{\jmath}, k$. Principle of transmissibility of force (sliding vector); Varignon's theorem for a system of concurrent forces with proof; Resolution of a force by its equivalent force-couple system; Resultant of forces.

Module – ll : [10L]

Type of forces - collinear, concurrent, parallel, concentrated, distributed; Active and reactive forces, different types of reaction forces; Free body concept and diagram; Concept and equilibrium of forces in two dimensions; Equations of equilibrium; Equilibrium of three concurrent forces — Lami's theorem.

Concept of friction: Laws of Coulomb's friction; Angle of friction, angle of repose, coefficient of friction — static and kinematic.

Module – lll : [12L]

Distributed force system; Centre of gravity; Centre of mass & centroid; Centroid of an arc; Centroid of plane areas - triangle, circular sector, quadrilateral and composite area consisting of above figures.

Area moment of inertia: Moment of inertia of a plane figure; Polar moment of inertia of a plane figure; Parallel axes theorem.

Concept of simple stress and strain ; Normal stress , shear stress , normal strain, shear strain; Hooke's law; Poisson's ratio; stress- strain diagram of ductile and brittle material; Proportional limit, elastic limit, yield point, ultimate stress, breaking point; Modulus of elasticity.

Module – III : [16L]

Introduction to dynamics: Kinematics & kinetics; Newton's laws of motion; Law of gravitation and acceleration due to gravity; Rectilinear motion of particles with uniform & non - uniform acceleration.

Plane curvilinear motion of particles: Rectangular components (projectile motion), normal and tangential components.

Kinetics of particles: D'Alembert's principle and free body diagram; Principle of work & energy; Principle of conservation of energy.

Impulse momentum theory: Conservation of linear momentum

References:

1. Engineering Mechanics:- Statics and Dynamics by Meriam & Kreige , Wiley India
2. Engineering Mechanics:- Statics and Dynamics by I.H. Shames, P H I
3. Engineering Mechanics by Timoshenko , Young and Rao , TMH
4. Element of strength of materials by Timoshenko & Young, E W P
5. Fundamentals of Engineering Mechanics by Nag & Chanda - Chhaya Prakashani.

Course Name : PHYSICS I Lab					
Course Code: PHYS 1011					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	3	3	2

List of Experiments:

Determination of Young's modulus by Flexure Method and calculation of bending moment and shear force at a point on the beam.

1. Determination of modulus of rigidity by Static/Dynamic Method.
2. Determination of thermal conductivity of a good conductor by Searle's Method.
3. Determination of thermal conductivity of a bad conductor by Lee's and Chorlton's Method.
4. Determination of dielectric constant of a given dielectric material.
5. Use of Carey Foster's bridge to determine unknown resistance.
6. Determination of wavelength of light by Newton's ring method.
7. Determination of wavelength of light by Fresnel's biprism method.
8. Determination of wavelength of light by Laser diffraction method.
9. Determination of dispersive power of the material of a given prism.
10. Determination of co-efficient of viscosity of a liquid by Poiseulle's capillary flow method.

Course Name : Basic Electronics Engineering Lab					
Course Code: ECEN1011					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	3	3	2

List of Experiments

1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs in CB mode.
7. Study of I-V characteristics of BJTs in CE mode.
8. Study of I-V characteristics of Field Effect Transistors.
9. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
10. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
11. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, and Integrators.

Course Name : Workshop Practice					
Course Code: MECH1011					
Contact hrs per week:	L	T	P	Total	Credit points
	1	0	3	4	3

Job 1: General awareness of a typical workshop.

Theory requirements: Workshop definition, various shops in a typical workshop, Carpentry, Fitting, Foundry; Sheet Metal Shop, Welding and Brazing Shop, Machine Shop , Forging & Blacksmithy, Safety precautions to be followed in a workshop, Familiarization of Various safety devices and their uses.

Job 2: Making of a wooden pattern.

Theory requirements: Market forms of converted Timber ,eg, log, balk, plank, batten, beam .Types of Wood, Hard Wood, Soft Wood, particle board; Seasoning of wood, Natural seasoning, Artificial seasoning, Carpentry Tools-Marking Tools, Cutting Tools, Planing Tools, Boring Tools, Striking Tools , Holding & Misc. Tools, Carpentry Processes (marking, sawing, planning, chiselling, boring, grooving, joining etc.), Safely precautions in Carpentry Shop.

Job 3: Making of a matched profile form MS plate.

Theory requirements: Work Bench, Fitting Tools (Bench Vice, Chisel, Hammer, Different types of Files, (Rough, Bastard, Second Cut, Half Round, Triangular File),Saw(Hack saw etc.), Scriber, Punch, Try Square, Angle Plate, caliper (outside & inside), Universal Surface Gauge, Centre Punch, Prick Punch, Drill (Flat, straight fluted, taper shank twist drill).
Fitting Operations, Filing, Marking, Drilling, Tapping (Rougher, Intermediate, Finisher taps), Tap Drill size (D=T-2d), Sawing, Dieing. Safety precautions in Fitting Shop.

Job 4: Making of an internal and external thread.

Theory requirements : Thread standards and thread classifications, Internal Thread, External Thread, Thread Nomenclature (Major dia, Minor dia, Pitch dia, pitch, Lead, TPI, Metric, BSP , Nominal size), Specifications of threaded fasteners (in Metric System). Safety precautions in Dieing and Tapping.

Job 5: Making of a green sand mould using the pattern made under Job no. 2.

Theory requirements: Mould making, Preparation of sand, (silica, clay, moisture, and misc items and their functions), Properties of a good sand mould, General procedure for making a good sand mould, Different tools used for preparation of a mould, Explanation of various terms , Cope and Drag Box, Runner, Riser, Gating and its utility, Parting sand, Vent holes.

Job 6: Demonstration of metal melting and casting

Theory requirements: Metal melting furnaces: Ladles, Using of Tongs, Molten metal pouring procedure, Safety precautions in pouring molten metal in a mould.

Job 7. Making of a stepped pin in a centre lathe. (2 Classes)

Theory requirements: Machining and common machining operations , Lathe M/c and its specifications, Head stock, Tailstock, Chuck-Self centering chuck , 4 jaw chuck, Bed, Carriage, Feed mechanism, Screw cutting mechanism, various lathe operations like turning, facing, grooving, chamfering, taper turning .Thread cutting, Knurling, Parting, Cutting speed, Feed, Depth of cut, Different types of cutting tools-Safety precautions in a machine shop.

Job 8: Making of square prism from a round shaft by Shaping Machine

Theory requirements: Description of a Shaping machine, Base , Column, Saddle, Clapper box, Quick return mechanism, Feed Mechanism, Table, Rotation of table, Adjustment of stroke length, Adjustment of starting point of cut. Safety Precautions while working in Shaping Machine.

Job 9: Making of square prism from a round shaft by Milling Machine

Theory requirements: Description of a milling machine, Specification of a Milling machine, Types of Milling-Dp Milling, Down Milling, Vertical Milling Machine, Horizontal Milling Machine , Safety precautions while working in Milling Machine.

Job 10: Arc Welding practice and making of a welded joint

Theory requirements: Welding, Weldability, Types of Welding, MMAW, Gas Welding, Electrode , Functions of Flux, Equipment for MMAW, Different types of Flames in Gas Welding and Gas Cutting (Neutral-Oxidising-Reducing Flames), Different types of welding joints, AC Welding , DC Welding; Safety precautions in Welding Shop.

Job 11: Sheet Metal forming & Brazing

Theory requirement: Specification of sheet metal, SWG vs. mm, HR sheet, CR sheet, Gl Sheet, Stainless Steel Sheet, Aluminum sheets, Tin Plates, Sheet metal working Tools, Micrometer, Chisels, Punches, Hammers, Mallets, Hand Shear or Snippets, Various sheet metal forming operations, Shearing, Marking, Punching, Drilling, Bending, Drawing, Brazing, Safety precautions in Sheet Metal Working Shop.

References:

1. Elements of Workshop Technology (Vol- land II)- Hajra Choudhury, Media Promoter &Publishers Privet Limited.

2. Workshop Technology (Vol-1 and II) - Chapman, Viva Books Privet Limited.

Course Name : Language Practice Lab (level 1)					
Course Code: HMTS 1111					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	2	2	1

Module I [3P]

Introduction to Linguistics (Phonology)
Phonetics-Vowel and Consonant Sounds (Identification &articulation)
Word- stress
Intonation (Falling and rising tone)
Voice Modulation
Accent training

Module II [3P]

Listening Skills
Principles of Listening
Approaches to listening
Guidelines for Effective
Listening Listening
Comprehension Audio Visual
(Reviews)

Module III [2P]

Discourse Analysis-Spoken Discourse Conversational Skills / Spoken Skills Analysing Speech dynamics (Political Speeches Formal Business Speeches)

Module IV [9P]

Writing Skill-Descriptive, narrative and
expository writing
Writing with a purpose—Convincing skill, argumentative skill/negotiating Skill (These skills will be repeated in oral skills).
Writing reports/essays/articles—logical organization of thoughts
Book review

References

1. Munter, Mary. Guide to Managerial Communication. 5th ed. Upper Saddle River, NJ: Prentice Hall, 1999.
2. Cypres, Linda. Let's Speak Business English. Hauppauge, NY: Barren's Educational Series, 1999. Crystal, David. 1971. *Linguistics.* Baltimore: Penguin Books.
3. Larsen-Freeman, D. (1986). "Techniques and principles in language teaching." Oxford: Oxford University Press.
4. Littlewood, W. (1981). "Language teaching. An introduction." Cambridge: Cambridge University Press.
5. Savignon, S. J. & Berns, M. S. (Eds.). (1983) "Communicative language teaching: Where are we going? Studies in Language Learning," 4(2). (EDRS No. ED 278 226, 210 pages)

Course Name : Co Curricular Activities					
Course Code: HMTS 1121					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	2	2	1

Objective: This course aims at instilling a sense of social responsibility. This objective can be achieved by bringing in awareness about the contemporary issues relevant to the GenX and Gen Y through enlightened discussions and active participation. Since the course has 1 credit detailed planning regarding the area of activities and method of evaluation should be charted at the start of the semester.

Module I:

Project Work

Development of projects based on integral and holistic developmental models to be implemented in rural areas or underdeveloped areas in the peripheral areas of cities. This could include a wide area of activity-
from taking up a research projects to analyse the need of a particular underdeveloped area to trying to implement a project already formulated. This could also relate to mobilizing funds for a specific project.

Module II:

Action-oriented schemes

e.g. Organising Blood -donation camps
Conducting child -healthcare services Helping the old and sick (in coordination with NGOs and other institutes)

Module III:

Society and Youth

Developing Awareness among the youth about social issues both local and global for e.g. Eradication of social evils like drug abuse, violence against women and others.

Module IV:

Youth and Culture

Generating new ideas and help the participants to be creative and innovative for e.g. Enacting street plays, encouraging creative writing by organizing workshops and competitions. Active participation of the students in the nation building process by making positive changes in the social and individual space.

Course Name : Introduction to Computing					
Course Code: CSEN 1201					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Learning Objective: Introduction to the concept of computer and computation and solving of problems using C as a programming language. Coverage of C will include basic concepts, arithmetic and logic, flow control, and data handling using arrays, structures, pointers and files.

Course Outcome:

Understand basic concepts of vector algebra as applied to engineering mechanics.

1. Analyze free body diagram of a system under equilibrium.
2. Understand friction phenomenon and calculate friction work loss.
3. Interpret dynamics of members/ links in a mechanism and understand inertia force with the help of D' Alembert's principle.
4. Know how to calculate the CG from the view point of mechanical stability.
5. Calculate MI values required for engineering design calculations.
6. Apply the principles of work - energy and impulse- momentum for analysis of dynamic systems.

Module I : [13L]

Fundamentals of Computer

History of Computers, Generations of Computers, Classification of Computers.

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Assembly language, high level language, compiler and assembler (basic concepts).

Binary & Allied number systems (decimal, octal and hexadecimal) with signed and unsigned numbers (using 1's and 2's complement) - their representation, conversion and arithmetic operations. Packed and unpacked BCD system, ASCII. IEEE-754 floating point representation (half-16 bit, full- 32 bit, double- 64 bit). Binary Arithmetic & logic gates. Boolean algebra - expression, simplification, Karnaugh Maps.

Basic concepts of operating systems like MS WINDOW, LINUX. How to write algorithms & draw flow charts.

Module II : [5L]

Basic Concepts of C

C Fundamentals:

The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements.

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. Standard input and output, formatted output -printf, formatted input scanf.

Module III : [8L]

Program Structures in C

Flow of Control:

Statement and blocks, if-else, switch-case, loops (while, for, do-while), break and continue, go to and labels.

Basic of functions, function prototypes, functions returning values, functions not returning values. Storage classes - auto, external, static and register variables -comparison between them. Scope, longevity and visibility of variables.

C preprocessor (macro, header files), command line arguments.

Module IV : [14L]

Data Handling in C

Arrays and Pointers:

One dimensional arrays, pointers and functions - call by value and call by reference, array of arrays. Dynamic memory usage- using malloc( ), calloc( ), free( ), realloc( ). Array pointer duality.

String and character arrays; C library string functions and their use.

User defined data types and files:

Basic of structures; structures and functions; arrays of structures.

Files - text files only, modes of operation. File related functions – fopen( ), fclose( ), fscanf( ), fprintf( ), fgets( ), fputs( );

Text Books

1. Schaum's outline of Programming with C - Byron Gottfried
2. Teach Yourself C- Herbert Schildt
3. Programming in ANSI C - E Balagurusamy

Reference Books

1. C: The Complete Reference - Herbert Schildt
2. The C Programming Language - D.M. Ritchie, B.W. Kernighan

Course Name : Chemistry 1					
Course Code: CHEM 1001					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

1. Knowledge of understanding the operating principles and reaction involved in batteries and fuel cells and their application in automobiles as well as other sectors to reduce environmental pollution.
2. An ability to design and conduct experiments, as well as to organize, analyzes, and interprets data
3. An ability to identify and formulate polymers and have a knowledge of various polymers like polyethene, PVC, PS, Teflon, Bakelite, Nylon which have engineering applications
4. Knowledge of synthesizing Nanomaterials and their applications in industry, carbon nano tube technology is used in every industry now-a-days
5. An ability of synthesizing bio fuels as a renewable and environment friendly alternative source for natural fuel
6. Elementary knowledge of IR and UV spectroscopy is usable in structure elucidation and characterisation of various molecules

Module I [10 L]

Thermodynamics & Spectroscopy

Chemical Thermodynamics & Thermochemistry:

Concept of Thermodynamic system, Introduction to first law of thermodynamics, Enthalpy Heat Capacity, Reversible and Irreversible processes, Adiabatic changes, Application of first law of thermodynamics to chemical processes, 2nd law of thermodynamics, Evaluation of entropy, Work function and free energy, Phase Changes, Clausius Clapeyron Equation, Chemical Potential, Gibbs Duhem Relation, Activity and Activity coefficient.

Spectroscopy

Electromagnetic Radiation, Basic idea of UV-visible & IR Spectroscopy.

Module II [10 L]

Structure & Bonding

Chemical Bonding:

Covalent bond, VSEPR Theory, Molecular Orbital Theory, Hydrogen bond, Intermolecular forces-vander Waals forces, lonization energy, Electronegativity, Electron affinity, Hybridisation, Dipole moment.

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.

Ionic Equilibria and Redox Equlibria:

Acid Base Equilibria in water, Strength of acids and bases, Hydrogen ion exponent, Ionic product of water, Salt Hydrolysis and Henderson Equation, Buffer solutions, pH indicator, Common ion Effect, Solubility product, Fractional Precipitation, Redox Equilibria.

Structure and reactivity of Organic molecule:

Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals.
Brief study of some addition, eliminations and substitution reactions.

Module III [10L]

Electrochemistry & Reaction Dynamics

Conductance:

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance, 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 KCI vs $AgNO_3$.

Electrochemical Cell:

Cell EMF and thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen 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) the change in thermodynamic function (ΔG, ΔH, ΔS), b) the equilibrium constant of a reversible chemical reaction, c) the valency of an ion.

Kinetics:

Reaction laws: rate expression, order and molecularity, zero, first and second order kinetics. Pseudounimolecular reaction, Arrhenius equation.
Mechanism and theories of reaction rates (Collision theory and Transition state theory,).
Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics).

Module IV [10L]

INDUSTRIAL CHEMISTRY & POLYMERIZATION

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.

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, Copolymerization, 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, PVC, Bakelite, PP), rubber (natural rubber, SBR, NBR) and Vulcanization., fibre (nylon 6.6, Nylon 6, Polyester).

Conducting and semi-conducting polymers.

Text Books

1. Engineering Chemistry, Gourkrishna Dasmohapatra, Vikas Publishing House
2. A Text book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co PvtLtd
3. Engineering Chemistry, K. L. Chugh, Kalyani Publishers.

Reference Books

1. General & Inorganic Chemistry, R. P. Sarkar, Fuels and Combustion, New Central Book Agency P Ltd.
2. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc
3. Organic Chemistry, Morrison & Boyd, Prentice Hall of India
4. Physical Chemistry, K. L. Kapoor, McMillan
5. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).

Course Name : Mathematics II					
Course Code: MATH1201					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

1. Construct differential equation as a mathematical model of physical phenomena.
2. Choose proper method for finding solution of a specific differential equation.
3. Discuss the elementary concepts of graph theory, for example, walk, path, cycle, Eulerian graph, Hamiltonian graph and tree.
4. Apply basic graph algorithms for searching and finding minimal spanning tree and shortest path.
5. Solve improper integrals and initial value problems with the help of Laplace transformation.
6. Evaluate distance, angle between planes and shortest distance between two skew lines in three dimension.

Module I : [10 L]

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 and non-linear differential equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation).

Second 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.

Module II : [10L]

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.

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 DPS, BFS, Kruskal's and Prim's algorithms.

Module III [10L]

Improper Integral:

Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations.

Laplace Transform:

Introduction to integral transformation, functions of exponential order, Definition and existence of LT (statement of initial and final value theorem only), LT of elementary functions, Properties of Laplace Transformations , Evaluation of sine , cosine and exponential integrals using LT, LT of periodic and step functions Definition and properties of inverse LT Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODEs with constant coefficients (initial value problem) using LT.

Module IV [10L]

Three Dimensional Geometry:

Equation of a plane. General form. Transformation to the normal form. Intercepts. Equation of the plane through three given points. Equation of a plane passing through the intersection of two planes. Angle between two intersecting planes. Bisectors of angles between two intersecting planes. Parallelism and perpendicularity of two planes.

Canonical equation of the line of intersection of two intersecting planes. Angle between two lines. Shortest distance between two lines. Condition of coplanarity of two lines. Length of the perpendicular from a point to a given line.

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, (WileyEastern)
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 (SPrdP edition, Pearson Education)
9. Engineering Mathematics (Volume 2): S. S. Sastry (Prentice-Hall of India)
10. Introductory Course in Differential Equations: Daniel A. Murray (Longmans & Green).
11. Co-ordinate Geometry - S. L. Loney.
12. Analytical Geometry And Vector Algebra- R M Khan

Course Name : BASIC ELECTRICAL ENGINEERING					
Course Code: ELEC1001					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

1. Analyse DC electrical circuits using KCL, KVL and network theorems like Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.
2. Analyse DC Machines; Starters and speed control of DC motors.
3. Analyse magnetic circuits.
4. Analyse single and three phase AC circuits.
5. Analyse the operation of single phase transformers.
6. Analyse the operation of three phase induction motors.

Module – l : [12 L]

DC Network Theorem: Kirch hoff's law, nodal analysis, mesh analysis, Superposition theorem, Thevenin's theorem, Norton theorem, Maximum power transfer theorem, star-delta conversion.

DC Machines: Construction, EMF equation, Principle of operation of DC generator, open circuit characteristics, external characteristics, Principle of operation of DC motor, Speed-torque characteristics of shunt and series machine, starting of DC motor, speed control of dc motor.

Module - ll [8L]

Electrostatics: Gauss's law and its applications to electric field and potential calculation. Capacitor, capacitance of parallel plate capacitor, spherical capacitor and cylindrical capacitor.

Electromagnetism: Amperes law, Biot-savart's law, Ampere's circuital law and their applications, Magnetic circuits, analogy between magnetic and electric circuits, Faraday's law, self and mutual inductance. Energy stored in a magnetic field, Hysteresis and Eddy current losses.

Module – Ill [10L]

AC single phase system: concept of alternating signal, average and RMS values of alternating signal, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, AC series , parallel and series parallel circuits, Active power, Reactive power, power factor, Resonance in RLC series and parallel circuit, Q factor, bandwidth.

Three phase system: balanced three phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two wattmeter method.

Module-IV [10L]

Single phase transformer: Construction, EMF equation, no load and on load operation and their phasor diagrams, Equivalent circuit, Regulation, losses of a transformer, open and short circuit tests, efficiency.

3-phase induction motor: Concept of rotating magnetic field, principle of operation, Construction, equivalent circuit and phasor diagram, torque-speed/slip characteristics, Starting of Induction Motor.

Text Books:

1. Basic Electrical engineering, D.P. Kothari & I.J. Nagrath, TMH, Second Edition
2. Basic Electrical Engineering, V.N. Mittle & Arvind Mittal, TMH, Second Edition
3. Basic Electrical Engineering, Hughes
4. Electrical Technology, Vol - l, Vol - ll, Surinder Pal Bali, Pearson Publication
5. A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company

Reference Books:

1. Electrical Engineering Fundamentals, Vincent Del Toro, Prentice-Hall
2. Advance Electrical Technology, H.Cotton, Reem Publication
3. Basic Electrical Engineering, R.A. Natarajan, P.R. Babu, Sictech Publishers
4. Basic Electrical Engineering, N.K. Mondal, DhanpatRai
5. Basic Electrical Engineering, Nath &Chakraborti
6. Fundamental of Electrical Engineering, Rajendra Prasad, PHI, Edition 2005.

Course Name : Engineering Thermodynamics & Fluid Mechanics					
Course Code: MECH1201					
Contact hrs per week:	L	T	P	Total	Credit points
	3	1	0	4	4

Course Outcome:

1. To analyze a thermodynamic system and calculate work transfer in various quasi-static processes.
2. To understand and apply the first law and 2nd law of thermodynamics.
3. To analyze thermal efficiency of Otto, Diesel cycles.
4. To understand physical properties of fluids
5. To apply mass, momentum and energy conservation principles to incompressible fluid flow.
6. To describe fluid flow and analyze acceleration of fluid particles.

Module I [10 L]

Basic concepts of Thermodynamics:

Introduction; Macroscopic and microscopic concept; Definition of Thermodynamic systems; Surrounding, universe; Open, closed and isolated systems; Concept of control volume; Thermodynamic properties: intensive, extensive & specific properties; state.

Thermodynamic equilibrium; Change of state; Thermodynamic processes and cycles; Quasi-static processes; Reversible processes; Zeroth law of Thermodynamics - concept of temperature.

Heat & Work:

Definition of Thermodynamic work; Work transfer-displacement work for a simple compressible system, path function, PdV work in various quasi-static processes(isothermal, isobaric, adiabatic, polytropic, isochoric); Free expansion; Indicated diagram (P-V diagram).
Definition of heat; Heat transfer-a path function; Similarities and dissimilarities between heat and work.

Module II [8 L]

First law of Thermodynamics: Statement; 1st law for a closed system executing a cycle; Concept of stored energy; Energy as a property, different forms of stored energy, internal energy, first law for a non-flow process; Flow work; Definition of enthalpy, C_p, (X; Energy of an isolated system; Flow energy; First law for an open system - steady flow energy equation; Examples of steady flow devices (nozzle and diffuser, turbine, pump, compressor, boiler, condenser and throttling device); PMM-I

Module III [10L]

Second law of Thermodynamics:

Qualitative difference between heat and work; Definition of source & sink: cyclic heat engine, heat pump and refrigerator, thermal efficiency of heat engine, C.O.P of heat pump and refrigerator; Kelvin-Plank and Clausius statements of second law; Equivalence of the two statements.

Reversible process; Irreversible process; Factors for irreversibility; Carnot cycle and Carnot efficiency; Reversible heat engine and heat pump; PMM-II

Entropy: Mathematical statement of Clausius Inequality: Entropy as a property; Entropy principle; T-s plot for reversible isothermal, adiabatic, isochoric & isobaric processes.

Air standard Cycles:

Otto cycle & Diesel cycle, P-V & T-s plots, Net work done and thermal efficiency.

Module IV [10L]

Properties & Classification of Fluid:

Definition of fluid; Concept of Continuum; Fluid properties- density, specific weight, specific volume, specific gravity; Viscosity: definition , causes of viscosity, Newton's law of viscosity, dimensional formula and units of viscosity, kinematic viscosity; Variation of viscosity with temperature. Ideal and Real fluids; Newtonian and Non-Newtonian fluids; No-slip condition.

Compressibility and Bulk modulus of elasticity.

Difference between compressible and incompressible fluids.

Fluid Statics:

Introduction; Pascal's Law-statement and proof; Basic Hydrostatic Law and its proof; Variation of pressure with depth in incompressible fluid, piezometric head, pressure head; Unit and scales of pressure measurement.

Measurement of fluid pressure: Piezometer, Manometers -Simple and Differential U-tube manometer, Inverted tube manometer, Inclined tube manometer.

Characteristics and choice of manometric fluid.

Module V [10 L]

Fluid Kinematics:

Definition; Flow field and description of fluid motion (Eulerian & Lagrangian method), steady and unsteady flow, uniform and non-uniform flow-examples.

Acceleration of a fluid particle-local acceleration, convective acceleration. Stream line, Stream tube, Path line and Streak line; Laminar and Turbulent flow, Reynolds Number. Equations of streamlines and path lines.

Continuity equation for unidirectional flow and for differential form in 3-D Cartesian coordinate system.

Dynamics of Ideal fluids:

Introduction, Euler's equation of motion along a streamline; Bernoulli's equation-assumptions and significance of each term of Bernoulli's equation. Application of Bernoulli's equation-problem on pipe line. Measurement of flow rate: Venturimeter and orificemeter.
Static pressure, Dynamic pressure, Stagnation pressure-measurement of velocity by Pitottube.

References:

1. Engineering Thermodynamics- Nag, P.K. - T. M.H
2. Fundamentals of Thermodynamics - Sonntag, Borgnakke & Van Wylen, Wiley India
3. Thermodynamics- an Engineering approach - 6e, Cengel & Boles, TM
4. Fluid Mechanics & Hydraulic Machines - R.K. Bansal, Laxmi Publications Ltd, India
5. Introduction to Fluid Mechanics and Fluid Machines- S.K. Som, G. Biswas, & S. Chakraborty, T.M.H
6. Fluid Mechanics-A.K. Jain, Khanna Publishers.

Course Name : Introduction to Computing Lab					
Course Code: CSEN1211					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	3	3	2

Basic Computation & Principles of Computer Programming Lab

Softwares to be used: Cygwin and notepad++, Tiny C

Day 1: LINUX commands and LINUX based editor
Day 2: Basic Problem Solving
Day 3: Control Statements (if, if-else, if-elseif-else, switch-case)
Day 4: Loops - Part I (for, while, do-while)
Day 5: Loops- Part II
Day 6: One Dimensional Array
Day 7: Array of Arrays
Day 8: Character Arrays/ Strings
Day 9: Basics of C Functions
Day 10: Recursive Functions
Day 11: Pointers
Day 12: Structures and Unions
Day 13: File Handling

Course Name : CHEMISTRY I LAB					
Course Code: CHEM 1011					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	3	3	2

List of Experiments:

1. To determine the alkalinity in a given water sample.
2. Estimation of iron using $KMnO_4$: self indicator.
3. Estimation of iron using $K_2Cr_2O_7$: redox sensitive indicator.
4. To determine total hardness and amount of calcium and magnesium separately in a given water sample.
5. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
6. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
7. Conductometric titration for determination of the strength of a given HCI solution by titration against a standard NaOH solution.
8. pH- metric titration for determination of strength of a given HCI solution against a standard NaOH solution.
9. lodometric estimation of Cu^{2+}.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution).

Course Name : BASIC ELECTRICAL ENGINEERING LAB.					
Course Code: ELEC1011					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	3	3	2

List of Experiments:

1. Characteristics of Fluorescent lamps.
2. Characteristics of Tungsten and Carbon filament lamps.
3. Verification of Thevenin's & Norton's theorem.
4. Verification of Superposition theorem.
5. Verification of Maximum Power Transfer theorem.
6. Calibration of ammeter and voltmeter.
7. Open circuit and Short circuit test of a single phase Transformer.
8. Study of R-L-C Series / Parallel circuit.
9. Starting and reversing of speed of a D.C. shunt Motor.
10. Speed control of DC shunt motor.
11. No load characteristics of D.C shunt Generators.
12. Measurement of power in a three phase circuit by two wattmeter method.

Course Name : Engineering Drawing					
Course Code: MECH 1012					
Contact hrs per week:	L	T	P	Total	Credit points
	1	0	3	4	3

1. Importance of engineering drawing; Acquaintance with different drafting equipment & accessories;
2. Introduction to lines: Practising different types of lines; Basic concepts in Lettering : Practising vertical & inclined letters (Practice Sheet 1)
3. Different systems of dimensioning with practice. Introduction to the concept of scale of drawing. (Practice Sheet 2)
4. Introduction to concept of orthographic projection: 1st angle and 3rd angle projection method; Symbols; projection of points. (Practice Sheets)
5. Projection of straight lines for different orientation including inclined to both the planes. (Practice Sheet 4)
6. Projection of plane surfaces inclined to HP and parallel to VP; Inclined to VP and Parallel to HP (Practice Sheets)
7. Projection of solids: Cube, rectangular prism, Hexagonal prism, Cylinder, Pyramid, Cone. (Practice Sheet 6)
8. Section of solids and their projections on principal and auxiliary planes for true shape: Cylinder, hexagonal pyramid. (Practice Sheet 7)
9. Isometric projections: Basic concepts, isometric scale; Isometric projection and view.
10. Practice with simple laminar and solid objects. (Practice Sheet 8)

References:

1. "Elementary Engineering Drawing" by Bhatt, N.D; Charotan Book Stall, Anand
2. "Engineering Graphics" by Narayana, K.L. and Kannaaiah P; TMH
3. "Engineering Graphics" by Lakshminarayanan, V. and Vaish Wanar, R.S, JainBrothers.

Subject Name: MATHEMATICAL METHODS
Subject Code: MATH 2001
Contact: 3L+2T
Credit: 4

Course Outcome:

After completing the course the student will be able to:

1. Construct appropriate mathematical models of physical systems.

2. Recognize the concepts of complex integration, Poles and Residuals in the stability analysis of engineering problems.

3. Generate the complex exponential Fourier series of a function and make out how the complex Fourier coefficients are related to the Fourier cosine and sine coefficients.

4. Interpret the nature of physical phenomena when the domain is shifted by Fourier Transform e.g. continuous time signals and systems.

5. Develop computational understanding of second order differential equations with analytic coefficients along with Bessel and Legendre differential equations with their corresponding recurrence relations.

6. Master how partial differentials equations can serve as models for physical processes such as vibrations, heat transfer etc.

Module I : Functions of Complex Variables (12L)

Complex numbers and its geometrical representation.
Functions of a complex variable – Limits, Continuity, Differentiability.
Analytic Functions, Cauchy- Riemann equations, Necessary and sufficient conditions for analyticity of complex functions (Statement only), Harmonic functions.
Line Integral on complex plane, Cauchy-Goursat theorem, Cauchy's Integral Formula.
Taylor's and Laurent's series expansion.
Zeros, Different types of Singularities. Definitions of poles and residues, Residue Theorem, Evaluation of real integrals using residue theorem.

Module II : Fourier Series, Integrals and Transforms (12L)

Definite Integra, Orthogonality of Trigonometric Functions, Power Series and its convergence.
Periodic Functions, Even and Odd Functions, Dirichlet's Conditions, Euler Formulas for Fourier coefficients, Fourier series representation of a function, e.g. Periodic square wave, Half wave rectifier, Unit step function.
Half Range series, Parseval's Identity.
Fourier Integral theorem, Fourier transform, Fourier sine and cosine transform, Linearity, Scaling, Frequency Shifting and Time shifting properties, Convolution Theorem.
Discussion of some physical problems: e.g Forced oscillations.

Module III: Series solutions to Ordinary Differential equations and Special Functions (12L)

Series solution of ODE: Ordinary point, Singular point and Regular Singular point, series solution when $x = a$ is an ordinary point, Frobenius method.
Legendre's Equation, Legendre's polynomials and its graphical representation.
Bessel's equation, Bessel's function of first kind and its graphical representation.
Finite Difference Method and its application to Boundary Value Problem.

Module IV: Partial Differential Equations (12L)

Introduction to partial differential equations, Formation of partial differential equations, Linear and Nonlinear pde of first order, Lagrange's and Charpit's method of solution.

Second order partial differential equations with constant coefficients , Illustration of wave equation, one dimensional heat equation, Laplace's equation, Boundary value problems and their solution by the method of separation of variables.

Solution of Boundary value problems by Laplace and Fourier transforms.

Suggested Books:

1. Complex Variables and Applications, Brown Churchill, MC Graw Hill
2. Complex Variable, Murrey R. Spiegel, Schaum's Outline Series
3. Theory of Functions of a Complex Variable, Shanti Narayan, P. K. Mittal S. Chand
4. Larry C. Andrew, B. K. Shivamoggi, Integral Transforms for Engineers and Applied Mathematicians, Macmillan
5. Fourier Analysis with Boundary Value Problem, Murrey R. Spiegel, Schaum's Outline Series
6. Mathematical Methods, Potter, Merle C., Goldberg, Jack. PHI Learning
7. Ordinary and Partial Differential Equations, M. D. Raisinghania, S. Chand
8. Elements of Partial Differential Equation, Ian Naismith Sneddon Dover Publications
9. Advanced Engineering Mathematics, Kreyszig, Willey
10. Higher Engineering Mathematics, B. V. Ramana, Tata McGraw-Hill

Subject Name: SURVEYING

Subject Code: CIVL 2101

Contacts: 3 L + 1 T

Credits: 4

Course Outcome:

After going through this course, the students will be able to:

1. Demonstrate the basics of linear/angular measurement methods like chain surveying, compass surveying and the significance of plane table surveying in plan making.
2. Analyze and interpret the data of leveling and theodolite survey in elevation and angular measurements.
3. Illustrate the theory and data of tacheometric surveying in distance and height measurements.
4. Estimate the area and volume by different methods.
5. Construct simple circular curves by using linear and angular method and to know the basics of transition curve.
6. Explain the basic concepts of the modern instrument like EDMs, GPS instrument, Total Station etc. and demonstrate the concepts of Triangulation, Hydrographic Survey and Aerial Photogrammetry.

SL. No	Module	Details of Course Contents	Hours	Total
1	I	**BASICS OF SURVEYING** Introduction to Surveying efinition, principles of surveying, types of scales (numerical problems), basic concepts of plans and maps. Chain Surveying ypes of chains, accessories for chain surveying with their use, methods of ranging and methods of offsets, obstacles in chain surveying. Compass Surveying Definition, instrument and terminology, local attraction and its elimination, Open and closed traverse, adjustment of traverse. Plane Table Surveying rinciple, equipment and methods, two and three point problems.	2 2 4 2	44
2	II	**METHODS OF MEASUREMENT** Levelling and Contouring Definitions and terminology, types and methods of leveling, use of leveling instruments and supporting accessories, different terms used in contouring, characteristics of contour and contour interval. Theodolite Surveying and Tacheometry Components of Theodolite, adjustments, measurement of vertical and horizontal angels, concepts of trigonometric leveling, definitions and principles of tachometry and stadia system, fixed hair stadia method, calculation of horizontal and vertical distance using tachometer.	6 8	

3	III	**COMPUTATION PROCEDURE AND SETTING OUT WORKS** Computation of Area And Volume)mputation of area using trapezoidal rule and Simpson's $^1/_3$ rule.)mputation of volume of different cross sections. Setting Out Of Horizontal Curves Elements of simple circular curves and methods of setting out simple circular curve by linear and angular method. equirements, types and elements of transition curve. Setting Out Of Vertical Curves Introduction to vertical curves.	2 4 1	
4	IV	**INTRODUCTION TO HIGHER SURVEYING** Measurement Procedure Using Advanced Instruments Basic concepts of EDMs and GPS instrument (relating to land surveying), Total Station and its different parts. Practical application of Total Station. Triangulation Concepts of triangulation and triangulation systems in brief. Hydrographic Survey Shoreline survey, soundings, locating soundings and reduction of soundings. Basic concept of Mean sea level, bathymetry. Aerial Photogrammetry Terminology, equipments and phototheodolite.	4 2 4 3	

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	Name of the Books
1.	Duggal S. K. *Surveying (Vol-1 and 2).* 4th edition, McGraw Hill Education (India) Pvt Ltd.
2.	Roy S.K. *Fundamentals of Surveying*. 2nd edition, PHI Learning Pvt. Ltd-New Delhi.
3.	Punmia B.C., Jain A.K. and Jain A.K. *Surveying (Vol-1 and 2).* 15th edition, Laxmi Publications (P) Ltd.

REFERENCE BOOKS	
Sl. No.	Name of the books
1.	Subramanian R. *Surveying and Levelling*. 2nd editon, Oxford university Press.
2.	Venkatramaiah C. *Textbook of Surveying*. 2nd edition, Orient Blackswan Pvt. Ltd. – New Delhi.
3.	Bannister A., Raymond S. and Baker R. *Surveying*. 1st edition, Pearson India.

Subject Name: STRENGTH OF MATERIALS

Subject Code: CIVL 2102

Contact: 3L + 1T = 4

Credit: 4

Course Outcome:

1. To identify the equilibrium conditions and elastic properties of axially loaded bars through stress-strain and force-displacement curves.
2. To identify the principal plane and principal stresses through Mohr circle.
3. To calculate the hoop and meridional stresses in thin cylinders and spherical shells.
4. To identify different degrees of freedoms for support conditions like hinge, roller and fixed constraints.
5. To calculate the bending moment, shear force and deflection of beams for uniformly distributed, concentrated, linearly varying and external concentrated moment.
6. To calculate the member forces in a plane truss using Method of Joint and Method of Section.
7. To identify torsional moment and twist on a circular shaft and calculate the shear stress.
8. To know the concepts of strain energy due to axial load, bending and shear.
9. To calculate the buckling load of columns using Euler's theory for different support constraints.

Sl.No.	Module	Details of course content	Hours	Total
1.	I	i. Condition of equilibrium, Degrees of freedom, Relation between different Elastic moduli, Composite section, thermal stress. ii. Principal stresses, principal plane, and Mohr's circle. iii. Hoop and meridonial stresses in thin cylindrical, conical and spherical shells.	8	44
2.	II	i. Shear force and bending moment diagrams for statically determinate beams subjected to concentrated, uniformly distributed, and linearly varying loads, relationship between load, shear force and bending moment. ii. Bending of beams, elastic flexure formulae, Bending and shear stress, shear centre and shear flow	14	
3.	III	i. Analysis of determinate two dimensional truss by Method of joints and Method of section and graphical method. ii. Torsion in circular solid and hollow shafts	8	
4.	IV	i. Slope and deflection analysis of determinate beams using Double integration method, Area-Moment theorem and Conjugate beam theory. ii. Strain energy: Strain energy and complementary strain energy, Strain energy due to axial load, bending and shear. iii. Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions – limitations and problems, eccentric load and secant formula.	14	

Reference books

Sl. No.	Name of the book	Name of author/authors	Publisher
1	Elements of Strength of Material	S. P. Timoshenko and 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 Materials	S S Bhavikatti	Vikas Publishing House Ltd
5	Strength of Material	A. Pytel & F. L. Singer	AWL Inc
6	Engineering Mechanics	J. L. Mariam	John Willey
7	Engineering Mechanics	I. H. Shames	PHI
8	Strength of Materials	S. S Rattan	McGraw Hill Education Pvt. Ltd.

Subject Name: BUILDING MATERIALS AND CONSTRUCTION

Subject Code: CIVL 2103

Contacts: 3 L + 1 T

Credits: 4

Course Outcome:

After going through this course, the students will be able to:

1. Impart knowledge regarding the various building and general construction products and their quality, durability and availability.
2. Impart knowledge regarding the various types of properties, uses and variety of materials used in the construction industry.
3. Study the behavior of concrete at its fresh and hardened state
4. Study about the concrete design mix.
5. Expose themselves to various quality control aspects of the civil engineering materials.
6. Learn and use the terms common in the building industry.

SL. No	Module	Details of Course Contents	Hours	Total
1	I	**Building Materials -I** Bricks Introduction, Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick earth, Different forms of bricks, Testing of bricks, Defects of bricks, Fly ash brick. Cement Introduction, Chemical Composition of Cement, Hydration of Cement. Tests on Cement and Cement Paste – specific gravity, fineness, consistency, setting time, soundness, strength. Types of Portland Cement – Ordinary, Rapid hardening, Low-heat, Sulphate resisting, Portland slag, Portland pozzolana, Super sulphated cement, White cement. Aggregates Introduction, Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction. Testing of Aggregates – Particle size distribution, Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value Lime Introduction, Classification, Slaking and hydration, Hardening, Lime putty, Storage, Handling.	2 5 5 1	42
2	II	**Building Materials -II** Ferrous Metals Introduction, Pig Iron- composition, properties, uses. Cast Iron- Properties, Manufacturing, uses. Wrought iron- properties, uses. Steel- composition, properties, manufacturing, uses. Rolled steel sections, Reinforcing steel bars, Rusting and corrosion of steel, Tensile testing of steel, Alloy steel. Mortars Introduction, Classification, Uses, Characteristics of good mortar,	5 1	

		Ingredients. Wood and Wood Products Classification of Timber, Structure, Characteristics of good timber, Seasoning of timber, Defects in Timber, Diseases of timber, Decay of Timber, Veneers , Plywood, 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, Anticorrosive, Waterproofing.	1 1 3	
3	III	**Building Construction -I** undations nction 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) Wall, Doors and Windows Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal.	4 4 2	
4	IV	**Building Construction -II** 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. Centering and Shuttering, Plastering and Pointing: Centering and Shuttering, 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.	2 2 2 2	

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	Name of the books
4.	Duggal S.K. *Building Materials* , New Age International
5.	Varghese P.C. *Building Materials*, PHI Learning Pvt. Ltd-New Delhi.
6.	Punmia B.C. *Building Construction*, Laxmi Publications.

REFERENCE BOOKS

Sl. No.	Name of the books
4.	M. S. Shetty R. *Concrete Technology*, S. Chand.
5.	Nevile A.M. & Brooks J.J. *Concrete Technology*, Pearson Education.
6.	S.C. Rangwala *Engineering Materials*, Charotar Publishing

Subject Name: ENGINEERING GEOLOGY
Subject Code: CIVL 2104
Contact: 3L
Credits-4

After going through this course, the students will be able to:

1. Characterize a site with respect to physical and chemical properties of foundation rocks and minerals.
2. Assess physical and chemical longevity of the earth material (rocks and minerals) with respect to dynamic and chemical activities of natural agencies.
3. Identify the main and most common igneous, sedimentary and metamorphic rocks encountered by foundations and construction.
4. To understand issues concerning the geological basement and structure of a region.
5. To distinguish the characteristics of the most important geological formations and problems that may arise in the various public works.
6. To describe and interpret the geological structures in the geological maps and cross sections.
7. To assess and appropriately adjust the results of geological study in order to secure construction and operation of a technical project.
8. To receive, analyze and evaluate data and appropriately solve problems both technical and environmental.

Sl. No.	Module	Details of Course Contents	Hours	Total
1	I	Geology and its importance in Civil Engineering. Mineralogy: Definition, internal and external structure of minerals, study of crystals, Classification and physical properties of minerals. 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.	9	36
2	II	Weathering and Erosion of rocks: Agents and kinds of weathering, soil formation & classification based on origin. Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition. 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.	9	
3	III	Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercelli's intensity scale and Richter's scale of magnitude. Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strength and abrasive	9	

		resistance. Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing.		
4	IV	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. 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. Landslides: Types of landslides, causes, effects and prevention of landslides.	9	

Text & Reference Books:

Sl. No.	Title	Author(s)	Publisher
1.	Engineering and General Geology	Parvin Singh	Katson Publishing House Delhi
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

Subject Name: INDIAN CULTURE AND HERITAGE

Subject Code: HMTS 2002

Contact: 2L

Credits-1

Course Outcome:

The students are

1. Aware of the rich philosophical heritage of our country
2. Will be able to use ancient knowledge about architecture, mathematics and allied sciences in solving contemporary issues.
3. Apply the knowledge gained by understanding the basic principles of Vedas and Upanishads in day to day life and at workplace.

Module 1

Indian Religion & Philosophy

1. Orthodox Indian Philosophy:
2. Unorthodox Indian philosophy:
3. Essentials of Hinduism
4. An overview of Jainism, Buddhism, Sikhism, Islam, Christianity religions

Module 2

Values and Personality

1. Aspects of Indian Values
2. Essentials of Personality Building
3. Ethics at work place
4. Aspects of Leadership qualities

Module 3

Indian Scriptures

1. Selections from the Vedas
2. Select verses from Upanishad
3. An overview of Gita
4. XVIth chapter of Gita

Module 4

Indian Psychology

1. Aspects of Yoga Philosophy
2. Mind and its workings according to Yoga
3. Law of Karma
4. Selections from Manusmriti

References:

1. Indian Philosophy by S.C. Chatter and D. M. Dutta, Calcutta University Press
2. Spiritual Heritage of India, Swami Prabhavananda, Sri Ramakrishna Math, Chennai
3. Raja Yoga by Swami Vivekananda, Advaita Ashrama, Mayavati
4. Vedic Selection, Calcutta University Press
5. Gita by Swami Swarupananda, Advaita Ashrama, Kolkata
6. Upanishads by any press
7. Carving a Sky (MSS) by Samarpan
8. Essentials of Hinduism (MSS) by Samarpan
9. The Call of the Vedas — Bharatiya Vidya Bhavan

Subject Name: STRENGTH OF MATERIALS LAB

Subject Code: CIVL 2111

Contact-3P

Credits-2

Course Outcome:

After going through this course, the students will be able to:

1. Demonstrate the method and findings of tension and compression tests on ductile and brittle materials.
2. Explain the method of bending tests on mild steel beam and concrete beam.
3. Demonstrate the method and findings of Torsion test on mild steel circular bar and concrete beam.
4. Illustrate the concept of hardness and explain the procedure and findings of Brinnel and Rockwell tests.
5. Demonstrate the concept and procedure of calculation of spring constant and elaborate its use in Civil Engineering.
6. Demonstrate the method and findings of Izod and Charpy impact tests.
7. Understand the concepts of fatigue test.

List of Experiments:

1. Tension test on structural materials: Mild steel and TMT bar.
2. Compression test on structural materials: Timber, bricks and concrete cubes.
3. Bending test on mild steel beam and concrete beam.
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 / leaf spring.
7. Impact tests: Izod and Charpy.
8. Demonstration of Fatigue test.

Subject Name: ENGINEERING GEOLOGY LAB

Subject Code: CIVL 2112

Contact: 3P

Credits-2

List of Experiments:

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

Subject Name: LANGUAGE PRACTICE LAB (LEVEL 2)

Subject Code: HMTS 2011

Contact: 3P

Credits-2

Module 1

Formal verbal communication:

- Introduction to formal verbal communication, Interpersonal Skills & Public Speaking: Building Positive Relationships, Focusing on Solving Problems, Time Management, Dealing with Criticism: Offering Constructive Criticism, Responding to Criticism - Managing Conflict: Approaches to Conflict, Resolving Conflict.
- Conversational skills in the business scenario: One-to-one and Group communication, Gender and Culture Sensitivity, Etiquette, Sample Business Conversation, Telephonic Conversation.

Module 2

Presentation skills:

- Speech Purposes - General: Informative Speeches, Persuasive Speeches, Entertaining Speeches, Methods of Speaking: Speaking from a Manuscript, Speaking from Memory, Impromptu Delivery, Extemporaneous Delivery, Analyzing the Audience, Nonverbal Dimensions of Presentation.
- Organizing the Presentation: the Message Statement, Organizing the Presentation: Organizing the Speech to Inform, The Conclusion, Supporting Your Ideas - Visual Aids: Designing and Presenting Visual Aids, Selecting the Right Medium, Post- presentation Discussion.

Module 3

Group Discussion:

- Introduction to Group Communication, Factors in Group Communication, Status - Group Decision Making: Reflective Thinking, Brainstorming, Body Language, Logical Argument, The Planning Process, Strategies for Successful GDs, Role of Social Awareness (Newspapers, Magazines, Journals, TV News, Social Media), Practice GDs.

Module 4

Job Application and Personal Interview:

- Job Application Letter: Responding to Advertisements and Forced Applications, Qualities of Well-Written Application Letters: The You-Attitude, Length, Knowledge of Job Requirement, Reader-Benefit Information, Organization, Style, Mechanics - Letter Plan: Opening Section, Middle Section, Closing Section.
- Resume and CV: Difference, Content of the Resume - Formulating Career Plans: Self Analysis, Career Analysis, Job Analysis, Matching Personal Needs with Job Profile - Planning your Resume - Structuring the Resume: Chronological Resume, The Functional Resume, Combination Chronological and Functional Resume - Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honours and Achievements, Personal Profile, Special Interests, References.
- **Interviewing:**
  Types of Interviews, Format for Interviews: One-to-one and Panel Interviews, Employment Interviews, Frequently Asked Questions, Dress Code, Etiquette, Questions for the Interviewer, Simulated Interviews.

References:

1. Carter, R. And Nunan, D. (Eds), The Cambridge guide to Teaching English to Speakers of Other Languages, CUP, 2001
2. Edward P. Bailey, Writing and Speaking At Work: A Practical Guide for Business Communication, Prentice Hall, 3rd Ed., 2004
3. Munter, M., Guide to Managerial Communication: Effective Business Writing and Speaking, Prentice Hall, 5th Ed., 1999
4. Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed.,2011

Subject Name: BUILDING PLANNING & DRAWING

Subject Code: CIVL 2121

Contact: **3P**

Credits: 2

FOUNDATIONS

- Footing for a RCC column and Brick wall.
- Combined footing.
- Strip footing.
- Raft foundation.
- RCC Pile Foundation.

DOORS, WINDOWS AND STAIRS

- Glazed and paneled doors of standard sizes.
- Glazed and paneled windows of standard sizes.
- Special windows and ventilators.
- Proportioning and planning of dog-legged and open well staircase.

ROOFS AND TRUSSES

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

FUNCTIONAL DRAWING OF BUILDINGS

- To draw the line diagram, plan, elevation and section of Residential Buildings (flat, pitched and combined roofs), Office Buildings (flat roof) showing positions of various components including lift well and their sizes, load bearing wall and column.
- Details of plumbing and sanitary lines, septic tank.

References:

Sl No.	Title	Author
1	Principles of Building Drawing	Shah & Kale
2	Text Book of Building Construction	Sharma & Kaul
3	Building Construction	BC Punmia
4	Civil Engineering Drawing	M. Chakraborti

Subject Name: CAD LAB

Subject Code: CIVL 2122

Contact: **3P**

Credits: 2

1) Study of capabilities of software for drafting and modeling - Coordinate systems, simple figures like polygon and multiline figures.
2) Drawing of Title Block with necessary text and projection symbol.
3) Drawing of curves like circular, parabolic, spiral using polylines and Bspline.
4) Drawing of front and top views of simple solids like prism, pyramid, cylinder, cone and dimensioning.
5) Drawing of architectural plan, sectional elevation, front elevation, side elevation and foundation plan of a residential building (two bedroom, kitchen, toilet, dining hall and verandah).
6) Drawing of a simple steel truss.

Textbooks recommended:

Sl. No	Name	Author	Publishers
1.	Engineering Graphics with Auto Cad 2015	James D. Bethune	Pearson publication house.
2.	AutoCAD 2016 Beginning and Intermediate	Mercury Learning	BPB Publications.
3.	AutoCAD 2016 and AutoCAD LT 2016	Donnie Gladfelter	Sybex

References: National building code, KMC rules.

Subject Name: NUMERICAL AND STATISTICAL METHODS

Subject Code: MATH 2002

Contact: **3L**

Credits: 3

Course Outcome:

(i) Apply numerical methods to obtain approximate solutions to mathematical problems where analytic solutions are not possible.

(ii) Develop algorithmic solutions for problems like system of linear equations, integration, ordinary differential equations which are pertinent to many physical and engineering problems.

(iii) Apply probabilistic methods to engineering problems where deterministic solutions are not possible.

(iv) Analyze probability distributions required to quantify phenomenon whose true value is uncertain.

(v) Find numerical solutions to algebraic and transcendental equations appearing in a vast range of engineering problems e.g in the study of Ideal and non ideal gas laws, pipe friction, design of electric circuits.

(vi) Apply numerical methods to find solutions to linear system of equations appearing in spring-mass systems, resistor circuits, steady state analysis of a system of reactors.

(vii) Solve problems in data analysis, least-cast treatment of wastewater where the knowledge of interpolation will be required.

(viii) Compute numerical solution to integrals to find root mean square current.

MODULE-I – NUMERICAL SOLUTION TO LINEAR AND NON-LINEAR EQUATIONS (8L)

SOLUTION OF NON-LINEAR ALGEBRAIC EQUATIONS AND TRANSCENDENTAL EQUATIONS:

Bisection Method, Newton-Raphson Method, Regula-Falsi Method.

SOLUTION OF LINEAR SYSTEM OF EQUATIONS:
Gauss elimination method, Gauss-Seidel Method, LU Factorization Method.

MODULE-II – NUMERICAL SOLUTION TO INTEGRATION AND ORDINARY DIFFERENTIAL EQUATIONS (8L)

INTERPOLATION AND INTEGRATION:

Newton's Forward and Backward Interpolation Method, Lagrange's Interpolation, Trapezoidal and Simpson's $1/3^{rd}$ Rule.

SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

Euler's and Modified Euler's Method, Runge-Kutta Method of 4^{th} order.

MODULE-III – FUNDAMENTALS OF PROBABILITY (5L)

Prerequisites - Set Theory.

Random experiment, Sample space, Events.

Definition of Probability,

Addition law of probability, Multiplication law and Conditional Probability.

Bayes' Theorem (Statement only)

MODULE-IV – PROBABILITY DISTRIBUTIONS AND STATISTICS (15L)

Random Variables – Discrete and Continuous, Probability Mass Function, Probability Density and Cumulative Distribution Functions, Mathematical Expectation and Variance.

Special Distributions: Binomial, Poisson, Uniform, Exponential and Normal.

Measures of Central Tendency and Dispersion – Mean, Median, Mode and Standard Deviation for grouped and ungrouped frequency distribution.

Simple Correlation and Regression.

Suggested Books:

1. Miller & Freund's Probability and Statistics for Engineers, R.A.Johnson, Prentice Hall of India
2. Numerical Mathematical Analysis, J.B.Scarborough, Oxford and IBH Publishing Co. Pvt. Ltd.
3. Numerical Methods (Problems and Solution), Jain, Iyengar , & Jain, New Age International Publishers
4. Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons
5. A First course in Probability, Sheldon Ross, Pearson

Subject Name: ANALYSIS OF STRUCTURES - I

Subject Code: CIVL 2201

Contact hours: 3L+1T

Credits: 4

Course Outcome:

After going through this course, the students will be able to:

1. Distinguish between stable and unstable and statically determinate and indeterminate structures.
2. Apply equations of equilibrium to structures and compute the reactions.
3. Calculate the internal forces in cable and arch type structures.
4. Evaluate and draw the influence lines for reactions, shears and bending moments in beams due to moving loads.
5. Use approximate methods for analysis of statically indeterminate structures.
6. Calculate the deflections of truss structures and beams.

Sl.No.	Module	Details of course contents	Hours	Total
1.	I	**BASICS OF STRUCTURAL ANALYSIS** (i) Concept of static and kinematic indeterminacy, Determination of degree of indeterminacy for different types of structures. (ii) Theorem of minimum potential energy, law of conservation energy, principle of virtual work, the first and second theorems of Castigilano, Betti's law, Clark Maxwell's theorem of reciprocal deflection. **ANALYSIS OF DETERMINATE STRUCTURES:** Portal Frames, Three hinged arches, Cables **DEFLECTION OF DETERMINATE STRUCTURES:** Energy methods. Unit Load method for beams, Deflection of trusses and Simple Portal Frames.	4 6 6	42
2.	II	**INFLUENCE LINE DIAGRAM** Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shear.	9	
3.	III	**ANALYSIS OF STATICALLY INDETERMINATE BEAMS:** Theorem of three moments, Energy methods, Force method (Method of consistent deformation) [For analysis of propped cantilever, fixed beams and continuous beams (maximum two degree of indeterminacy) for simple loading case], Analysis of two hinged arch.	12	
4.	IV	**INFLUENCE LINE DIAGRAM FOR INDETERMINATE STRUCTURES:** M*ü*ller – Breslau principle.	5	

Text & References:

Sl. No.	Name	Author	Publishers
1.	Basic Structural Analysis	C.S.Reddy	Tata Mc Graw Hill
2.	Statically Indeterminate Structures	C.K.Wang	Mc Graw Hill
3.	Structural Analysis-A unified Classical and Matrix Approach.	A. Ghali and A.M.Neville	E & FN SPON
4.	Theory of Structures	Timoshenko and Wang	Tata Mc Graw Hill
5.	Engineering Mechanics of Solids	E.P.Popov	Pearson Education

Subject Name: SOIL MECHANICS I
Subject Code: CIVL 2202
Contact: 3L+1T
Credits-4

Course Outcome:

After going through this course, the students will be able to:

1. Classify soil as per grain size distribution curve and understand the index properties of soil.
2. Apply the concept of total stress, effective stress and pore water pressure for solving geotechnical problems.
3. Assess the permeability of different types of soil and solve flow problems.
4. Estimate the seepage loss, factor of safety against piping failure using flow net related to any hydraulic structure.
5. Determine vertical stress on a horizontal plane within a soil mass subjected to different types of loading on the ground surface and also the maximum stressed zone or isobar below a loaded area.
6. Apply the concept of shear strength to analyze different geotechnical problems and determine the shear strength parameters from lab and field tests.

Sl. No.	Module	Details of Course Contents	Hours	Total
1	I	**PHYSICAL PROPERTIES OF SOILS** Soil Formation Introduction, Origin of Soil, Formation and Types of soil, Formative classification, Typical Indian Soil, Some Special Types of Soils, Structure and Composition, Clay Mineralogy.	3	40
		Soil as a Three Phase System Basic Definitions, Weight - Volume Relationship, Measurement of Physical Properties of Soil: Insitu Density, Moisture Content, Specific Gravity, Relative density, Functional Relationships.	4	
		Index Properties of Soil Introduction, Particle Size Distribution, Mechanical Analysis - Sieve Analysis, Sedimentation Analysis – Hydrometer and Pipette Methods. Consistency of Soil – Atterberg Limits, Different Indices, Discussion on Limits and Indices.	4	
		Classification of Soil Classification by Structure, Particle Size Classification, Textural System, PRA System (AASHTO Classification), Unified Classification System, As per IS Code Recommendation, Field Identification of Soil, Classification by Casagrande's Plasticity Chart.	4	

2	II	**SOIL WATER SYSTEM** Soil Hydraulics Modes of Occurrence of Water in Soil – Free Water, Held Water, Structural Water, Capillary Water, Gravitational Water, Adsorbed Water, Pore Water, Pore Water Pressure, Effective Pressure, Total Pressure, Effective Pressure under Different Conditions and in Different Cases of Flow through Soils, Critical Hydraulic Gradient, Quick Sand Condition. Permeability Introduction, Darcy's Law, Coefficient of Permeability, Discharge Velocity, Seepage Velocity, Factors Affecting Permeability. Determination of Coefficient of Permeability – Constant Head and Falling Head Methods, Permeability of Stratified Soil Deposits, Field Determination of Permeability – Unconfined and Confined Aquifers. Seepage Analysis Introduction, Seepage, Seepage Pressure, Two Dimensional Flow, Laplace's Equations, Continuity equation, Flow Nets, Flow through Earthen Dam, Estimation of Seepage, Construction, Properties and Use of Flow Nets, Piping and Heaving, Uplift due to Seepage, Design of Fillers.	4 4 4	
3	III	**STRESS DISTRIBUTION IN SOILS** Introduction, Geostatic Stress, Boussinesq's Equation, Determination of Stress due to Point Load, Vertical Stress Distribution on a Horizontal Plane, Isobar and Pressure Bulb, Vertical Stress Distribution on a Vertical Plane, Vertical Stress under Uniformly Loaded Circular Area, Vertical Stress Beneath a Corner of a Rectangular Area, Equivalent Point Load Method, 2:1 Method, Newmark's Influence Chart, Vertical Stress Beneath Line and Strip Loads. Westergaard Analysis, Comparison of Boussinesq and Westergaard Theories, Contact Pressure.	6	`
4	IV	**SHEARING CHARACTERISTICS OF SOILS** Shear Strength of Soil Introduction, Basic Concept of Shear Resistance and Shear Strength of Soil, Mohr Circle of Stress, Sign Conventions, Mohr - Coulomb Theory, Relationship between Principal Stresses and Cohesion. **Determination of Shear Parameters of Soil** Stress Controlled and Strain Controlled Tests, Laboratory Determination of Soil Shear Parameters- Direct Shear Test, Triaxial Test, Classification of Shear Tests Based on Drainage Conditions, Unconfined Compression Test, Vane Shear Test as per Relevant IS Codes. Stress- Strain Relationship of Clays and Sands, Concept of Critical Void Ratio. Skempton's Pore Pressure Parameters. Sensitivity and Thixotropy of clay. Concept of Stress path.	3 4	

Note: Sufficient numbers of problems are to be solved in class and also given as assignments.

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	Name of the books
7.	Murthy, V.N.S., *Textbook of Soil Mechanics and Foundation Engineering (Geotechnical Engineering Series)*, Reprint 2011, CBS Publishers and Distributors Pvt. Ltd.
8.	Punmia, B.C. and Jain A. K., *Soil Mechanics and Foundations*. 16th edition, Laxmi Publications (P) Ltd.
9.	Das, B. M., *Principles of Geotechnical Engineering*. 5th edition, Thomson Brooks / Cole

REFERENCE BOOKS	
Sl. No.	Name of the books
7.	Lambe T. W. and Whitman, R.V. *Soil Mechanics*. 2nd editon, Wiley Eastern Ltd.
8.	Rao, A.V. and Venkatramaiah, R.C., *Numerical Problems – Geotechnical Engineering*, 1st edition, University Press.
9.	Terzaghi, Peck and Mesri, *Soil Mechanics in Engineering Practice,* 3rd edition, Wiley-Interscience.
10.	Alam Singh, *Soil Engineering in Theory & Practice (Vol.1, 2 & 3)*, 2nd edition Jain Book Agency Publishers.

Subject Name: CONCRETE TECHNOLOGY

Subject Code: CIVL 2203

Contact hours: 3L+1T

Credits: 3

Course Outcome:

After going through this course, the students will be able to:

1. Understand the properties of ingredients of concrete
2. Study the behavior of concrete at its fresh and hardened state
3. Study about the concrete design mix
4. Know about the procedures in concreting
5. Understand special concrete and their use
6. Understand the various Non-Destructive tests.

Sl.No.	Module	Details of Course Contents	Hours	Total
1.	I	**QUALITY OF WATER** Mixing water, Curing Water, Harmful Contents. **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.	3 6	36
2.	II	**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.	9	
3.	III	**ADMIXTURES** Different types, Effects, Uses, Retarders and Admixtures. **MIX DESIGN BY I.S. 10262(2009)**	9	
4.	IV	**SPECIAL CONCRETE & CONCRETING TECHNIQUES** Light- weight Concrete, High performance Concrete. Polymer Concrete, Fibre-reinforced Concrete, Waste Material Based Concrete, Shotcrete, Ferrocement, Self Compacting Concrete, Foam Concrete Modification in the Microstructure. Deterioration of reinforced Concrete and its Prevention. Repair Technology and its restoration and health monitoring. **INTRODUCTION TO NON-DESTRUCTIVE TESTS** (rebound hammer & ultrasonic pulse velocity).	6 3	

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

Codes:
IS: 10262-2009, IS 456-2000, IS: 383-1970.

Subject Name: Fluid Mechanics

Subject Code: CIVL 2204

Contacts: 3 L + 1 T

Credits: 4

Course Outcome:

The course will assist the students to:

1. Introduce themselves to the fundamental aspects of fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
2. Learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems and determine performance characteristics of fluid machinery.
3. Develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
4. Imbibe basic laws and equations used for analysis of static and dynamic fluids.
5. Inculcate the importance of fluid flow measurement and its applications in Industries.
6. Determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.

SL. No	Module	Details of Course Contents	Hours	Total
1	I	**FLUID STATICS** Fluid pressure at a point, Variation of pressure within a static fluid, measurement of pressure, total fluid pressure on plane and curved areas, Center of pressure, buoyancy, stability of submerged and floating bodies, meta-centre. **FUNDAMENTALS OF OPEN CHANNEL FLOW** Scope and importance, characteristics of open channel flow, distinction between pipe flow and open channel flow, types of flow: Steady, Unsteady; Uniform, Non uniform, Gradually varied flow, Rapidly varied flow (definition only). **STEADY UNIFORM FLOW IN OPEN CHANNEL** Characteristics, Chezy's, Manning's formulae, Hydraulically efficient Rectangular and trapezoidal sections. Design features of rigid boundary channels.	4 4 4	44
2	II	**WEIRS AND NOTCHES** Rectangular, triangular, trapezoidal and cippoletti notch, sharp crested and broad crested weirs, submerged weirs. **FLOW IN PIPES** Laminar and turbulent flow through pipes, Reynold's number, fluid friction in pipes, head loss due to friction. Darcy- Weisbach equation, Friction factors for commercial pipes, use of Mody's diagram, minor losses in pipes, basic concept of boundary layer, drag, lift, concept of water hammer and surge tank.	4 6	

3	III	**SPECIFIC ENERGY / NON-UNIFORM FLOW IN OPEN CHANNEL** Definition, Diagram. Critical, Sub-critical and Super-critical flows. Establishment of critical flow, Specific force: Definition and diagram, Hydraulic Jump. **DIMENSIONAL ANALYSIS AND MODEL STUDIES** Dimensions and dimensional homogeneity, Importance and use of dimensional analysis. Buckingham Pi Theorem**:** Statement and application, Geometric, Kinematic and Dynamic similarity. Non Dimensional Numbers, Froude and Reynold model laws and applications.	4 2 4	
4	IV	**MACHINERIES IN FLUID MECHANICS** Turbines, Classification and types, power and efficiency, Working Principles of Pelton, Francis and Kaplan turbines, draft tube, Cavitations in pumps and turbines. Application of principles of similarity of hydraulic machines, specific speed of pumps and turbines, centrifugal and reciprocating pumps, performance characteristics graph for head, discharge and efficiency, hydraulic machines in parallel and series, hydraulic Ram.	6 6	

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	Name of the books
1.	Bansal R.K., *A textbook of Fluid Mechanics and Hydraulic Machines,* 9th edition, Laxmi Publications (P) Ltd
2.	Pati S., *A textbook of Fluid mechanics and Hydraulic machines,* 1st edition, McGraw Hill Education (India) Pvt Ltd
3.	Som S.K., Biswas G. and Chakraborty S., *Introduction to fluid mechanics and fluid machines,* 3rd edition, McGraw Hill Education (India) Pvt Ltd
4.	Ojha C.S.P., Berndtsson R. and Chandramouli P.N., *Fluid Machines and Machinery,* 1st edition, Oxford University Press

REFERENCE BOOKS	
Sl. No.	Name of the books
11.	Cengel Y. A. and Cimbala J. M., *Fluid Mechanics: Fundamentals and Applications,* 2nd edition, Tata McGraw Hill Education Private Limited
12.	Pritchard P.J. and Leylegian J.C., *Fox and McDonald's Introduction to Fluid Mechanics,* 8th edition, John Wiley & Sons
13.	Massey B.S. and Ward-Smith John., *Mechanics of Fluids*, 9th edition, Taylor & Francis.
14.	Modi P.N. and Seth S.M., *Hydraulics and Fluid Mechanics including hydraulics machines,* 19th edition, Standard Book House

Subject Name: HUMAN VALUES AND PROFESSIONAL ETHICS

Subject Code: HMTS 2001

Contacts: 2 L

Credits: 2

Course Outcome:

The students are

1. Aware of the value system governing an individual, society and organization and is able to analyze his actions based on this knowledge.
2. Able to use the concepts of democracy, justice etc at workplace to implement a system of fair and transparent administration.
3. Has acquired in-depth knowledge about the latest in EFT and shows enough will to use it.
4. Aware of the environmental issues in the global context and is able to implement corrective measures locally

Module 1

Human society and the Value System:

Values: Definition, Importance and application.
Formation of Values: The process of Socialization
Self and the integrated personality
Morality, courage, integrity

Types of Values:

Social Values: Justice, Rule of Law, Democracy, Indian Constitution, Secularism.
Aesthetic Values: Perception and appreciation of beauty.
Organizational Values: Employee: Employer—rights, relationships, obligations.
Psychological Values: Integrated personality and mental health. Spiritual Values & their role in our everyday life. Value Spectrum for a Good Life, meaning of Good Life.
Value Crisis in Contemporary Society: Value crisis at— Individual Level. Societal Level. Cultural Level. Value Crisis management — Strategies and Case Studies.

Module 2

Ethics and Ethical Values.
Principles and theories of ethics.
Consequential and non-consequential ethics.
Egotism, Utilatirianism, Kant's theory and other non-consequential perspectives.
Ethics of care, justice and fairness, rights and duties
Ethics— Standardization
Codification
Acceptance
Application
Types of Ethics— Ethics of rights and Duties
Ethics of Responsibility
Ethics and Moral judgment

Ethics of care
Ethics of justice and fairness
Work ethics and quality of life at work

Professional Ethics

Ethics in Engineering Profession; moral issues and dilemmas, moral autonomy(types of inquiry) Kohlberg's theory, Giligan's theory(consensus and controversy) Code of Professional Ethics Sample Code of ethics like ASME, ASCE. IEEE, Institute of Engineers, Indian Institute of materials management, Institute of Electronics and telecommunication engineers. Violation of Code of Ethics—conflict, causes and consequences. Engineering as social experimentation, engineers as responsible experimenters (computer ethics, weapons development). Engineers as managers, consulting engineers, engineers as experts, witnesses and advisors, moral leadership. Conflict between business demands and professional ideals. Social and ethical responsibilities of technologies.

Whistle Blowing: Facts, contexts, justifications and case studies.

Ethics and Industrial Law:

Institutionalizing Ethics: Relevance, Application, Digression and Consequences.

Module 3

Science, Technology and Engineering

Science, Technology and Engineering as knowledge and profession
—Definition, Nature, Social Function and Practical application of science
Rapid Industrial Growth and its Consequences.
Renewable and Non- renewable Resources: Definition and varieties.
Energy Crisis.
Industry and Industrialization.
Man and Machine interaction.
Impact of assembly line and automation.
Technology assessment and Impact analysis.
Industrial hazards and safely.
Safety regulations and safety engineering.
Safely responsibilities and rights.
Safety and risk, risk benefit analysis and reducing risk.
Technology Transfer: Definition and Types The Indian Context

Module 4

Environment and Eco- friendly Technology:

Human Development and Environment. Ecological.
Ethics / Environment ethics.
Depletion of Natural Resources: Environmental degradation.
Pollution and Pollution Control.
Eco-friendly Technology: Implementation, impact and assessment.

Sustainable Development: Definition and Concept
Strategies for sustainable development Sustainable Development - The Modern Trends

Appropriate technology movement by Schumacher and later development Reports of Club of Rome.

Suggested Readings:

1. Tripathi,A.N., Human Values, New Age International, New Delhi,2006
2. Ritzer, G., Classical Sociological Theory, The McGraw Hill Companies, New York, 1996.
3. Doshi,S.L., Postmodern Perspectives on Indian Society, Rawat Publications, New Delhi,2008.
4. Bhatnagar, O.K., Sustainable Development, Cyber Tech Publications, New Delhi, 2008.
5. Kurzwell,R., The age of Spiritual Machines, Penguin Books, New Delhi, 1999.
6. Weinberg, S.K., Social Problems in Modern Urban Society, Prentice Hall,Inc.,USA, 1970.
7. Giddens, Anthony 2009. Sociology. London: Polity Press (reprint 13th Edition).

Subject Name: Fluid Mechanics Lab

Subject Code: CIVL 2211

Contacts: 3P

Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Be acquainted with the fundamentals of fluid mechanics.
2. Practice in the analytical formulation of fluid mechanics problems using Newton's Laws of motion and thermodynamics.
3. Be acquainted with the introduction to experimental methods.
4. Get exposure to practical applications, work on a small design project, and writing of a technical report related to the designed project.
5. Discuss and practice standard measurement techniques of fluid mechanics and their applications.
6. Impart knowledge in measuring pressure, discharge and velocity of fluid flow.

List of Experiments:

1. To determine the coefficient of discharge for an Orifice meter
2. Calibration of V- Notch
3. Determination of Co-efficient of Discharge for Venturimeter
4. Measurement of velocity of fluid in pipe using a pitot tube
5. Measurement of water surface profile for flow over Broad crested weir
6. To verify Bernoulli's equation experimentally
7. Measurement of water surface profile for a hydraulic jump
8. Determination of efficiency of a Centrifugal pump
9. Determination of efficiency of a Pelton wheel Turbine
10. Determination of efficiency of a Francis Turbine

REFERENCE BOOKS:

Sl. No.	Name of the Books
1	Laboratory Manual: Hydraulics and Hydraulic Machines by R. V. Raikar, PHI Learning.
2	Laboratory manual for Civil Engineering second edition by H S Moondra and R Gupta, CBS Publishers, New Delhi.
3	Fluid Mechanics by Modi & Seth Standard Book House, New Delhi.
4	Fluid Mechanics by A.K.Jain, Khanna Publishers, Nath Market, Nai Sarak, New Delhi.
5	Fluid Mechanics & Machinery by H. M. Raghunath – CBS Publishers, New Delhi.

Subject Name: SURVEYING PRACTICE

Subject Code: CIVL 2212

Contacts: 3P

Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Prepare maps by chain and compass traverse.
2. Perform temporary adjustment of Dumpy level, Differential leveling, Profile leveling and plot long and cross sections.
3. Construct traverse plot using theodolite with the help of Gales traverse table.
4. Set out circular curve and transition curve and estimate the error in setting out method.
5. Instruct the procedure of setting out of building layout.
6. Demonstrate different parts of a Total station and can perform simple operations of the instrument.

1. **Chain and Compass survey:** Preparation of maps, method of ranging-method of taking offsets, measurement of bearings, chain and compass traverse.
2. **Plane Table survey:** Temporary adjustments of plane table and Radiation method, Intersection, Traversing and Resection methods of plane tabling, Three-point problem.
3. **Levelling:** Temporary adjustment of Dumpy level, Differential leveling, Profile leveling and plotting of long and cross sections.
4. **Theodolite survey:** Traversing using theodolite, preparation of gales traverse table using the field data, tacheometry in theodolite.
5. **Total station:** Demonstration of the instrument and perform Leveling using it.
6. **Curve setting:** Setting out of simple circular curve and transition curve.
7. **Setting out of building:** Setting out procedure of building layout.

Subject Name: NUMERICAL AND STATISTICAL METHODS LAB

Subject Code: MATH 2012

Contacts: 2P

Credit: 1

Course outcome: After completing the course the student will be able to:

1. Reproduce customized programs to solve problems based on Numerical Methods.
2. Develop algorithms to handle large systems of equations appearing in physical and engineering problems.

Development of computer programs in C for the following problems:

1. Regula-Falsi Method
2. Newton-Raphson Method
3. Gauss-elimination Method
4. Gauss-Seidel Method
5. Newton's Forward Interpolation
6. Lagrange's Interpolation
7. Trapezoidal and Simpson's $1/3^{rd}$ rule
8. Euler's and Modified Euler's Method
9. Runge-Kutta method of 4^{th} order
10. Computation of Mean, Median, Mode and Standard Deviation for grouped and ungrouped frequency distribution
11. Computation of Correlation coefficient and Regression equation for Bivariate data.

Subject Name: QUANTITY SURVEY, SPECIFICATION AND VALUATION
Subject Code: CIVL 2221
Contacts: 1L+3P
Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Apply different types of estimates in different situations.
2. Prepare quantity estimates for buildings, roads, rails and canal works.
3. Calculate the quantity of materials required for civil engineering works as per specifications.
4. Demonstrate the concepts of specification writing.
5. Evaluate contracts and tenders in construction practices.
6. Prepare cost estimates.

1. Introduction of Estimation in Civil Engineering:

Introduction-Principles of estimating, Types of estimates, approximate estimates, items of work, unit of measurement, unit rate of payment.

2. Preparation of Bill of Quantities:

Measurements and calculations of quantities of Civil engineering works, Preparation of abstracts of bill of quantities.

3. Analysis of Rates of different items with specifications:

Specifications for materials and construction of a building.

Rate analysis for Earthwork, PCC, Shuttering, Reinforcement, RCC, brick work, plastering, flooring and finishing, Use of standard schedules such as PWD schedules of rates. Specifications.

4. Quantity Estimation of infrastructures:

Quantity estimates of road, Underground reservoir, Surface drain, Septic tank

5. Valuation:

Concept of price, value and cost. Purpose of valuation; free hold and lease hold properties; market value, present value; sinking fund; year's purchase. Different methods of land valuation. Different methods of valuation of real properties. Outgoing, appreciation, depreciation, different methods for fixation of rents. Valuation of plant and machineries.

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. IS CODE SP34

Subject Name: ANALYSIS OF STRUCTURES II

Subject Code: CIVL 3101

Contacts: 3L+1T

Credit: 4

Course Outcome:

On completion of the course, the students will be able to:

1. Apply the Slope Deflection and Moment Distribution Method to analyze indeterminate structures.
2. Develop and analyze the concept of suspension bridge and stiffness girders
3. Apply and analyze the concepts of curved beam analysis in hooks, rings and Bow girders.
4. Develop the concept bending in unsymmetrical beams.
5. Develop the fundamental concepts of plastic analysis using kinematic method and apply them in frames and continuous beam analysis.
6. Develop and analyze the portal frames using Portal and Cantilever method. Develop and analyze the indeterminate structures (continuous beams and frames) using flexibility and stiffness matrix method.

Sl. No.	Module	Details of Course content	Hours	Total
1.	I	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. Suspension Bridge and stiffening girders.	6 4 2	42
2.	II	Curved Beam analysis: Hooks, rings and Bow girders. Unsymmetrical bending.	12	
3.	III	Plastic analysis of structures: beams and portal frames.	8	
4.	IV	Approximate method of analysis of structures: Portal and Cantilever methods. Matrix methods of structural analysis – Stiffness and flexibility approaches for analysis of beam.	4 6	

Text & References:

Sl.No	Name	Author	Publishers
1.	Basic Structural Analysis	C.S.Reddy	Tata Mc. Graw Hill
2.	Statically Indeterminate structures	C.K.Wang	Mc.Graw Hill
3.	Structural Analysis-A unified Classical and matrix approach.	A. Ghali and A.M. Neville	E & FN SPON
4.	Theory of structure	Timoshenko and Wang	Tata McGraw Hill

Subject Name: SOIL MECHANICS II

Subject Code: CIVL 3102

Contacts: 3L+1T

Credit: 4

Course Outcome:

After going through this course, the students will be able to:

1. Assess the compaction and consolidation characteristics of soil for solving geotechnical problems.
2. Calculate earth pressure on rigid retaining walls on the basis of classical earth pressure theories.
3. Analyze and design rigid retaining walls (cantilever types) from geotechnical engineering consideration.
4. Evaluate the bearing capacity of shallow foundation by applying established theory.
5. Estimate settlement in soils by different methods.
6. Compute safety of dams and embankments on the basis of various methods of slope stability analysis.

Sl. No.	Module	Details of Course Content	Hours	Total
1.	I	**Compressibility & Consolidation of Soil :-** Terzaghi's theory of one dimensional consolidation, Compressibility characteristics of soils, Compression index, Coefficient of compressibility and volume change, Coefficient of consolidation, Degree and rate of consolidation, Time factor, Settlement computation, Consolidometer and laboratory one dimensional consolidation test as per latest IS Code, Determination of consolidation parameters. **Compaction of Soil:** - Principles of compaction, Standard and modified proctor compaction test, Field compaction methods, Field compaction control, Factors affecting compaction, Effect of compaction on soil properties.	12	41
2.	II	**Earth Pressure Theories :-** Plastic equilibrium of soil, Earth pressure at rest, Active and passive earth pressures, Rankine's and Coulomb's earth pressure theories, Different types of backfill, Wedge method of analysis. Analytical and graphical methods for determination of earth pressure against various earth retaining structures. **Stability of retaining walls:** Cantilever retaining wall.	10	
3.	III	**Bearing capacity of shallow foundations :-** Bearing capacity, Definition, Factors affecting bearing capacity, Modes of failures, Methods of determining bearing capacity of soils. Terzaghi's bearing capacity theory, Effect of depth of embedment, Eccentricity of load, Foundation shape on bearing capacity, Effect of	11	

		water table and eccentric loads. Isolated footings with combined action of loads and moments, Bearing capacity as per IS: 6403.		
4.	IV	**Settlement:-** Allowable bearing pressure and settlement analysis (as per IS: 8009), Immediate and consolidation settlements, Rigidity and depth factor corrections, Settlement values as per IS: 1904 recommendations. **Stability of slopes :-** Types of failure, Analysis of finite and infinite slopes, Swedish and friction circle method, Ordinary method of slices, Factor of safety, Taylor's stability number, Bishop's simplified method of stability analysis.	8	

RECOMMENDED BOOKS:-

TEXT BOOKS:	
Sl. No.	Name
1.	Murthy, V.N.S., *Textbook of Soil Mechanics and Foundation Engineering* (Geotechnical Engineering Series), CBS Publishers and Distributors Pvt. Ltd.
2.	Punmia, B.C. and Jain A.K., *Soil mechanics and Foundations.* Laxmi Publications (P) Ltd.
3.	Das, B.M., *Principles of Geotechnical Engineering*, Thomson Brooks / Cole
4.	Gopal Ranjan & A.S.R. Rao, *Basic and Applied Soil Mechanics*, New Age International Pvt.Ltd, Publishers

REFERENCE BOOKS:	
Sl. No.	Name
1.	Lambe, T. W. and Whitman, R.V., *Soil Mechanics*, Wiley Eastern Ltd.
2.	Rao, A.V. and Venkatramaiah, R.C., *Numerical Problems - Geotechnical Engineering*, University press.
3.	Terzaghi, Peck and Mesri, *Soil Mechanics in Engineering Practice*, Wiley-Interscience.
4.	Alam Singh, Soil Engineering in Theory & Practice (Vol.1, 2 & 3), Jain Book Agency Publishers.

Subject Name: HIGHWAY & TRAFFIC ENGINEERING
Subject Code: CIVL 3103
Contacts: 3L+1T
Credit: 3

Course Outcome:

At the end of the course, the student will be able to:

1. Remembering the highway development in India including understanding the highway planning surveys & alignment.
2. Design highway geometrics.
3. Understanding the component parts of flexible and rigid pavement including the importance of soil & bitumen as pavement material.
4. Analyze and design flexible and rigid pavement (IRC Method).
5. Understand the principles of construction, maintenance and safety of highways.
6. Conduct traffic studies, analyze traffic data and design intersections including traffic signal and analyze parking & accidents.

SL. No	Module	Details of Course Contents	Hours	Total
1.	I	**Highway Network Planning**: Different modes of transportation, Role & Development of highway transportation, Classification, Network patterns, Planning surveys, Evaluation by saturation system, Introduction to highway economics. **Highway Alignment**: Factors controlling alignments, Principles of highway alignment, engineering surveys for highway alignment and location. **Highway Geometric Design**: Importance of geometric design, design controls, pavement cross-sectional elements, PIEV theory, Sight distance, Design of horizontal alignments, Design of vertical alignments, Geometric Design of Hill Roads.	2 2 8	42
2.	II	**Pavement Materials**: Types and component parts of pavement and their functions, highway and airport pavement materials, basic soil & aggregate properties relevant to pavement application, basic properties of bitumen and tar, Modified Bitumen (PMB, CRMB) tests on pavement materials, Use of geo-synthetics. **Design of Pavements**: Design factors, classification of axle types, contact pressure, EWLF & ESAL concept, Traffic analysis: vehicle damage factor. **Flexible Pavement Design**: Design of flexible pavements (GI method, CBR method, Triaxial method - only introduction), IRC method of design. **Rigid Pavement Design**: Design considerations, Westergaard's theory and assumptions, Design of dowel and tie bars, Joints in Rigid Pavements, IRC method of design.	4 8	

3.	III	**Highway Construction**: Construction of earth roads, gravel roads, WBM roads, Cement Concrete Pavements, Bituminous pavements. **Highway Maintenance**: Pavement failures, causes of failure, routine and periodic maintenance of highways. **Highway Drainage**: Importance of highway drainage, surface and sub-surface drainage, drainage of slopes and erosion control, road construction in water logged areas. **Highway Safety**: Introduction to highway safety, accident characteristics and factors, accident recording and analysis, road safety audit, safety education, traffic law enforcement, elements of highway safety management system, road safety management system**.**	2 2 2 2	
4.	IV	**Traffic Engineering**: Introduction, road users and vehicle characteristics, microscopic and macroscopic flow characteristics, time headways, interrupted and un-interrupted traffic, speed and travel time variation, travel time and delay studies, flow and density measurement techniques, highway capacity and level of service, level of service estimation, traffic signs. **Traffic Signal Design and Design of at grade Intersections**: Signal phasing, cycle length, fixed and vehicle actuated signal, Webster method, IRC method, signal co-ordination and problems on signal design, types of intersections, rotary and round-about, design aspects. **Parking and Accident Analysis**: Parking inventory study, on street and off street parking facilities, introduction to Intelligent Transport System, accident characteristics, accident recording and analysis.	4 4 2	

RECOMMENDED BOOKS:

TEXT & REFERENCE BOOKS	
Sl. No.	**Name of the books**
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., PHI
4.	Kadiyali L.R. Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, India, 1997
CODES FOR REFERENCE	
Sl. No.	**Name of the Codes**
5.	I.S Specifications on Concrete , Aggregate & Bitumen Bureau of Indian Standard
6.	Relevant latest IRC Codes (IRC-37 – 2001, IRC-37 – 2012, IRC 58 – 2011, IRC 73 - 1980, IRC 86 - - 1983, IRC 106 – 1990, IRC 64 – 1990, IRC 15-2002 - Indian Road Congress

Subject Name: ENVIRONMENTAL ENGINEERING

Subject Code: CIVL 3104

Contacts: 3L+1T

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Identify the nature and quality of water & waste water as per its characteristics like physical, chemical & biological.
2. Estimate the future water demand by using various population forecasting methods.
3. Define & design in detail about the various water treatment units.
4. Define & design in detail about the various waste water treatment units.
5. Estimate the quantity of sewage produced and design the sewerage system.
6. Analysis and design of water distribution networks.

SL. No.	Module	Details of Course Content	Hours	Total
1	I	**Water Quality Parameter:** Physical and Chemical water quality parameters; Sources, impacts and methods of measurement	7	40
2	II	**Water Demand:** Per capita demand; Variations in demand; Factors affecting demand; Design period; Population Forecasting Methods. **Sources of water**: Surface and ground water. **Water Distribution:** Analysis of pipe networks by Hardy Cross Method, Storage and distribution of water; Estimation of reservoir capacity. **Water Treatment :** Typical flow chart for ground and surface water treatments; Unit Processes- Aeration, Plain sedimentation, coagulation & flocculation, Water Softening, Filtration, Disinfection.	15	
3	III	**Conveyance of Waste Water:** Definition of Common Terms, Quantity of sewage and storm sewage. **Sewer Design:** Hydraulic design of sewers, Analysis of partial flow diagrams and Nomograms.	8	
4	IV	**Wastewater Quality Parameters:** Physical, chemical and biological. **Wastewater treatment:** Typical flow chart for municipal wastewater treatment; Primary, Secondary & Tertiary Treatments: Unit Processes- Activated Sludge Process, Trickling Filter Process, Septic Tank, Advance Methods of Wastewater treatment.	10	

RECOMMENDED BOOKS:-

1. Water Supply & Sanitary Engineering. G. S. Birdie, Dhanpat Rai Publishing CO.
2. Environmental Engineering by P.V. Rowe, McGraw-Hill
3. Wastewater Engineering by Metcalf & Eddy, McGraw-Hill
4. Environmental Engineering, N. N. Basak, McGraw-Hill
5. Water Supply Engineering by Santosh Kr Garg, Khanna Publishers
6. Wastewater Engineering by B.C. Punmia & A.K. Jain, Laxmi Publications

Subject Name: DESIGN OF R.C.C. STRUCTURES

Subject Code: CIVL 3105

Contacts: 3L+1T

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Understand material properties and design methodologies for reinforced concrete structures.
2. Assess different type of loads and prepare layout for reinforced concrete structures.
3. Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members.
4. Analyse and design various structural elements of reinforced concrete building like beam, slab, column, footing, and staircase.
5. Assessment of serviceability criteria for reinforced concrete beam and slab.
6. Prepare structural drawings and detailing and produce design calculations and drawing in appropriate professional format.

SL. No	Module	Syllabus	Hours	Total
1	I	**Introduction:** Principles of Design of Reinforced Concrete Members - Working Stress and Limit State Method of Design Basic concepts of Balanced, Under-reinforced and Over-reinforced Beam section by Working Stress Method and Limit State Method **Working Stress Method of Design**: Analysis and Design of Beams and Columns. **Limit State Method of Design:** Basic Concepts and IS Code Provisions (IS: 456 2000) for Design against Strength and Serviceability Limit States. Concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP: 16).	2 1 4 4	42
2	II	**Analysis, design and detailing** of singly reinforced rectangular, 'T', 'L' and doubly reinforced beam sections by limit state method. **Design and detailing** of one-way and two-way slab panels as per IS code provisions **Design and detailing** of continuous beams and slabs as per IS code provisions	5 3 3	

3	III	**Staircases:** Types; Design and detailing of reinforced concrete doglegged staircase **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.	2 4 4	
4	IV	**Design and detailing** of reinforced concrete isolated square and rectangular isolated and combined footing for columns as per IS code provisions by limit state method **Design and detailing** of Pile foundation as per IS code provisions.	6 4	

RECOMMENDED BOOKS:-

CODES:

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

TEXT BOOKS:

1. Reinforced Concrete Design by Pillai and Menon
2. Reinforced concrete Design by S.N.Sinha
3. Limit State Design of Reinforced Concrete by P. C. Varghese

REFERENCE BOOKS:

1. Fundamental design of Reinforced concrete by N.C.Sinha & S.K. Roy

Subject Name: ECONOMICS FOR ENGINEERS

Subject Code: HMTS 3101

Contacts: 3L

Credit: 3

Module 1:

Market: Meaning of Market, Types of Market, Perfect Competition, Monopoly, Monopolistic and Oligopoly market.

The basic concept of economics – needs, wants, utility.

National Income - GDP, GNP. Demand & Supply, Law of demand, Role of demand and supply in price determination, Price Elasticity.

Inflation: meaning, reasons, etc. **(6L)**

Module 2:

Business: Types of business, Proprietorship, Partnership, Joint-stock company, and cooperative society – their characteristics.

Banking: role of commercial banks; credit and its importance in industrial functioning. Role of central bank: Reserve Bank of India.

International Business or Trade Environment. **(4L)**

Module 3:

Financial Accounting- Journals, Ledgers, Trial Baslance, Profit & Loss Account, Balance Sheet.

Financial Statement Analysis (Ratio and Cash Flow analysis). **(8L)**

Cost Accounting- Terminology, Fixed, Variable and Semi-variable costs.

Break Even Analysis. Cost Sheet. Budgeting and Variance Analysis.

Marginal Cost based decisions. **(6L)**

Module 4:

Time Value of Money: Present and Future Value, Annuity, Perpetuity.

Equity and Debt, Cost of Capital. **(4L)**

Capital Budgeting: Methods of project appraisal - average rate of return - payback period - discounted cash flow method: net present value, benefit cost ratio, internal rate of return.

Depreciation and its types, Replacement Analysis, Sensitivity Analysis. **(8L)**

Suggested Readings:

1. R. Narayanswami, *Financial Accounting- A Managerial Perspective*. Prentice-Hall of India Private Limited. New Delhi
2. Horne, James C Van, *Fundamentals of Financial Management*. Prentice-Hall of India Private Limited, New Delhi
3. H. L. Ahuja., *Modern Economic Theory*. S. Chand. New Delhi.
4. Newman, Donald G., Eschenbach, Ted G., and Lavelle, Jerome P. *Engineering Economic Analysis.* New York: Oxford University Press. 2012.

Subject Name: SOIL MECHANICS LAB I
Subject Code: CIVL 3111
Contacts: 3P
Credit: 2

Course Outcome

After going through this course, the students will be able to:

1. Identify different types of soil by visual inspection.
2. Determine natural moisture content and specific gravity of various types of soil.
3. Estimate in-situ density by core cutter method and sand replacement method.
4. Analyze grain size distribution and Atterberg limits for soil.
5. Perform laboratory tests to determine permeability and compaction characteristics of soil.
6. Prepare technical laboratory report.

List of Experiments:

1. Field identification of different types of soil as per Indian Standards [collection of field samples and identifications without laboratory testing].
2. Determination of natural moisture content.
3. Determination of specific gravity of cohesionless and cohesive soils.
4. Determination of in-situ density by core cutter method and sand replacement method.
5. Determination of grain size distribution by sieve and hydrometer analysis.
6. Determination of Atterberg limits (liquid limit, plastic limit and shrinkage limit).
7. Determination of co-efficient of permeability by constant and variable head permeability tests.
8. Determination of compaction characteristics of soil by standard proctor compaction test.

REFERENCES:

1. Soil Testing by T.W. Lamb (John Willey).
2. SP: 36 (Part - I and Part - II).
3. Soil Mechanics Laboratory Manual by Braja Mohan Das (Oxford university press).

Subject Name: CONCRETE TECHNOLOGY LAB
Subject Code: CIVL 3112
Contacts: 3P
Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Outline the importance of testing of cement and its properties
2. Assess the different properties of aggregate
3. Summarize the concept of workability and testing of concrete
4. Describe the preparation of fresh concrete
5. Describe the properties of hardened concrete.
6. Develop mix design of concrete as per provision of the IS Codes.

List of Experiments:

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 and 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

Subject Name: ENVIRONMENTAL ENGINEERING LAB.

Subject Code: CIVL 3113

Contacts: 3P

Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Determine physical, chemical and biological characteristics of water and wastewater.
2. Determine optimum dosage of coagulant.
3. Assess the quality of water and wastewater.
4. To understand the different important water quality parameters, their relevance to human health and in treatment processes.
5. To know the permissible limits of different water quality parameter as per the standards.
6. Prepare technical laboratory report.

List of Experiments:

Experiment no.	Experiment name	Type of test
01	Determination of Color & Turbidity in an aqueous sample	Physical
02	Determination of pH and various solids (Total solids, Total suspended solids and Total dissolved solids) in an aqueous sample	
03	Determination of electrical conductivity and chloride in an aqueous sample	
04	Determination of Total & Phenolpthalein alkalinity in an aqueous sample and speciation of different alkalinities	Chemical
05	Determination of total and calcium hardness in an aqueous solution	
06	Determination of concentration of fluorides in an aqueous solution	
07	Determination of total and soluble iron of aqueous sample.	
08	Determination of the optimum coagulant dose for a given sample of water through Jar test	
09	Determination of chlorine demand of a contaminated water sample	
10	Determination of biochemical oxygen demand (BOD_5 at 20 deg C) for a given wastewater sample.	
11	Determination of chemical oxygen demand for a given wastewater sample.	
12	Determination of bacteriological quality of water : presumptive test, confirmative test and determination of Most Probable Number(MPN)	Bacteriological

Subject Name: R. C. C. DESIGN & DETAILING

Subject Code: CIVL 3121

Contacts: 3P

Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Understand material properties and design methodologies for reinforced concrete structures.
2. Assess different type of loads and prepare layout for reinforced concrete structures.
3. Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members.
4. Analyse and design various structural elements of reinforced concrete building like beam, slab, column, footing, and staircase.
5. Assessment of serviceability criteria for reinforced concrete beam and slab.
6. Prepare structural drawings and detailing and produce design calculations and drawing in appropriate professional format.

Course Details:

1. **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. General Introduction to IS 1893-2002
2. **Design & detailing of a** Continuous T- Beam.
3. **Design & Detailing of** columns, isolated and combined footing
4. **Design & detailing of a** One way Continuous slab.
5. **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.

References:

I.S- 456-2000, SP 34, SP 16, IS-875, IS 1893-2002
Standard text books of RCC design.

Subject Name: DESIGN OF STEEL STRUCTURES

Subject Code: CIVL 3201

Contacts: 3L + 1T

Credit: 4

Course Outcome:

After going through this course, the students will be able to:

1. Identify the material properties of structural steel. Moreover, the students will identify different bolted and welded connections, analyse and design them for axial and eccentric loads.
2. Design different steel sections subjected to axial compression and tension following Indian codes of practices.
3. Comprehend the differences between laterally supported and unsupported flexure members. Designing of the flexure members using Indian codes of practice.
4. Analyse and design rolled and built up compression members along with base connection subjected to axial compression, bending and tension.
5. Calculate shear force and bending moment on rolled and built up girders, dimension the section and finally design it following Indian standard design guidelines.
6. Identify different components of gantry system, calculate lateral and vertical loads acting on the system, dimension the components and design them.
7. Design different components of an industrial building.

Sl. No.	Module	Details of Course Content	Hours	Total
1	I	**Materials and Specification**: Rolled steel sections, mechanical properties of steel and their specifications for structural use. Codes of practices. **Structural connections:** Bolted and welded connections: Introduction to different types of connectors, types of bolted and welded joints, assumptions, failure and efficiency of joints. Design of bolted and welded connections for axial load, torsion and shear, tension and shear, interaction check. High strength friction grip bolted joints.	8	42
2	II	**Tension members**: Working stress and limit state design of tension members, I.S code provisions, design rules, examples. **Compression members**: Effective lengths about major and minor principal axes, I.S code provisions. i) Design of axially loaded compression member: Working stress and limit state design of axially loaded compression members using rolled steel and built up sections.	13	

		Examples. ii) Design of beam – column: Design of rolled steel and built up columns under eccentric loading, design of lacing and batten plates. Design of column bases: Design of slab base, gusseted base, connection detailing.		
3	III	**Beams:** Working stress and limit state design in bending, compression and tension. Design of rolled steel sections, plated beams, concepts of curtailment of flanges. **Plate girders**: Design of web, flanges and stiffeners. Splices and connections using bolts and welding.	13	
4	IV	**Gantry system**: Design gantry girder and gantry column considering I.S code provisions.	8	

Text and References:

Sl. No	Name	Author	Publishers
1.	Design of steel structures	N. Subramanian	Oxford University Press
2.	Design of steel structures	A.S. Arya and J.L. Ajmani	Nemchand and Bros.
3.	Limit state design of steel structures (2^{nd} edition)	S.K. Duggal	McGraw Hill India, New Delhi.
4.	Fundamentals of structural steel design	M.L. Gambhir	McGraw Hill India, New Delhi
5.	Analysis and design of steel structures, 2^{nd} ed.	Karuna Moy Ghosh	Prentice Hall, India

Reference code: IS: 800 – 2007, SP 6 (I) – 1964.

Subject Name: FOUNDATION ENGINEERING

Subject Code: CIVL 3202

Contacts: 3L

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Determine the load carrying capacity of pile foundation.
2. Compute the efficiency and settlement of pile group.
3. Understand different subsoil exploration methods and interpret field and laboratory test data to obtain design parameters for geotechnical analysis.
4. Correlate bearing capacity of shallow foundation from field test data.
5. Analyze and design sheet pile structure on the basis of earth pressure theories.
6. Understand and apply various types of ground improvement methods for solving complex geotechnical problems.

Sl. No.	Module	Details of Course Content	Hours	Total
1.	I	**Foundations: -** Classification, selection- shallow and deep foundations. **Deep foundations:- Pile foundation:** Types of piles, material, Suitability and uses, Method of installation of piles - classification of piles based on material, Installation Techniques – Selection and uses, Determination of types and lengths of piles, Load transfer mechanism, Determination of load carrying capacities of piles by static and dynamic formulae as per IS codes, Pile spacing and group action, Group efficiency, Negative skin friction, Pile load test, Settlement of pile group, Lateral load capacity of pile by IS: 2911 and Reese & Matlock methods, Uplift capacity of pile - introduction.	14	40
2.	II	**Site Investigation & Soil Exploration:-** Planning of sub-surface exploration, Methods of boring, sampling, Different types of samples, Spacing, Depth and number of exploratory borings, Bore log, Preparation of sub-soil investigation report. **Insitu tests:-** Standard penetration test, Static cone penetration test, Dynamic cone penetration test, Field vane shear test, Plate load test. **Indirect methods of soil exploration:-** Geophysical method: seismic refraction and electrical resistivity methods.	9	
3.	III	**Shallow Foundations:-** Bearing Capacity from SPT, SCPT and Plate load Test data.	9	

		Sheet pile structures: - Type of sheet pilling, Design of sheet pile, Cantilever sheet piling, Anchored sheet piling, Free earth and fixed earth support methods, Analysis with anchored bulk heads.		
4.	IV	**Introduction to Ground Improvement Techniques:-** Introduction, Economic considerations, Consolidation by preloading and sand drains, Stone columns, Compaction by vibrofloatation, Grouting techniques and principles, Applications of geosynthetics, Ground anchors and soil nailing.	8	

Recommended books:-

TEXT BOOKS:	
Sl. No.	**Name**
1.	Murthy, V.N.S., *Textbook of Soil Mechanics and Foundation Engineering* (Geotechnical Engineering Series), CBS Publishers and Distributors Pvt. Ltd.
2.	Das, B.M., *Principles of Foundation Engineering*, Thomson Brooks / Cole
3.	Punmia, B.C. and Jain A.K., *Soil mechanics and Foundations*, Laxmi Publications (P) Ltd.
4.	Das, B.M., *Principles of geotechnical Engineering*, Thomson Brooks / Cole

REFERENCE BOOKS:	
Sl. No.	**Name**
1.	Bowels, J.E. *Foundation Analysis & Design*, Mc Graw Hill
2.	Rao, A.V. and Venkatramaiah, R.C., *Numerical Problems- Geotecnical Engineering*, University press.
3.	Terzaghi, Peck and Mesri, *Soil mechanics in engineering practice*, Wiley-Interscience.
4.	Alam Singh, Soil Engineering in theory & Practice (Vol.1, 2 & 3), Jain Book Agency Publishers.

Subject Name: PRESTRESSED CONCRETE
Subject Code: CIVL 3203
Contacts: 3L + 1T
Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Learn the introduction of prestressed concrete member and its deflection properties
2. Develop the design criteria of prestressed concrete section for flexure and shear properties
3. Analyze the anchorage zone stress for post-tensioned members
4. Impart knowledge regarding the methods of Analysis of Statically Indeterminate Structures.
5. Impart knowledge regarding the composite construction of Prestress and In-situ concrete.
6. Impart knowledge regarding Design of Prestressed concrete poles and sleepers and introduction of partial prestressing.

SL. No	Module	Syllabus	Hours	Total
1	I	**Introduction of Prestressed Concrete**: Materials, Prestressing System, Advantages of Prestressing, Analysis of Prestress and Bending Stress, Losses **Deflections of Prestressed Concrete Members**: Importance, Factors, Short term and Long term Deflection	8 4	42
2	II	**Shear and Torsional Resistance**: Design of Shear Reinforcement, Design of Reinforcement for Torsion, Shear and Bending. **Limit State Design Criteria**: Inadequacy of Elastic and Ultimate Load Method, Criteria for Limit States, Strength and Serviceability. **Design of Prestressed Concrete Section:** for Flexure & methods by Lin and Magnel	6 2 4	
3	III	**Anchorage Zone Stresses in Post Tensioned Members**: Stress Distribution in End Block, Anchorage Zone Reinforcement **Statically Indeterminate Structures**: Advantages of Continuous Member, Effect of Prestressing, Methods of Achieving Continuity and Method of Analysis of Secondary Moments	4 6	
4	IV	**Composite Construction of Prestressed and In-situ Concrete**: Types, Analysis of Stresses **Prestressed Concrete Poles and Sleepers**: Design of Sections for Compression and Bending. Introduction to Partial Prestressing.	4 4	

Recommended books:-

Code: IS 1343:1980

Text Books:

1. Prestressed Concrete, Fourth Edition, N Krishna Raju McGraw Hill
2. Fundamentals of Prestressed Concrete, N.C.Sinha and S.K.Roy
3. Prestressed Concrete, S.Ramamurthan

Reference Books:

1. Design of Prestressed Structures, T.Y.Lin and N.H.Burns, Wiley Eastern Ltd.

Subject Name: DATA STRUCTURE & RDBMS

Subject Code: CSEN 3206

Contacts: 3L

Credit: 3

Module I: **(11L)**

Linear Data structures:
Singly Linked List- Insertion at beginning, at end and any position of the List. Deletion by value, by position: beginning, end and any position of the List
Stack and Queue: Both array and Linked Representation, Circular queue using array only.
Application of stack: Infix to postfix conversion, Evaluation of postfix expression.

Module II: **(10L)**

Recursion: Design of Recursive algorithm.
Non-Linear Data Structures:
Trees: Binary Trees: Array and Linked representation, Binary tree Traversal Techniques, reconstruction of binary tree using traversal sequence.
Binary Search Trees - Insertion and Deletion algorithms.
Sorting Algorithms: Bubble sort, Insertion sort, Selection sort, Quick sort and their comparison.
Searching Algorithms: Linear search, Binary search and their comparison.

Database Concept

Module III: (10L)

Introduction to Database Concepts, File Processing System and Database Management System, DBMS Architecture and Data Independence.
Data Model: Basic Concepts, Entity-Relationship Diagram, Keys, Cardinality, Weak Entity Set.
Introduction to relational algebra & SQL: Operators like select, project, rename, Cartesian product, join, union, intersect, minus, DDL, DML.

Module IV: (10L)

Relational Database Design: Functional Dependencies, Normalization: Different anomalies in database designing
1NF, 2NF, 3NF and BCNF.
Introduction to Transaction Processing Concepts: ACID properties, Serializability and Recoverability

Text Books:

Data Structures:

I) Title: Data Structures.
Author: Seymour Lipschutz.
Publication: Tata McGraw-Hill (India)

II) Title: Data Structures and Program Design in C.
Author: Kruse Robert L., Robert Kruse, Cl Tondo.
Publication: Pearson Education India.

Database Concept:

I) Title: Fundamentals of Database Systems
Author: Elmasri Ramez and Navathe Shamkant
Publication: Pearson.

II) Title: Database System Concepts
Author: A. Silberschatz, H.F Korth, S.Sudarshan
Publication: McGraw Hill Education (India) Private Limited

Reference Books:

Data Sturucture:

I) Title: Data Structures using C.
Author: Tanenbaum A. S, Langsam Y., Augenstein M. J.
Publication: Pearson.

II) Title: The Art of Computer Programming
Author: Donald E. Knuth
Publication: Addison-Wesley Professional

Database Concept:

I) Title: Introduction to Database Management Vol. I, II, III,
Author: Date C. J.
Publication: Addison Wesley.

II) Title: Principles of Database Systems
Author: Ullman JD.
Publication: Galgottia Publication

Subject Name: RAILWAY & AIRPORT ENGINEERING
Subject Code: CIVL 3231
Contacts: 3 L + 1 T
Credit: 3

Course Outcome:

At the end of the course, the student will be able to:

1. Understand the importance of railway infrastructure, planning & design and identify the factors governing the design.
2. Understand the function of various permanent way components and design railway geometrics & turnouts.
3. Calculate tractive effort & platform height and understand the function of signaling & interlocking.
4. Get an idea about components of aircraft, airport planning and obstruction.
5. Design Runways and Taxiways.
6. Have a brief knowledge of airport layout, airport drainage and airport marking & lighting.

SL. No	Module	Details of Course Contents	Hours	Total
1.	I	**Railways in India**: *Introduction* - Role of Indian railways in National Development, Railways for urban transportation. *Alignment of Railway Lines* - Location survey, Engineering surveys for track alignment- Obligatory points, Conventional and modern methods. (Remote sensing, GIS). **Permanent Way components and Functions**: Rails- Types of rails, Rail fastenings, Concept of gauges, Coning of wheels, Sleepers- Functions, Materials, Density, Ballast - Functions, Materials, Ballast less tracks. **Geometric Design of railway tracks**: Grade compensation and gradient, Widening of gauges in curves, Super elevation, Horizontal, Vertical and Transition curves.	 2 8 4	42
2.	II	**Track Maintenance**: Points and Crossings- Design of Turnouts, Working principles, Various types of track junctions. **Rolling Stock, Railway Section and Yards**: Rolling Stock. Tractive power, Track resistance, Layouts of railway stations and yards, Re-laying of tracks, Level crossings. **Signalling and Interlocking**: Signalling, Interlocking and Track circuiting- Construction and Maintenance. **Design of tracks for high speed**: Geometrical requirements, Ballasted or Ballast less, Design methodology, Maintenance considerations.	2 2 2 2	
3.	III	**Aircraft component and Airport planning**:		

		Component parts and its function, aircraft characteristics and their influence on airport planning, air traffic characteristics, development of new airports, factors affecting airport site selection, Airport Maintenance. **Airport obstruction**: Zoning laws, classification of obstructions, imaginary surfaces, approach zones, turning zones. **Design of Runway and Taxiway**: Runway orientation, wind rose diagrams, basic runway length, corrections for runway length, airport classification, geometric design, airport capacity, runway configuration, taxiway design, geometric standards, exit taxiways, holding aprons, location of terminal buildings, aircraft hangers parking.	2 4 6	
4.	IV	**Terminal area & airport layout**: Terminal area, planning of terminal buildings, apron, size of gate position, number of gate position, aircraft parking system, hanger, general planning considerations blast considerations. **Airport drainage**: Requirement of airport drainage, design data, surface drainage design. **Airport marking and lighting**: Marking lighting of runways, taxiway, approach other areas.	2 2 2	

RECOMMENDED BOOKS:

TEXT AND REFERENCE BOOKS	
Sl. No.	Name of the books
1.	A Text Book of Railway Engineering, S.P. Arora& S.C. Saxena
2.	Railway Engineering, Satish Chandra, Oxford University press
3.	Airport planning and Design, S.K.Khanna&M.G.Arora
4.	Airport Transportation Planning & Design-. Virendra Kumar &Satish Chandra, Galgotia Publication Pvt. Ltd., New Delhi

Subject Name: ADVANCED SURVEYING

Subject Code: CIVL 3232

Contacts: 3 L + 1 T

Credit: 3

Course Outcome:

After successful completion of the course student will be able to:

1. Record the accurate and thorough data from the field work, for documentation.
2. Analyse the data from the records of the Global Positioning System, Geographic Information System and Remote Sensing.
3. Employ the knowledge to use modern survey equipment to measure angles and distances with accuracy considering the curvature of the earth.

SL. No	Module	Details of Course Content	Hours	Total
1	I	**Setting out works** Laying out of building, setting out of Culverts, setting out of Bridges, setting out of Tunnels. **Tacheometry** Concepts of anallactic lens, Stadia systems, movable hair stadia method, calculation of horizontal and vertical distance using tachometer.	10	40
2	II	**Geodetic survey** Concepts of triangulation and triangulation systems in brief, order of triangulation, strength of figures. **Astronomical survey** Spherical trigonometry, Celestial sphere, Coordinate systems-Altitude and Azimuth systems, Declination-Hour Angle system, application of astronomical survey.	10	
3	III	**Aerial surveying** Terrestrial photogrammetry, aerial photogrammetry, photo interpretation, Parallax. **Curve surveying** Elements and setting out of compound curves, reverse curve and vertical curves.	10	
4	IV	**Theory of errors and adjustments** Direct and indirect observations, sources of errors, types of error, elimination of errors, error propagation, method and application of error adjustment. **Remote Sensing** Introduction, historical perspective, uses, basic Principles, types, Platforms and Satellites, Sensors, Spectral Bands, Spectral reflectance curves. **Geographic Information Systems** Introduction, Data, Information Systems and Planning, GIS subsystems.	10	

Recommended books:-

TEXT BOOKS:

1. Punmia B.C., Jain A.K. and Jain A.K. Higher Surveying (Vol-3). 15th edition, LaxmiPublications (P) Ltd.

REFERENCE BOOKS:

1. Subramanian R. Surveying and Levelling. 2nd editon, Oxford university Press
2. Satheesh Gopi, R. Sathikumar, and N. Madhu, Advanced Surveying: Total Station, GIS and Remote Sensing (English) 1st Edition, Pearson
3. W. Norman Thomas., Surveying, Edward Arnold, 1920.

Subject Name: DESIGN OF TALL STRUCTURES

Subject Code: CIVL 3233

Contacts: 3 L + 1 T

Credit: 3

Course Outcome:

After attending the course, students will be able to:

1. Understand the advanced methods of analysis and design of high rise structures.
2. Design high rise structures such as multistoried buildings, chimney structures etc.
3. Analyse the static as well as dynamic effect of seismic and wind on tall structures.

SL. No	Module	Details of Course Content	Hours	Total
1	I	**INTRODUCTION** Concept of tall buildings, factors affecting growth, height and structural forms. Tall building structure- design process, strength and stability, stiffness and drift limitation, creep, shrinkage and temperature effects. **BASIC STRUCTURAL FORMS** Braced frame structures, rigid frame structures, in filled frame structure, flat plate and flat- slab structures, shear wall structures, wall- frame structures, framed-tube structures, outrigger –braced structures, suspended structures, core-structures, space and hybrid structures. Modelling concept of 2D and 3D structures, exposure to the design philosophy of Staad software.	10	44
2	II	**WIND ANALYSIS** Design considerations for nature of wind, use of Gust Factor Method to assess the dynamic effect of wind on structures. Introductory concept of wind tunnel test, objectives of wind tunnel tests.	10	
3	III	**SEISMIC ANALYSIS** Tall building behaviour during earthquakes, use of Response Spectrum Method to assess the dynamic effect of earthquake on structures. Basic concept of Time History Analysis.	12	

4	IV	**DESIGN PHILOSOPHY OF A TALL BUILDING WITH SHEAR WALLS** Concept of P-delta effects. Concepts of ductile detailing of building, referring to IS 13920-1993. Detailed concept of shear wall design for a Tall building.	12	

Recommended books:-

TEXT BOOKS:

1. Bryan S. Smith and Alex Coull., *Tall Building Structures: Analysis and Design*, John Wiley & Sons, Inc, New York, 1991.
2. Agarwal P and Shrikhande M., *Earthquake Resistant Design of Structures*, PHI Learning Pvt. Ltd, 2006.
3. Manohar, S.N., "Design and Construction of Tall Chimneys", McGraw-Hill Book Co., New York, 1972.

REFERENCE BOOKS:

1. Taranath B.S., *Structural Analysis and Design of Tall Buildings- Steel and Composite Construction*, CRC Press, 2012.
2. Sarkisian M., *Designing Tall Buildings- Structure as Architecture*, Routledge, 2012
3. Parker D and Wood A., *The Tall Buildings-Reference Book*, Routledge, 2013.

CODES:

IS 875 (Part-3): 1987, IS 1893 (Part-1): 2002, IS 1893 (Part 4): 2005, IS 4998 (Part 1): 1992, IS 13920: 1993.

Subject Name: SOIL STABILIZATION & GROUND IMPROVEMENT TECHNIQUES
Subject Code: CIVL 3234
Contacts: 3 L + 1 T
Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Understand soil stabilization using cement, lime and flyash for various critical geotechnical problems.
2. Illustrate in-situ densification techniques applied to both cohesionless and cohesive soils.
3. Examine different types of geotextiles on the basis of its properties and applications.
4. Interpret functions of geotextiles with its applications.
5. Apply the knowledge of grouting for various field applications.
6. Review the methods of soil stability such as reinforced earth, soil nailing, underpinning etc.

Sl. No.	Module	Details of Course Content	Hours	Total
1.	I	**Soil Stabilization**:- Introduction, Stabilization of soil with and without granular skeleton, Common nomenclature of stabilized soil systems and stabilization methods, Specific methods of soil stabilization: stabilization with cement, lime and fly-ash.	10	38
2.	II	**In-situ densification**: - Introduction, Compaction methods and controls, Densification of granular soil**,** Impact at ground surface, Vibrofloatation. Densification of cohesive soils, Preloading and dewatering, Design of sand drains and stone columns, Electrical and thermal methods.	10	
3.	III	**Geotextile**:- Over view, Classification of geotextile, Geotextile as separator and reinforcement, Geotextile in filtration and drainage, Geotextile in erosion control, Natural and artificial geotextiles.	8	
4.	IV	**Grouting**: - Over view, Grouting equipments and methods, Grout design and layout, Grout monitoring schemes. **Soil stability**: - Reinforced earth fundamentals, Soil nailing, Soil and rock anchors, Underpinning.	10	

Recommended books:-

TEXT BOOKS:	
Sl. No.	**Name**
1.	Bowels, J.E., *Foundation Analysis and Design*, Mc Graw Hill
2.	Das, B.M., *Principles of Foundation Engineering*, Thomson Brooks / Cole
3.	Koerner, R.M., *Construction and Geotechnical methods in foundation engineering*, Mc Graw Hill
REFERENCE BOOKS:	

Sl. No.	Name
1.	Ingold, T. S., *Reinforced Earth*, Thomas Telford.
2.	Koerner, R. M., *Designing with Geosynthetics*, Prentice Hall
3.	Saran, S., *Reinforced soil and its engineering application*, I. K. International Publishing House.

Subject Name: PRINCIPLES OF MANAGEMENT
Subject Code: HMTS 3201
Contacts: 2 L
Credit: 2

Module 1:

Management: Definition, nature, purpose and scope of management, Skills and roles of a Manager, functions, principles; Evolution of Management Thought: Taylor Scientific Management, Behavioral Management, Administrative Management, Fayol's Principles of Management, Hawthorne Studies. **(4L)**

Module 2:

a) **Planning:** Types of plans, planning process, Characteristics of planning, Traditional objective setting, Strategic Management, premising and forecasting.
b) **Organizing:** Organizational design and structure, Coordination, differentiation and integration.
c) **Staffing:** Human Resource Management and Selection, Performance appraisal and Career strategy, Managing Change.
d) **Decision-Making:** Process, Simon's model of decision making, creative problem solving, group decision-making.
e) **Coordinating:** Concepts, issues and techniques.
f) **Controlling:** Concept, planning-control relationship, process of control, Types of Control, Control Techniques. (**8L)**

Module 3:

Span of management, centralization and de-centralization Delegation, Authority & power - concept & distinction, Line and staff organizations. **(4L)**

Module 4:

Organization Behaviour: Motivation, Leadership, Communication, Teams and Team Work**. (6L)**

Management by Objectives (MBO): Management by exception; Styles of management: (American, Japanese and Indian), McKinsey's 7-S Approach, Self Management. **(2L)**

Suggested Readings:

1. Harold Koontz & Heinz Weihrich, Essentials of Management, TMH.
2. Stoner, Freeman, Gilbert Jr., Management, PHI.
3. Bhatt & Kumar, Principles of Management, OUP.

Subject Name: SOIL MECHANICS LAB II

Subject Code: CIVL 3211

Contacts: 3P

Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Estimate compressibility characteristics of soil.
2. Determine shear strength parameters of soil by unconfined compression test and vane shear test.
3. Determine shear strength parameters of soil by direct shear test.
4. Perform triaxial test to determine shear strength parameters of soil.
5. Determine California Bearing Ratio (CBR) of soil.
6. Prepare technical laboratory report.

List of Experiments:

1. Determination of compressibility characteristics of soil by oedometer test.
2. Determination of unconfined compressive strength of soil by unconfined compression test.
3. Determination of shear strength parameters of soil by direct shear test.
4. Determination of undrained shear strength of soil by vane shear test.
5. Determination of shear strength parameters of soil by unconsolidated undrained triaxial test.
6. Determination of California Bearing Ratio (CBR) of soil.
7. Determination of relative density of soil.
8. Standard Penetration Test.

REFERENCES:

1. Soil Testing by T.W. Lamb (John Willey).
2. SP: 36 (Part - I and Part - II).
3. Soil Mechanics Laboratory Manual by Braja Mohan Das (Oxford university press).

Subject Name: TRANSPORTATION ENGINEERING LAB

Subject Code: CIVL 3212

Contacts: 3P

Credit: 2

Course Outcomes:

After going through this course, the students will be able to:

1. Access the quality of different bitumen grade.
2. Characterize the pavement materials.
3. It will help the students to gather knowledge about the quality control techniques of various aggregates and pavement materials.
4. Enable the students to characterize bituminous grade according to their work suitability.
5. Recognize the knowledge and idea about the different physical properties of aggregates by performing different test on aggregates.
6. Prepare technical laboratory report.

List of Experiments:

A. Test on Highway Materials:

1. Aggregates –
   a) Impact Value Test.
   b) Los Angeles Abrasion Value Test.
   c) Water Absorption and Specific Gravity.
   d) Elongation and Flakiness Index.
2. Bitumen –
   a) Specific Gravity Test.
   b) Penetration Value Test.
   c) Softening Point Test.
   d) Loss on Heating Test.
   e) Flash and Fire point Test.
   f) Ductility Test.
   g) Viscosity Test.

B. Bituminous Mix Design by Marshall Stability Method.

C. Stripping Value Test.

D. Benkelman Beam Deflection Test.

References:

1. BIS Codes on Aggregates and Bituminous Materials.
2. Highway Material Testing (Laboratory Manual) by S.K. Khanna and CE. G. Justo.
3. Relevant IS and I.R.C codes.

Subject Name: RDBMS Lab

Subject Code: CSEN 3216

Contacts: 3P

Credit: 2

Experiments on Database on RDBMS Platform (Oracle):

DDL Commands: Creating Tables along with constraints like: Primary Key, Foreign Key, unique, Not Null, Check. Altering Table Structure like adding and modifying constraints, adding and modifying column data types, etc.

DML: Inserting rows, Updating rows, Deleting rows

SQL Query: Cartesian Product, All types of Join, Union, Intersect, Minus, Single Row functions, multiple row functions using GROUP BY clause, ORDER BY Clause, Nested Sub-Queries

Introduction to PL/SQL: Programming Language Constructs in PL SQL like variable declaration, Conditional Statements, different types of loop structures, functions, etc. Programming using Cursors.

Books:

DBMS Laboratory

Title: SQL, PL/SQL: The Programming Language Of Oracle (With CD-ROM) (English) 4th Revised Edition

Author: Ivan Bayross

Publisher: BPB Publications

Subject Name: STEEL STRUCTURE DESIGN & DETAILING
Subject Code: CIVL 3221
Contacts: 3P
Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Identify the material properties of structural steel. Moreover, the students will identify different bolted and welded connections, analyse and design them for axial and eccentric loads.
2. Design different steel sections subjected to axial compression and tension following Indian codes of practices.
3. Comprehend the differences between laterally supported and unsupported flexure members. Designing of the flexure members using Indian codes of practice.
4. Analyse and design rolled and built up compression members along with base connection subjected to axial compression, bending and tension.
5. Calculate shear force and bending moment on rolled and built up girders, dimension the section and finally design it following Indian standard design guidelines.
6. Identify different components of gantry system, calculate lateral and vertical loads acting on the system, dimension the components and design them.
7. Design different components of an industrial building.

List of topics:

I) Problems on general consideration and basic concepts
II) Discussion on different loads (i.e. Dead load, live load, wind load and others) as per IS 875.
III) Introduction to PEB (pre-engineered building) structures.
IV) Design and drawing of the following components of a factory shed:

1. Members of the roof truss.
2. Joints of the roof truss members.
3. Purlins.
4. Wind bracings.
5. Columns.
6. Gantry girder and gantry column.
7. Column base connection.

References: I.S. 875 (part I, II and III) - 1987, I.S: 800-2007, SP: 6 (I) – 1964.

Text & References:

Sl. No	Name	Author	Publishers
1.	Design of steel structures.	N. Subramanian	Oxford University Press
2.	Design of steel structures.	A.S.Arya and J.L.Ajmani	Nemchand and Bros.
3.	Limit State design of steel structures (2^{nd} edition).	S.K.Duggal	McGraw Hill India, New Delhi
4.	Fundamentals of structural steel design.	M.L. Gambhir	McGraw Hill India, New Delhi
5.	Analysis and design of steel structures (2^{nd} edition).	Karuna Moy Ghosh	Prentice Hall, India

Subject Name: PERSONALITY DEVELOPMENT

Subject Code: HMTS 3221

Contacts: 1L

Credit: 1

Module I:

Self-Growth

i)Self Growth- Maslow's Hierarchy of Needs Theory

ii) Anger, Stress & Time Management- Theories and application

iii) SWOT Analysis

Module II:

Stepping Up

i) Growth & Environment

ii) Competitive Spirit

iii) Responsibility Factor

Module III:

Professional Communication

i) Impression Management- theory on social psychology

ii) Employability Quotient

iii) Cross-cultural communication

Module IV:

Leadership & Team Playing

i) Leadership & Team Playing: Theories, Styles, Stages

ii) Motivation, Negotiation Skills, Conflict Management

iii) Planning & Envisioning: Initiative and Innovation in the Work Environment- De Bono's Six Thinking Hats

Suggested Reading:

1. Personality Development and Soft Skills by Barun K. Mitra, Oxford University, 2011
2. Soft Skills: An Integrated Approach to Maxmise Personality by Gajendra Singh Chauhan and Sangeeta Sharma, Wiley, 2016
3. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalaswamy Ramesh and Mahadevan Ramesh, Pearson, 2010

Subject Name: WATER RESOURCES ENGINEERING

Subject Code: CIVL 4101

Contacts: 3 L + 1 T

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Understand the design of water resources systems utilizing the basic principles of the hydrologic cycle and the watershed.
2. The concepts of movement of ground water beneath the earth.
3. Understand the value of probability and statistical analysis in deriving precipitation and stream flow data and hydrograph theories.
4. To impart the knowledge of irrigation techniques, efficiencies, optimal irrigation of the fields, consumptive water requirements of the crops and crop types.
5. Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals system.
6. Master the concept of water logging and drainage systems.

SL No.	Module	Details of Course Contents	Hours	Total
1	I	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	36
		Evaporation, evapo-transpiration and infiltration: Processes, Factors affecting run off, estimation of run-off, rainfall run off relationship.	4	
2	II	Stream flow measurement: Direct and indirect methods, Examples. Stage discharge relationships, back water effect, unsteady flow effect.	4	
		Hydrographs; characteristics: Base flow separation. Unit Hydrographs. Derivation of unit hydrographs, S-curve.	4	
		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	

3	III	Canal Irrigation: Introduction, classification of irrigation canals, Efficient section, certain important definitions, Time factor, Capacity factor, full supply coefficient, Nominal duty, Channel losses, Examples.	10	
4	IV	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.	6	

RECOMMENDED BOOKS:

SL. No.	Name of Text and Reference books	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	Irrigation, Water Resource & Water Power Engineering	Dr. P.N Modi	Standard Book House-New Delhi
4	Irrigation and Water Resources Engineering	G.L. Asawa,	New Age International Publishers, New Delhi (2005)

Subject Name: ADVANCED STRUCTURAL ANALYSIS

Subject Code: CIVL 4141

Contacts: 3 L + 1 T

Credit: 3

Course Outcome:

1. Basic Knowledge of the student will increase.
2. Student will be able to apply stiffness and flexibility method using system approach.
3. Student will understand the yield conditions from their knowledge of stress-strain relations.
4. Student will be able to solve simple plate and shell problems.

SL No.	Module	Details of Course Contents	Contact hours	Total
1.	I	Matrix methods of structural analysis: Application of matrix methods to plane truss, beams, continuous frames.	12	42
2.	II	Finite difference and relaxation technique-application to simple problems.	10	
3.	III	Theory of plate bending: Navier's Sol utions. Levy's solution. Plate buckling problem. Membrane theory of domes and cylindrical shells.	10	
4.	IV	Theory of Elasticity: Three dimensional stress and strain analysis, stress strain transformation, stress invariants, equllibrium and compatibility equations. Two dimensional problems in Cartesian and polar coordinates. Plane stress, plane stain problems, St. Venant's principle.	10	

References:

1. Matrix, finite element, computer and structural analysis, M. Mukhopadhyay, ANE Books.
2. Intermediate Structural analysis, C. K. Wang, Mc-Graw Hill
3. Matrix method of Structural Analysis, P.N.Godbole, R.S. Sonparote, S.U.Dhote, PHI.
4. Theory of Plates and Shells, Timoshenko & Krieger, Mc-Graw-Hill
5. Theory of Elasticty, Timoshenko & Goodier, Mc-Graw-Hill

Subject Name: REMOTE SENSING AND GIS

Subject Code: CIVL 4142

Contacts: 3 L + 1 T

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Understand the principles, applications, trends, and pertinent issues of geographical information systems and sciences, including remote sensing (RS), Photogrammetry, cartography, and global positioning systems (GPS).
2. Provide learning and teaching experiences with real world problems.
3. Develop technical skills and competence in data and information acquisition, extraction, management and analysis; spatial and statistical modelling; mapping and visualization.
4. Increase awareness of GIS and modelling tools for improving competition and business potential.
5. Describe how geographical information is used, managed, and marketed globally.

SL No.	Module	Details of Course Contents	Hours	Total
1	I	**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.	8	36
2	II	**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	10	
3	III	**Remote Sensing:** 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, Information extraction from satellite images.	10	

4	IV	**Geoinformatics:** GIS concept (Introduction/ definition), planning and management, spatial data model, linking of attributes, geospatial analysis, modern trends.	8	

RECOMMENDED BOOKS:

Text and Reference Books			
SL. No.	**Name of the books**	**Publishers**	**Author**
1	Remote Sensing & GIS	Oxford University Press	Basudeb Bhatta
2	Remote Sensing & Image Interpretation	Wiley	Lilesand, Kiefer and Chipman
3	Remote Sensing & Geographical information System	BS publication	Reddy M.A.
4	Surveying (Volume 2)	NCBA Publisher, New Delhi	Kanetker & Kulkarni
5	Surveying	Pearson Education	Bannister, Raymond & Baker

Subject Name: ADVANCED PAVEMENT ENGINEERING

Subject Code: CIVL 4143

Contacts: 3 L + 1 T

Credit: 3

Course Outcome:

At the end of the course, the student will be able to:

1. Differentiate between different types of pavements, both structurally and functionally.
2. Conduct Axle Load Survey and Estimate Design Traffic.
3. Analyze and design bituminous and cement concrete pavement using.
4. Understand the principles of Pavement Maintenance and identify various pavement distresses.

SL. No	Module	Details of Course Contents	Hours	Total
1.	I	**Introduction:** Classification of pavements, Difference between highway and runway pavements, Factors affecting structural design. Concept of innovative pavement materials, Geometric design of Hill Roads.	6	38
2.	II	**Traffic Considerations in Pavement Design:** Vehicle types, Axle configurations, Contact shapes and contact stress distribution, Concept of standard axle load and ESWL, Vehicle damage factor, Axle load surveys, Estimation of design traffic	8	
3.	III	**Pavement Analysis and Design:** Principles of pavement design: Concepts of structural and functional failures, Performance criteria; Analysis of pavements: Analysis of stress, strain and deflection characteristics of flexible and rigid pavements, Linear Elastic Theory. Design of flexible and rigid pavements by IRC, AASHTO and other important methods.	12	
4.	IV	**Pavement Maintenance:** Distresses in Pavement; Functional Evaluation of Pavement (Pavement Roughness and Skid Resistance); Structural Evaluation Of pavement (Benkelman Beam and Falling Weight Deflectometer); Pavement Maintenance with and without Overlay.	12	

RECOMMENDED BOOKS:

TEXT & REFERENCE BOOKS	
Sl. No.	**Name of the books**
1	Principles of Pavement Design, E. J. Yoder & M.W. Witzack, John Wiley and Sons
2.	Pavement Analysis and Design, Yang H. Huang, Pearson
3.	Principles of Transportation Engineering, P. Chakraborty& A. Das - PHI
4.	D. Croney & P. Croney, Design and Performance of Road Pavements, McGraw-Hill Professional; 3 rd edition, 1997.
5.	Highway Engineering, Khanna& Justo, Nemchand& Brothers, Roorkee.
CODES FOR REFERENCE	
Sl. No.	**Name of the Codes**
6.	Relevant latest IRC Codes (IRC-37 – 2001, IRC-37 – 2012, IRC 58 – 2015, IRC 81 -1997- Indian Road Congress
7.	Relevant AASHTO Guidelines

Subject Name: HYDRAULICS STRUCTURES

Subject Code: CIVL 4144

Contacts: 3 L + 1 T

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Integrate themselves in water-structures design applications.
2. Solve multi-variable hydraulic design problems in an open-ended solution space.
3. Develop understanding of the basic principles and concepts of analysis and design of hydraulic structures.

SL No.	Module	Details of Course Contents	Hours	Total
1	I	**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.	8	38
2	II	**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 flow nets, 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.	10	
3	III	**Dam (General):** Definition, classification of Dams, factors governing selection of type of dam, selection of suitable site for a dam. **Earthen Dams:** Introduction, Types of Earthen Dams, Methods of Construction, Causes offailure, Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam, seepage control in Earthen Dam, Examples.	5 5	
4	IV	**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.	10	

Recommended Books:

Text and Reference Books	
SL. No.	**Name of the books**
1	"Irrigation Engineering and hydraulic structures." by Santosh Kumar Garg (Khanna Publishers)
2	"Irrigation, water Resources and Water Power Engg." by Dr.P.N. Modi (Standard Book House, Delhi-6)
3	"Irrigation and Water Resources Engineering" by G.L. Asawa, (New Age International Publishers, New Delhi (2005).)

Subject Name: SOIL DYNAMICS AND MACHINE FOUNDATIONS

Subject Code: CIVL 4161

Contacts: 3 L + 1 T

Credit: 4

Course Outcome:

After going through this course, the students will be able to:

1. Understand the basic concept of vibration.
2. Define various aspects of machine foundation.
3. Illustrate and formulate equation for wave propagation.
4. Analyze and design block type machine foundation with an overview of rotary and impact type machines.
5. Enumerate dynamic properties of soil.
6. Examine liquefaction potential of soil and to mitigate hazards associated with it.

Sl. No.	Module	Details of Course Content	Hours	Total
1	I	**Fundamental of Vibrations**: Basic definitions, degrees of freedom, natural frequency, undamped single degree of freedom system, damped single degree freedom system, transmissibility, response to ground motion, introduction to multiple degree freedom system.	9	42
2	II	**Introduction to Machine Foundation**: Types of machine foundations, general requirement of machine foundations, dimensional criteria, design data, permissible amplitude, permissible bearing pressure. **Propagation of elastic waves in soils**: Mechanism of wave propagation, Body waves, Surface waves, Rayleigh waves.	12	
3	III	**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. **Introduction to Rotary and Impact type machines**	12	
4	IV	**Dynamic properties of Soil**: Introduction, laboratory and field evaluation of soil properties as per IS codes, **Liquefaction of Soil**: Definition, causes and effects of liquefaction, evaluation of liquefaction potential, mitigation of liquefaction hazards.	9	

RECOMMENDED BOOKS:

TEXT & REFERENCE BOOKS	
Sl. No.	**Name of the books**
1.	Hand Book of Machine Foundation, Srinivasalu and Vaidyanathan, Mcgraw Hill Education
2.	Geotechnical Earthquake Engineering, S. L. Kramer, Pearson India
3.	Earthquke Resistant Design, D. J. Dorwick, John Wiley & Sons Inc
4.	Fundamentals of Soil Dynamics & Earthquake Engineering, B. B. Prasad, Phi Learning Pvt. Ltd.
5.	Principles of Soil Dynamics, B. M. Das and Z. Luo, Cengage Learning.
6.	Soil Dynamics and Machine Foundations, Swami Saran, Galgotia Publications.

CODES FOR REFERENCE:

Sl. No.	**Name of the Codes**
7.	IS 2974, IS 5249

Subject Name: STRUCTURAL DYNAMICS & EARTHQUAKE ENGINEERING

Subject Code: CIVL 4162

Contacts: 3 L + 1 T

Credit: 4

Course Outcome:

After going through the course:

1. Knowledge of students about Earthquake Engineering will advance enormously.
2. Student will understand the behavior of structures under earthquake.
3. Student will get an idea about the practical applications of earthquake engineering.
4. Student will be able to design the ductile detailing of structures.

Sl. No.	Module	Details of Course Content	Contact hours	Total
1.	I	**Theory of vibration:** Degrees of freedom, Undamped single degree freedom system, Damped single degree freedom system, Natural frequency, modes of vibration, Introduction to multiple degree freedom system	10	44
2.	II	**Response of single degree freedom system due to harmonic loading:** Undamped Harmonic excitation, Damped harmonic excitation. **Response due to Transient loading:** Duhamel's Integral, Response due to constant force, rectangular load, Introduction to numerical evaluation of Duhamel's integral of un-damped system.	10	
3.	III	**Elements of seismology**: Fundamentals: Elastic Rebound Theory, Plate tectonics, Definitions of magnitude, Intensity, Epicenter etc. Seismograph, Seismic zoning. Response of simple structural system, recent Earth Quakes.	10	
4.	IV	**Principles of Earthquake Resistant Design**: Terminology, General Principles and Philosophy of earth quake resistant design, Methods of analysis, Equivalent lateral force method and response spectrum method of analysis for multistoried building as per Indian Standard Code of Practice, Fundamental concepts of ductile detailing, Introduction to performance based design.	14	

References:

1. Structural Dynamics (Theory and computation), Mario Paz, CBS Publishers and Distributor.
2. Dynamics of Structures, Clough and Penzien, Computers & Structures, Inc. 1995 University Ave.Berkeley, CA 94704USA
3. Dynamics of Structure (Theory and application to earthquake engineering), A. K. Chopra, Pearson Education.
4. Dynamics of Structures, Ashok K. Jain, Pearson Education.
5. Earthquake resistant design of Structures, Agarwal and Shrikhande, PHI.
6. Earthquake-resistant design of structures, S.K. Duggal, Oxford University Press.
7. IS1893: PartI, 2002, IS 13920:1993, IS4326:1993.

Subject Name: ENVIRONMENTAL POLLUTION & CONTROL

Subject Code: CIVL 4163

Contacts: 3 L + 1 T

Credit: 4

Course Outcome:

1. Understanding the basic concepts of environmental pollution.
2. Ability to justify the use of pollution control equipment and their design.
3. Ability to identify air pollution problems.
4. Understand industry specific treatment technologies.
5. Capacity to assess the various aspects of noise pollution and understand the different environmental laws.
6. Get an overall understanding of various ways to manage solid waste.

Sl. No.	Module	Details of Course Content	Contact hours	Total
1	**I**	**Introduction**: Overview on Environmental Pollution- Air, Water, Solid waste. Concept of Pollution control- Air, Water, Solid waste. **Air Pollution**: Air Pollutants: Types- Primary and secondary pollutant, Sources, Effects; Air quality standard. Meteorological aspect of Air Pollution: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.	2 8	10
2	**II**	**Air pollution Control**: Self cleansing mechanism of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles. **Industrial Water pollution control**: Characteristics of various industrial waste water- physical and chemical. Specific treatment technologies- physical, chemical and biological, Management of treatment plant sludge.	8 2	10

3	**III**	**Noise Pollution:** Definition; Sources of noise, characteristics of noise; Sound Pressure, Power and Intensity level; 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}; strategies for noise pollution control. **Global Environmental Issues**: Ozone Depletion, Acid Rain, Global Warming-Green House Effects, Eutrophication, photochemical smog.	4 4	8
4	**IV**	**Administrative Control on Environment:** Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects. **Environmental Laws:** Relevant Water Acts, Air Acts, Motor Vehicle Acts, solid and hazardous waste acts. **Solid Waste Management:** Introduction, Source, Quality and composition of municipal solid waste, Collection, transfer, processing and transportation, Method of disposal- Sanitary landfill, Composting, Incineration, Pyrolysis, Anaerobic digestion and Energy recovery.	2 2 4	8

Recommended books:

Sl. No.	Title	Author	Publisher
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	H. Peavy, D. Rowe, G. Tchobanoglous	TMH
4	Environmental Engineering, Vol. II	S.K . Garg	Khanna Publishers
5	Air Polution	Rao and Rao	TMH
6	Water Supply, Waste Disposal and Environmental Pollution Engineering	A.K.Chatterjee	Khanna Publishers
7	Sewage Treatment & Disposal And Wastewater Engg	P. N. Modi	Standard Book House
8	Integrated solid waste management: engineering principles and management issues	G.Tchobanoglous, H.Theisen, S. A. Vigil	McGraw-Hill

Subject Name: ADVANCED R.C.C. DESIGN

Subject Code: CIVL 4164

Contacts: 3 L + 1 T

Credit: 4

Course Outcome:

1. To perform the analysis and design of reinforced concrete members and their connections.
2. To identify and apply the industrial design codes relevant to the design of Reinforced concrete members.
3. To be familiar with the professional and contemporary design issues and fabrication of Reinforced concrete members.

Sl. No.	Module	Details of Course Content	Contact hours	Total
1	I	**Overall Review:** Review of Limit State Design of Beams, Slabs & Columns according to IS 456-2000. Yield line theory, Biaxial Bending & Slander Column. **Analysis and Design of beams curved in plan:** Design principle, structural design of beams curved in plan of circular and rectangular types. **Flat slabs:** Introduction, components – IS code provisions-Design method –Design for flexure and shear and Detailing.	3 5 3	40
2	II	**Deep beams:** Introduction, Flexural and shear stresses in deep beam and Design and Detailing. **Water tank:** Introduction, Types, Analysis and Design of water tanks e.g. Underground & Elevated water tank (Circular, Rectangle and Intz)	3 6	
3	III	**Raft Foundation:** Introduction, Types and Design of raft foundation. **Design** of folded plate **Design** of shear wall as per IS 13920	4 4 2	
4	IV	**Design of bunkers and silos**: Introduction, Difference between Bunkers and Silo (rectangular, square and circular bunker and silo design for storage of cement). **Analysis and design of chimneys:** Introduction and different type of linings, wind load calculation on chimney (Static and dynamic) Analysis and design of chimney linings, foundation types.	4 6	

Recommended books:-

Code: IS 3370 -2009 (Part-II, IV)
IS-456-2000
SP-16
IS 1893-2016
IS-875-2015 (PART-III)

TEXT BOOKS:

1. Advanced RCC Design by S.S.Bhavikatti, New Age International
2. Advanced RCC Design by N. Krishnaraju, CBS publishers
3. Advanced Reinforced Concrete Design by P.C. Varghese, PHI publishers
4. Chimney Design & construction by S.N.Manohar, Tata McGraw Hill.

Subject Name: BUILDING MATERIALS

Subject Code: CIVL 4181

Contacts: 3 L

Credit: 3

Course Outcome:

At the end of the course, the student will be able to:

1. Learn and use common terms used in building industry.
2. Able to understand and utilize basic principles used in building industry.
3. Will be aware of the application of these materials.
4. Can display safe and professional work practice.

Sl. No.	Module	Details of Course Content	Contact hours	Total
1	I	**Building Materials - I** Bricks: Introduction, Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick earth, Different forms of bricks, Testing of bricks, Defects of bricks, Fly ash brick. Cement: Introduction, Chemical Composition of Cement, Hydration of Cement. Tests on Cement and Cement Paste – specific gravity, fineness, consistency, setting time, soundness, strength. Manufacturing of cement. Types of Portland Cement – Ordinary, Rapid hardening, Low-heat, Sulphate resisting, Portland slag, Portland pozzolana, Super sulphated cement, White cement. Aggregates: Introduction, Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction. Testing of Aggregates – Particle size distribution, Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value	2 5 5	35
2	II	**Building Materials -II** Ferrous Metals: Introduction, Pig Iron- composition, properties, uses. Cast Iron-Properties, Manufacturing, uses. Wrought iron-properties, uses. Steel- composition, properties, manufacturing, uses. Rolled steel sections, Wide flanged section, Reinforcing steel bars (TMT bars). Corrosion of steel, Tensile testing of steel, Alloy steel. Mortars: Introduction, Classification, Uses, Characteristics of good mortar, Ingredients. Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting:	5 1 1	

		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		
3	III	**Building Construction -I** 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) Wall, Doors and Windows Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal.	4 4 2	
4	IV	**Building Construction -II** 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. 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.	2 2 2	

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	**Name of the books**
1.	*Building Materials* , Duggal S.K., New Age International
2.	*Building Materials*, Varghese P.C., PHI Learning Pvt. Ltd-New Delhi.
3.	*Building Construction*, Punmia B.C., Laxmi Publications.

REFERENCE BOOKS

Sl. No.	**Name of the books**
1.	*Concrete Technology*, M. S. Shetty R., S. Chand.
2.	*Concrete Technology*, Nevile A.M. & Brooks J.J., Pearson Education.
3.	*Engineering Materials*, S.C. Rangwala, Charotar Publishing

Subject Name: HYDROLOGY

Subject Code: CIVL 4182

Contacts: 3 L

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Understand the design of water resources systems utilizing the basic principles of the hydrologic cycle and the watershed.
2. Review the fundamentals of fluid mechanics including fluid statics and dynamics.
3. Master the computation of flow in closed conduits including pipelines, pumps, and water supply systems.
4. Perform open channel flow design including water surface profiles, floodplain delineation, storm water and sanitary sewer design.
5. Understand the value of probability and statistical analysis in deriving precipitation and stream flow data.

Sl. No.	Module	Details of Course Content	Contact hours	Total
1.	I	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	36
		Evaporation, evapo-transpiration and infiltration: Processes, Factors affecting run off, estimation of run-off, rainfall run off relationship.	4	
2.	II	Stream flow measurement: Direct and indirect methods, Examples. Stage discharge relationships, back water effect, unsteady flow effect.	4	
		Hydrographs; characteristics: Base flow separation. Unit Hydrographs. Derivation of unit hydrographs, S-curve.	4	
		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	

3.	III	Canal Irrigation: Introduction, classification of irrigation canals, Efficient section, certain important definitions, Time factor, Capacity factor, full supply coefficient, Nominal duty, Channel losses, Examples.	10	
4.	IV	Water logging and drainage: Causes, effects and prevention of water logging. Type of drains-open drains and closed drains (introduction only), Discharge and spacing of closed drains. Examples.	6	

RECOMMENDED BOOKS:

SL. No.	Name of Text and Reference books	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	Irrigation, Water Resource & Water Power Engineering	Dr. P.N Modi	Standard Book House-New Delhi
4	Irrigation and Water Resources Engineering	G.L. Asawa,	New Age International Publishers, New Delhi (2005)

Subject Name: ENVIRONMENTAL POLLUTION & CONTROL

Subject Code: CIVL 4183

Contacts: 3 L

Credit: 3

Course Outcome:

To give an idea to the students about the different kinds of environmental pollution, viz. Air, Water, Noise, Solid Waste, their sources, characteristics, effects and control mechanisms as well as legislation issues.

Sl. No.	Module	Details of Course Content	Contact hours	Total
1	**I**	**Introduction**: Overview on Environmental Pollution- Air, Water, Solid waste. Concept of Pollution control- Air, Water, Solid waste. **Air Pollution**: Air Pollutants: Types- Primary and secondary pollutant, Sources, Effects; Air quality standard. Meteorological aspect of Air Pollution: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.	2 8	10
2	**II**	**Air pollution Control**: Self cleansing mechanism of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles. **Industrial Water pollution control**: Characteristics of various industrial waste water, physical and chemical. Specific treatment technologies- physical, chemical and biological, Management of treatment plant sludge.	8 2	10
3	**III**	**Noise Pollution:** Definition; Sources of noise, characteristics of noise; Sound Pressure, Power and Intensity level; 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}; strategies for noise pollution control. **Global Environmental Issues**: Ozone Depletion, Acid Rain, Global Warming-Green House Effects, Eutrophication, photochemical smog.	4 4	8

4	**IV**	**Administrative Control on Environment:** Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects. **Environmental Laws:** Relevant Water Acts, Air Acts, Motor Vehicle Acts, solid and hazardous waste acts. **Solid Waste Management:** Introduction, Source, Quality and composition of municipal solid waste, Collection, transfer, processing and transportation, Method of disposal- Sanitary landfill, Composting, Incineration, Pyrolysis, Anaerobic digestion and Energy recovery.	2 2 4	8

Recommended books:

Sl. No.	Title	Author	Publisher
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	H. Peavy, D. Rowe, G. Tchobanoglous	TMH
4	Environmental Engineering, Vol. II	S. K. Garg	Khanna Publishers
5	Air Polution	Rao and Rao	TMH
6	Water Supply, Waste Disposal and Environmental Pollution Engineering	A. K. Chatterjee	Khanna Publishers
7	Sewage Treatment & Disposal And Wastewater Engg	P. N. Modi	Standard Book House
8	Integrated solid waste management: engineering principles and management issues	G.Tchobanoglous, H.Theisen, S. A. Vigil	McGraw-Hill

Subject Name: COMPUTER APPLICATION IN CIVIL ENGINEERING
Subject Code: CIVL 4111
Contacts: 3 P
Credit: 2

Course Outcome:

After going through this course, the students will be able to:

1. Understand the details of STAAD.Pro software package.
2. To prepare input data of STAAD.Pro.
3. Run STAAD.Pro for analysis and designing of structures.
4. Design different components of structures.
5. Apply wind load and seismic loads from load definition
6. Assign built up section member properties and generate geometry using structural wizard.

Course Content:

1. Study of capabilities of STAAD software for modeling and design – Radial and Cartesian coordinate systems, generating simple structures like two dimensional and three dimensional frames and truss.
2. Study on space, plane, floor and truss options in STAAD.
3. Assigning steel and concrete materials to different structures. Application of built – up steel sections and steel – concrete composites.
4. Different supports available in STAAD.
5. Different loads like member load, floor load, area load, plate load, wind load, seismic load etc.
6. Design of a concrete framed structure using STAAD.
7. Design of an industrial shed using STAAD.

Subject Name: PROFESSIONAL DEVELOPMENT

Subject Code: HMTS 4121

Contacts: 3 P

Credit: 2

Module1: Professional Growth

- Goal Setting- Characteristic of goals, Short-term and long-term goals, Goal-achievement timeline
- Skill identification and Skill up gradation- Washington Accord and Skills for engineers (generic and specific), Local and global skills, Knowledge sources such as MOOC, NPTEL
- Career Planning- Vision and mission, Skill mapping to job profile, Basic and add-on qualifications, Career growth, Self-appraisal, Lifelong learning

Module 2: Entrepreneurship

- The start-up ecosystem in India- Why entrepreneurship?, Indian tech start-up landscape, Stand-up India policies, funding agencies, market development, trends and best practices
- E-Commerce- India as a growing E-commerce market, Possibilities of growth, funding, niche retailers
- Make in India- New processes, Investments, Focus sectors, Makers of Make In India, Opportunities, Policies

Module 3: Industry specific opportunities

- Industry prospects in India and Beyond
- Industry-specific job opportunities
- Research & Development
- Other opportunities

Module 4: Working and living happily

- Managing crisis- Organisational and personal crisis, Analysing crisis, Turnaround strategies, Learning from crisis as opportunity
- Work-life balance- Performance-expectation management, Personal and professional goal- mapping
- Understanding happiness- Components, Conflicts, Happiness Index

Suggested Reading:

1) Basic Managerial Skill for All by E. H. McGrath.SJ. Pub:PHI, New Delhi.
2) The Start-up Equation by Steven Fisher and Jae-Nae Duane. Pub: Mc Graw Hill Education (India) Pvt. Ltd. New Delhi.
3) Live Happily, Work Happily by Siddhartha Ganguli. Pub: Allied Publishers Pvt.Ltd. New Delhi.
4) Crisis Management: Planning for the Inevitable by Steven Fink. Pub: iUniverseInc.USA.
5) Influencer:The New Science of Leading Change by Joseph Grenny&Kerey Patterson. Pub:McGraw Hill Education , USA.

Subject Name: CONSTRUCTION PLANNING AND PROJECT MANAGEMENT

Subject Code: CIVL 4201

Contacts: 3 L

Credit: 3

Course Outcome:

At the end of the course, the student will be able to:

1. Develop the bar chart for the project.
2. Compile the tender documents.
3. Estimate the critical path of the project i.e. the maximum duration which the project require for completion.
4. Understand the uses of various construction equipments at site and the preparation of concrete.
5. Make use of the bylaws of different authorities to get the approval of drawings for construction.
6. Understand the process of arbitration in case the projects suffer from disputation.

SL. No.	Module	Details of Course Contents	Contact Hours	Total
1	I	**Planning**: General consideration, Definition of aspect, prospect, roominess, grouping, circulation, Privacy. **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 **Fire Protection**: Fire fighting arrangements in public assembly buildings, planning , offices, auditorium	2 4 2	36
2	II	**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.	4 4	
3	III	**Planning &Scheduling of constructions Projects**: **Planning by CPM**: Preparation of network, Determination of slacks or floats. Critical activities. Critical path. Project duration. **Planning by PERT**: Expected mean time, probability of completion of project, Estimation of critical path, problems.	4 4	
4	IV	**Management: Professional practice**, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contract **Departmental Procedures**: Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbritation	4 8	

Recommended books, IS Codes:-

1. Estimating, costing, Specification and Valuation in Civil Engineering by M. Chakroborty
2. Construction Planning, Equipments and methods Puerifoy, R.L. McGraw Hill.
3. Management in construction industry P. P. Dharwadkar Oxford and IBH Publishing company New Delhi
4. Construction Management, Critical path Methods in Construction, J. O. Brien Wiley Interscience
5. PERT and CPM L. S. Srinath
6. Project planning and control with PERT and CPM' Construction equipments and its management B. C. Punmia, K. K. Kandelwal and S. C. Sharma
7. National Building code BIS

Subject Name: BRIDGE ENGINEERING

Subject Code: CIVL 4241

Contacts: 3L + 1T

Credit: 4

Course Outcome:

After going through this course, the students will be able to:

1) Discuss basic definitions, types, and components of bridges.
2) Discuss sub-surface investigations required for bridge construction.
3) Understand standard specification and loads for bride design.
4) Perform design of different types bearings and joints for bridges.
5) Perform design of various reinforced concrete and steel bridges.

Sl. No.	Module	Details of Course Content	Contact hours	Total
1	I	**Introduction**: Definition and basic forms, components of a typical bridge, classification of bridges, site investigation, bridge hydrology and hydraulics. **Loads**: I.R.C loads, impact factors, wind loads, longitudinal forces, lateral forces and centrifugal forces. **Bearings**: Types of bearings, details of bearing, joints, design examples.	4	44
2	II	**Reinforced concrete solid slab bridge**: Introduction, general design features, economic span, effective width method, simply supported and cantilever slab bridges, analysis and design. **Box culvert bridge**: Introduction, design method and design example.	14	
3	III	**Design of a T beam bridge**: Introduction, components, design of interior panel of slab, longitudinal and cross girders, Pigeaud's method, design example. **Composite bridge**: General aspects, method of construction, analysis of composite section, shear connectors, design of composite beam.	14	
4	IV	**Steel bridges**: General features, types of stress, design of railway truss bridge and plate girder bridge. **Cable Stayed Bridge**: General features, Philosophy of design.	12	

Text and References:

Sl. No	Name	Author	Publishers
1.	Design and Construction and Highway Bridges	K. S. Rakshit	New Central Book Agency (P) Limited
2.	Bridge Engineering	S. Ponnusamy	McGraw Hill India, New Delhi.
3.	Design of Concrete Bridges	Aswani, Vizirani Ratwani	Khanna Publishers
4.	Design of Steel Structures	Arya and Ajmani	Nem Chand and Bros.

Subject Name: TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING

Subject Code: CIVL 4242

Contacts: 3L + 1T

Credit: 4

Course Outcome:

At the end of the course, the student will be able to:

1) Understand various road user and vehicular characteristics, Analysing traffic flow parameters at Mid-block section and Intersections.
2) Conduct traffic studies and get an idea about traffic regulations & management measures, Parking, Road safety.
3) Plan and evaluate economical transportation systems and Prepare project reports.
4) Understand the principles of Urban transport planning.

SL. No	Module	Details of Course Contents	Contact Hours	Total
1	I	**Traffic Engineering:** Organization of traffic engineering department and its importance under Indian conditions, Road User Characteristics, Human factors governing road user behaviour, vehicle characteristics, slow moving traffic characteristics in Indian conditions. **Traffic flow parameters:** Speed, density and volume relationships, Headway, Spacing, Delay **Intersection:** Road Intersection, Basic Traffic Conflicts, Classification of at-grade intersection, Channelisation , Rotary.	3 4 3	33
2	II	**Traffic Engineering Studies and Surveys:** Traffic Volume Study, Speed Studies, Origin and Destination Study, Traffic Capacity Studies, Parking Studies, Accident Studies. Traffic regulations, Traffic management measures, Traffic signals, Traffic Signs and Markings. **Parking and Accidents:** Parking types, ill effects of parking, off street parking facilities, Causes of Accidents, Accident Studies and Records, Accident Investigations, Measures for the Reduction in Accident Rates.	2 2 3	
3	III	**Transportation Planning**: Brief ideas about urban and regional transportation systems; Components of Transportation system planning; Land use planning, Systems approach to transport planning, Stages in transport planning. Economic evaluation of transportation plans, Preparation of Project Report.	4 4	

4	IV	**Urban Transport Planning:** Elements of Urban Transport Planning, Planning and Work Programme, Transportation Plan, Plan Refinement, Urban Activity Forecast, Overview of Information Needs. Trip generation and distribution, Traffic assignment and modal split, Transport Demand Analysis.	4 4	

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	**Name of the books**
1.	Traffic Engineering and Transport Planning, L.R. Kadiyali, Khanna Publishers, New Delhi
2.	Transportation Engg: An introduction, C. J. Khisty& B. K. Lall,
3.	Transportation Planning, C. S. Papacostas and P. D. Prevedouros

Subject Name: ADVANCED FOUNDATION ENGINEERING

Subject Code: CIVL 4243

Contacts: 3L + 1T

Credit: 4

Course Outcome:

After going through this course, the students will be able to:

1. Design of shallow and deep foundations to carry ultimate loads.
2. Understand advantages and limitations of advanced analytical techniques.
3. Assess dewatering mechanism also design of braced excavation.

SL. No.	Module	Details of Course Contents	Hours	Total
1.	I	**Shallow foundations**: Types of shallow foundation. **Advanced Method of Analysis**: Beams on elastic foundation – Infinite beam, finite beam, Modulus of subgrade reaction, factors affecting modulus of subgrade reaction. **Raft foundation**: Settlement and bearing capacity analysis, analysis of flexible and rigid raft as per IS code.	9	39
2.	II	**Pile foundation**: Vertical, uplift and lateral capacity, elastic continuum approach, ultimate load analysis, Brom's method, settlement of pile and pile group, pile load test and cyclic load test, analysis and geotechnical design of piled raft. **Drilled shaft** – construction procedure, design considerations, load carrying capacity and settlement analysis. **Foundation on expansive soils and collapsible soils**: Problems and remedies.	11	
3.	III	**Well foundation and its elements**: Size and depth; forces on well foundation; methods of sinking; scour depth; analysis of well foundation for bearing capacity and lateral stability. **Caison type** – sinking and control.	10	
4.	IV	**Braced excavation**: Types of bracing system; stability considerations; heave and uplift computation of earth pressure and strut load; ground movement, construction control. **Dewatering**: Field pumping test; common dewatering methods; effects of dewatering.	9	

RECOMMENDED BOOKS:

TEXT & REFERENCE BOOKS	
Sl. No.	Name of the books
1.	Foundation Analysis and Design, J. E. Bowels, McGraw Hill
2.	Principles of Foundation Engineering, B. M. Das, Thomson Book
3.	Advanced Foundation Engineering, N. Som and S.C. Das, PHI Learning Pvt. Ltd.
4.	Advanced Foundation Engineering, V. N. S. Murthy, CBS Publishers
5.	Foundation Engineering, P. C. Varghese, PHI Learning Pvt. Ltd.

CODES FOR REFERENCE:

Sl. No.	Name of the Codes
6.	IS 1904, 6403, 8009, 2950, 2911

Subject Name: FINITE ELEMENT ANALYSIS

Subject Code: CIVL 4244

Contacts: 3L + 1T

Credit: 4

Course Outcome:

After going through this course, the students will be able to:

1. Obtain an understanding of the fundamental theory of the FEA method.
2. Develop the ability to generate the governing FE equations for systems governed by partial differential equations.
3. Understand the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements and

SL. No.	Module	Details of Course Content	Contact Hours	Total
1	I	**Introduction to Finite Element Analysis:** Basic Concepts of Finite Element Analysis and its necessity. **Numerical tools for Finite Element Formulation:** Variational Principle: Ritz method, Weighted residual method: Galerkin approach, Petrov-Galerkin approach.	2 8	44
2	II	**Finite element Formulation:** Formulation of Euler-Bernoulli beam element and Timoshenko beam element, Imposition of boundary conditions.	12	
3	III	**Elements and their properties:** One dimensional and Two dimensional elements (Bar element, Beam element, Plate element), Interpolation functions, Numerical integration.	10	
4	IV	**Finite element solutions:** Formulation of stiffness matrix and solution of beam, plate and truss problems, Problems on Plates with cutout. Introduction to the software SAP2000.	12	

Recommended books:-

TEXT BOOKS	
Sl. No.	**Name of the books**
1.	Bathe K.J, *Finite Element Procedures.* Prentice Hall India Learning Private Limited (1996).
2.	Cook R.D, Malkus, Plesha and Witt, *Concepts and Applications of Finite Elements Analysis,* 4th edition, Wiley.
3.	Mukhopadhyay M. and Hamid S. A., *Matrix and Finite Element Analyses of Structures,* ANE Books.
4.	Reddy J.N., An Introduction to the Finite Element Method, 3rd edition, , McGraw Hill Publication

REFERENCE BOOKS	
Sl. No.	Name of the books
5.	Krishnamoorty C. S., *Finite Element Analysis: Theory and Programming*, 2nd edition, McGraw Hill Publication.
6.	ChandrupatlaT. R. and Belegundu A. D., *Introduction to Finite Elements in Engineering*, 4th edition, Prentice Hall India Learning Private Limited.

Subject Name: REMOTE SENSING AND GIS

Subject Code: CIVL 4281

Contacts: 3L

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Understand the principles, applications, trends, and pertinent issues of geographical information systems and sciences, including remote sensing (RS), Photogrammetry, cartography, and global positioning systems (GPS).
2. Provide learning and teaching experiences with real world problems.
3. Develop technical skills and competence in data and information acquisition, extraction, management and analysis; spatial and statistical modelling; mapping and visualization.
4. Increase awareness of GIS and modelling tools for improving competition and business potential.
5. Describe how geographical information is used, managed, and marketed globally.

SL. No.	Module	Details of Course Contents	Contact Hours	Total
1	I	**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.	8	36
2	II	**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	10	
3	III	**Remote Sensing:** 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, Information extraction from satellite images.	10	
4	IV	**Geoinformatics:** GIS concept (Introduction/ definition), planning and management, spatial data model, linking of attributes, geospatial analysis, modern trends.	8	

RECOMMENDED BOOKS:

Text and Reference Books			
SL. No.	**Name of the books**	**Publishers**	**Author**
1	Remote Sensing & GIS	Oxford University Press	Basudeb Bhatta
2	Remote Sensing & Image Interpretation	Wiley	Lilesand, Kiefer and Chipman
3	Remote Sensing & Geographical information System	BS publication	Reddy M.A.
4	Surveying (Volume 2)	NCBA Publisher, New Delhi	Kanetker & Kulkarni
5	Surveying	Pearson Education	Bannister, Raymond & Baker

Subject Name: PRINCIPLES OF SURVEYING

Subject Code: CIVL 4282

Contacts: 3L

Credit: 3

Course Outcome:

After going through this course, the students will be able to:

1. Carry out preliminary surveying in the field,
2. Take accurate measurements, field booking, plotting and adjustment of traverse,
3. Use various conventional instruments involved in surveying.

SL. No.	Module	Details of Course Content	Contact Hours	Total
1.	I	INTRODUCTIONTO SURVEYING Definition, principles of surveying, types of scales (numerical problems), basic concepts of plans and maps. CHAIN SURVEYING Types of chains,accessories for chain surveying with their use, methods of ranging and methods of offsets, obstacles in chain surveying.	5 5 (10)	40
2.	II	COMPASS SURVEYING Definition, instrument and terminology, local attraction and its elimination, Open and closed traverse, adjustment of traverse. PLANE TABLE SURVEYING Principle, equipment and methods, two and three point problems.	5 5 (10)	
3.	III	LEVELLING Definitions and terminology, types and methods of leveling, use of leveling instruments and supporting accessories. CONTOURING Different terms used in contouring, characteristicsof contour and contour interval, preparation of contour maps.	5 5 (10)	
4.	IV	THEODOLITE SURVEYING Components of Theodolite, adjustments, measurement of vertical and horizontal angels, concepts of trigonometric leveling, TACHEOMETRY Definitions and principles of tachometry and stadia system, fixed hair stadia method, calculation of horizontal and vertical distance using tachometer.	5 5 (10)	

Recommended books:-

TEXT BOOKS	
Sl. No.	**Name of the books**
1.	Basak N.N. *Surveying and Levelling.* 2nd edition, McGraw Hill Education.
2.	Roy S.K. *Fundamentals of Surveying*. 2nd edition, PHI Learning Pvt. Ltd-New Delhi.

REFERENCE BOOKS	
Sl. No.	**Name of the books**
3.	Venkatramaiah C. *Textbook of Surveying*. 2nd edition, Orient Blackswan Pvt. Ltd. –New Delhi.
4.	Duggal S. K. *Surveying (Vol-1 and 2)*. 4th edition, McGraw Hill Education (India) Pvt Ltd.

Subject Name: PROJECT PLANNING AND MANAGEMENT

Subject Code: CIVL 4283

Contacts: 3L

Credit: 3

Course Outcome:

At the end of the course, the student will be able to:

1. Prepare the bar chart for the project.
2. Prepare the tender documents.
3. Estimate the critical path of the project i.e. the maximum duration which the project require for completion..
4. Familiar with the uses of various construction equipments at site
5. Familiar with by laws of different authorities to get the approval of drawings for construction.
6. Know the process of arbitration incase the projects suffer from disputation.

SL. No.	Module	Details of Course Contents	Hours	Total
1	I	**Planning**: General consideration, Definition of aspect, prospect, roominess, grouping, circulation, Privacy. **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 **Fire Protection**: Fire fighting arrangements in public assembly buildings, planning , offices, auditorium	2 4 2	36
2	II	**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.	4 4	
3	III	**Planning &Scheduling of constructions Projects**: **Planning by CPM**: Preparation of network, Determination of slacks or floats. Critical activities. Critical path. Project duration. **Planning by PERT**: Expected mean time, probability of completion of project, Estimation of critical path, problems.	4 4	
4	IV	**Management: Professional practice**, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contract **Departmental Procedures**: Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbritation.	4 8	

Recommended books, IS Codes:-

1. Estimating, costing, Specification and Valuation in Civil Engineering by M. Chakroborty
2. Construction Planning, Equipments and methods Puerifoy, R.L. McGraw Hill.
3. Management in construction industry P.P.Dharwadkar Oxford and IBH Publishingcompany New Delhi
4. Construction Management, Critical path Methods in Construction, J.O.Brien Wiley Interscience
5. PERT and CPM L.S. Srinath
6. Project planning and control with PERT and CPM' Construction equipments and its management B.C.Punmia, K.K.Kandelwal and S.C.Sharma
7. National Building code BIS

Subject Name: ORGANIZATIONAL BEHAVIOUR

Subject Code: HMTS-4201

Contacts: 2L

Credit: 2

Module I

Introduction to Organizational Behaviour-Concept, Importance, Challenges and Opportunities (1L)
Personality-Meaning of Personality, Personality Determinants and Traits, Psychoanalytic Theory, Argyris Immaturity to Maturity Continuum Impact on organization.(2L)
Attitude-Concept, Components, Cognitive Dissonance Theory, Attitude Surveys. (2L)

Module II
Perception- Concept, Nature and Importance, Process of Perception, Factors influencing perception, Perceptual Selectivity, Shortcuts to Judge Others: Halo Effect, Stereotyping, Projection and Contrast Effects, Impact on Organization. (2 L)
Motivation-Definition, Theories of Motivation-Maslow's Hierarchy of Needs Theory,McGregor's TheoryX&Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.(4L)

Module III
Leadership-Concept, Leadership Styles, Theories-Behavioural Theory: Ohio Studies, Michigan Studies, Blake & Mouton Managerial Grid; Contingency Theory: Fielder Theory. (4L)
Group Behaviour: Definition, Characteristics of Group, Types of Groups: Formal & Informal; Stages of Group Development, Group Decision making, Group Decision Making Vs Individual Decision Making. (4L)

Module IV
Organizational Design-Various organizational structures and their pros and cons.
Concepts of organizational climate and culture, Organizational Politics-Concept, Factors influencing degree of Politics (2L)
Conflict management- Concept,Sources of conflict, Stages of conflictprocess, Conflict resolution techniques,Tools-Johari Window to analyse and reduce interpersonal conflict, Impact on organization. (3L)

Suggested Readings:

1) Organization Behaviour by Stephen Robbins

2) Organization Behaviour by Luthans

3) Organization Behaviour by L.M. Prasad

4) Organization Behaviour: Text, Cases &Games by AswathappaK.