Heritage Institute of Technology

(A Kalyan Bharti Trust Initiative)

(An Autonomous Institute under MAKAUT)

Civil Engineering Department

B.TECH. PROGRAMME

SYLLABUS

Effective from: July 2018

FIRST YEAR FIRST SEMESTER

A. Theory							
Sl. No.	Code	Subject	Contacts Hours / Week				Credit Points
			L	T	P	Total	
1.	PHYS 1001	Physics - I	3	1	0	4	4
2.	MATH 1101	Mathematics - I	3	1	0	4	4
3.	CSEN 1001	Programming for Problem Solving	3	0	0	3	3
		Total Theory	9	2	0	11	11
B. Laboratory							
1.	PHYS 1051	Physics Lab - I	0	0	3	3	1.5
2.	CSEN 1051	Programming for Problem Solving Lab	0	0	4	4	2
3.	MECH 1051	Workshop / Manufacturing Practices	1	0	4	5	3
		Total Practical	1	0	11	12	6.5
		Total of Semester without Honours	10	2	11	23	17.5
C. Honours							
1.	ECEN 1011	Basic Electronics	3	0	0	3	3
2.	ECEN 1061	Basic Electronics Lab	0	0	2	2	1
		Total Honours	3	0	2	5	4
		Total of Semester with Honours	13	2	13	28	21.5

FIRST YEAR SECOND SEMESTER

A. Theory							
Sl. No.	Code	Subject	Contacts Hours / Week				Credit Points
			L	T	P	Total	
1.	CHEM 1001	Chemistry - I	3	1	0	4	4
2.	MATH 1201	Mathematics - II	3	1	0	4	4
3.	ELEC 1001	Basic Electrical Engineering	3	1	0	4	4
4.	HMTS 1201	Business English	2	0	0	2	2
		Total Theory	11	3	0	14	14
B. Laboratory							
1.	CHEM 1051	Chemistry Lab	0	0	3	3	1.5
2.	ELEC 1051	Basic Electrical Engineering Lab	0	0	2	2	1
3.	MECH 1052	Engineering Graphics & Design	1	0	4	5	3
4.	HMTS 1251	Language Lab	0	0	2	2	1
		Total Practical	1	0	11	12	6.5
		Total of Semester without Honours	12	3	11	26	20.5
C.Honours							
1.	HMTS 1011	Communication for Professionals	3	0	0	3	3
2.	HMTS 1061	Professional Communication Lab	0	0	2	2	1
		Total Honours	3	0	2	5	4
		Total of Semester with Honours	15	3	13	31	24.5

SECOND YEAR THIRD SEMESTER

A. Theory

Sl. No.	Code	Subject	Contacts Hours / Week			Total	Credit Points
			L	T	P		
1.	CIVL 2101	Fundamentals of Strength of Materials	3	1	0	4	4
2.	CIVL 2102	Soil Mechanics - I	3	1	0	4	4
3.	CIVL 2103	Construction Materials and Technology	3	1	0	4	4
4.	BIOT 2105	Biology	2	0	0	2	2
5.	EVSC 2016	Environmental Sciences (Mandatory Course)	2	0	0	2	0
		Total Theory	13	3	0	16	14

B. Laboratory

Sl. No.	Code	Subject	L	T	P	Total	Credit Points
1.	CIVL 2151	Strength of Materials Lab	0	0	2	2	1
2.	CIVL 2152	Soil Mechanics Lab - I	0	0	2	2	1
3.	CIVL 2153	Construction Materials Lab	0	0	2	2	1
4.	CIVL 2154	Building Planning and Drawing	0	0	4	4	2
		Total Practical	0	0	10	10	5
		Total of Semester without Honours	13	3	10	26	19

C. Honours

Sl. No.	Code	Subject	L	T	P	Total	Credit Points
1.	CIVL 2113	Fluid Mechanics	3	0	0	3	3
2.	CIVL 2163	Fluid Mechanics Lab	0	0	2	2	1
		Total Honours	3	0	2	5	4
		Total of Semester with Honours	16	3	12	31	23

SECOND YEAR FOURTH SEMESTER

A. Theory

Sl. No.	Code	Subject	Contacts Hours / Week			Total	Credit Points
			L	T	P		
1.	MATH 2001	Mathematical Methods	3	1	0	4	4
2.	CIVL 2201	Structural Analysis - I	3	0	0	3	3
3.	CIVL 2202	Soil Mechanics - II	3	0	0	3	3
4.	CIVL 2203	Surveying	3	0	0	3	3
5.	CIVL 2204	Highway and Traffic Engineering	3	0	0	3	3
6.	HMTS 2001	Human Values and Professional Ethics	3	0	0	3	3
		Total Theory	18	1	0	19	19

B. Laboratory

Sl. No.	Code	Subject	L	T	P	Total	Credit Points
1.	CIVL 2251	Soil Mechanics Lab - II	0	0	2	2	1
2.	CIVL 2252	Surveying Lab	0	0	4	4	2
3.	CIVL 2253	Highway Engineering Lab	0	0	2	2	1
4.	CIVL 2254	Quantity Survey, Specification and Valuation	0	0	2	2	1
		Total Practical	0	0	10	10	5
		Total of Semester	18	1	10	29	24

2

THIRD YEAR FIFTH SEMESTER

A. Theory

Sl. No.	Code	Subject	Contacts Hours / Week			Total	Credit Points
			L	T	P		
1.	CIVL 3101	Structural Analysis - II	3	1	0	4	4
2.	CIVL 3102	Design of RCC Structures	3	1	0	4	4
3.	CIVL 3103	Foundation Engineering	3	1	0	4	4
4.	CIVL 3104	Environmental Engineering	3	1	0	4	4
5.	CIVL 3141 - CIVL 3143	Professional Elective - I	3	0	0	3	3
6.	INCO 3016	Indian Constitution and Civil Society **(Mandatory Course)**	2	0	0	2	0
		Total Theory	17	4	0	21	19

B. Laboratory

Sl. No.	Code	Subject	L	T	P	Total	Credit Points
1.	CIVL 3152	RCC Design and Detailing Lab	0	0	3	3	1.5
2.	CIVL 3154	Environmental Engineering Lab	0	0	2	2	1
3.	CIVL 3154	Computer-aided Civil Engineering Drawing	0	0	4	4	2
		Total Practical	0	0	9	9	4.5
		Total of Semester	17	4	9	30	23.5

THIRD YEAR SIXTH SEMESTER

A. Theory

Sl. No.	Code	Subject	Contacts Hours / Week			Total	Credit Points
			L	T	P		
1.	CIVL 3201	Design of Steel Structures	3	1	0	4	4
2.	HMTS 3201	Economics for Engineers	3	0	0	3	3
3.	CIVL 3241 - CIVL 3244	Professional Elective - II	3	0	0	3	3
4.	CIVL 3221 & CIVL 3222	Open Elective - I	3	0	0	3	3
		Total Theory	12	1	0	13	13

B. Laboratory

Sl. No.	Code	Subject	L	T	P	Total	Credit Points
1.	CIVL 3251	Industrial Structure Design and Detailing Lab	0	0	3	3	1.5
2.	CIVL 3253	Computer-aided Structural Analysis and Design	1	0	4	5	3
		Total Practical	1	0	7	8	4.5

C. Sessional

Sl. No.	Code	Subject	L	T	P	Total	Credit Points
1.	CIVL 3293	Term Paper and Seminar	0	0	4	4	2
		Total Sessional	0	0	4	4	2
		Total of Semester without Honours	13	1	11	25	19.5

D. Honours

Sl. No.	Code	Subject	L	T	P	Total	Credit Points
1.	CIVL 3214	Prestressed Concrete Structures	3	1	0	4	4
		Total Honours	3	1	0	4	4
		Total of Semester with Honours	16	2	11	29	23.5

FOURTH YEAR SEVENTH SEMESTER

A. Theory

Sl. No.	Code	Subject	Contacts Hours / Week			Total	Credit Points
			L	T	P		
1.	HMTS 4101	Principles of Management	3	0	0	3	3
2.	CIVL 4141 - CIVL 4144	Professional Elective - III	3	0	0	3	3
3.	CIVL 4145 - CIVL 4148	Professional Elective - IV	3	0	0	3	3
4.	CIVL 4121 & CIVL 4122	Open Elective - II	3	0	0	3	3
5.	CIVL 4123 & CIVL 4124	Open Elective - III	3	0	0	3	3
		Total Theory	15	0	0	15	15
B. Sessional							
1.	CIVL 4191	Industrial Training / Internship	-	-	-	-	2
2.	CIVL 4195	Project - I	0	0	8	8	4
		Total Sessional	0	0	8	8	6
		Total of Semester without Honours	15	0	8	23	21
C. Honours							
1.	CIVL 4115	Water Resources Engineering	3	1	0	4	4
		Total Honours	3	1	0	4	4
		Total of Semester with Honours	18	1	8	27	25

FOURTH YEAR EIGHTH SEMESTER

A. Theory

Sl. No.	Code	Subject	Contacts Hours / Week			Total	Credit Points
			L	T	P		
1.	CIVL 4241 - CIVL 4244	Professional Elective - V	3	0	0	3	3
2.	CIVL 4221 & CIVL 4222	Open Elective - IV	3	0	0	3	3
		Total Theory	6	0	0	6	6
B. Sessional							
1.	CIVL 4295	Project - II	0	0	16	16	8
2.	CIVL 4297	Comprehensive Viva-voce	-	-	-	-	1
		Total Sessional	0	0	16	16	9
		Total of Semester	6	0	16	22	15

PROFESSIONAL ELECTIVE COURSES FOR CIVIL ENGINEERING

Professional Elective - I	CIVL 3141	Pavement Design
	CIVL 3142	Advanced Highway and Traffic Engineering
	CIVL 3143	Airport, Railway and Harbour Engineering
Professional Elective - II	CIVL 3241	Conveyance of Water and Waste Water
	CIVL 3242	Environmental Impact Assessment
	CIVL 3243	Air and Noise Pollution
	CIVL 3244	Solid and Hazardous Waste Management
Professional Elective - III	CIVL 4141	Design of Tall Structures
	CIVL 4142	Structural Dynamics and Earthquake Engineering
	CIVL 4143	Advanced Structural Analysis
	CIVL 4144	Finite Element Analysis
Professional Elective - IV	CIVL 4145	Rock Mechanics
	CIVL 4146	Ground Improvement Techniques
	CIVL 4147	Soil Dynamics and Machine Foundation
	CIVL 4148	Advanced Foundation Engineering
Professional Elective - V	CIVL 4241	Hydraulic Structures
	CIVL 4242	Irrigation Engineering
	CIVL 4243	Bridge Engineering
	CIVL 4244	Offshore Structures

OPEN ELECTIVE COURSES OFFERED BY CIVIL ENGINEERING DEPARTMENT

Open Elective - I (Emerging Field)	CIVL 3221	Repair & Rehabilitation of Structures
	CIVL 3222	Sustainable Construction Methods
Open Elective - II	CIVL 4121	Project Planning and Management
	CIVL 4122	Introduction to Surveying
Open Elective - III	CIVL 4123	Estimation and Valuation
	CIVL 4124	An Introduction to Concrete Technology
Open Elective - IV	CIVL 4221	Building Materials
	CIVL 4222	Introduction to Finite Element Methods

NOTE:-

Open Elective - I (Emerging Field) - to be offered exclusively for the students of Civil Engineering

Open Elective - II, III and IV – to be offered for the students of other Departments.

Honours Credit Chart

Sl. No.	Semester	Paper Code	Course Title	Contacts Hours / Week			Credit Points
				L	T	P	
1	First Year First Semester	ECEN 1011	Basic Electronics	3	0	0	3
2	First Year First Semester	ECEN 1061	Basic Electronics Lab	0	0	2	1
3	First Year Second Semester	HMTS 1011	Communication for Professionals	3	0	0	3
4	First Year Second Semester	HMTS 1061	Professional Communication Lab	0	0	2	1
5	Second Year Third Semester	CIVL 2113	Fluid Mechanics	3	0	0	3
6	Second Year Third Semester	CIVL 2163	Fluid Mechanics Lab	0	0	2	1
7	Third Year Sixth Semester	CIVL 3214	Prestressed Concrete Structures	3	1	0	4
8	Fourth Year Seventh Semester	CIVL 4115	Water Resources Engineering	3	1	0	4
	Total			15	2	3	20

Definition of Credit (as per AICTE):

➢ 1 Hour Lecture (L) per week = 1 Credit

➢ 1 Hour Tutorial (T) per week = 1 Credit

➢ 1 Hour Practical (P) per week = 0.5 Credit

➢ 2 Hours Practical (P) per week = 1 Credit

Range of Credits (as per AICTE):

➢ A total of 160 credits will be necessary for a student to be eligible to get B. Tech. degree.

➢ A student will be eligible to get B. Tech. degree with Honours if he/she completes an additional 20 credits. This could be acquired through various Honours courses offered by the respective departments.

➢ A part or all of the above additional credits may also be acquired through MOOCs. Any student completing any course through MOOC will have to submit an appropriate certificate to earn the corresponding credit.

➢ For any additional information, the student may contact the concerned HODs.

Credit Summary for B Tech in Civil Engineering Programme with effect from 2018-2019

Sl. No.	Course Type	Credit	AICTE suggested
1.	Humanities and Social Sciences including Management Courses	12	12
2.	Basic Science courses	21	25
3.	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	26	24
4.	Professional core courses	57	48
5.	Professional Elective courses relevant to chosen specialization/branch	15	18
6.	Open subjects – Electives from other technical and /or emerging subjects	12	18
7.	Project work, seminar and internship in industry or elsewhere	17	15
8.	Mandatory Courses [Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge, Organizational Behavior]	Non-credit	0
	Total	160	160
9	Honours Courses	20	20
	Grand Total	180	180

Paper Name: **Physics - I**					
Paper Code: **PHYS 1001**					
Contact hours per week:	L	T	P	Total	Credit Points
	3	1	0	4	4

Course objective:

1. To develop basic understanding of the modern science to the technology related domain.

2. Analytical & logical skill development through solving problems.

3. To impart idea of concise notation for presenting equations arising from mathematical formulation of physical as well as geometrical problems percolating ability of forming mental pictures of them.

4. Imparting the essence and developing the knowledge of controlling distant object like satellite, data transfer through optical fiber, implication of laser technology, handling materials in terms of their electrical and magnetic properties etc.

Module 1: Mechanics   (7+5) = 12L

Elementary concepts of grad, divergence and curl. Potential energy function; F=-grad V, Equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, Curl of a force field; Central forces ; conservation of angular momentum; Energy equation and energy diagrams; elliptical, parabolic and hyperbolic orbit; Kepler Problem; Application : Satellite manoeuvres .
Non-inertial frames of reference; rotating coordinate system; five term acceleration formula-centripetal and coriolis accelerations; applications: Weather system, Foucault pendulum.

Module 2: Optics = (4 +3+ 5) = 12 L

Oscillatory Motion:
Damped harmonic motion – Over damped, critically damped and lightly damped oscillators; Forced oscillation and resonance. Electrical equivalent of mechanical oscillator, Wave equation, plane wave solution.

Optics:

Elementary features of polarization of light waves. Double refraction, Production and analysis of linearly, elliptic and Circularly polarized light, Polaroid and application of polarizations.: Polarimeter.

Laser & Fiber Optics:

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.
Fiber optics - principle of operation, numerical aperture, acceptance angle, Single mode , graded indexed fiber.

Module 3: **Electrostatics (8+4) = 12 L**

Electrostatics in free space
Calculation of electric field and electrostatic potential for a charge distribution, Divergence and curl of electrostatic field, Laplace's and Poisson's equation for electrostatic potential. Boundary conditions of electric field and electrostatic potential. Method of images, energy of a charge distribution and its expression in terms of electric field.

Electrostatics in a linear dielectric medium
Electrostatic field and potential of a dipole, Bound charges due to electric polarization, Electric displacement, Boundary conditions on displacement, Solving simple electrostatic problem in presence of dielectric – point charge at the centre of a dielectric sphere, charge in front of dielectric slab, Dielectric slab and dielectric sphere in uniform electric field.

Module 4: **(6+3+3)= 12L**

Magnetostatics :
Biot-Savart law, divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem;   equation for vector potential and it's solutions for given current densities .

Magnetostatics in a linear magnetic medium:
Magnetization and associated bound currents; Auxiliary magnetic field $\vec{H}$; boundary conditions on $\vec{B}$ and $\vec{H}$. Solving for magnetic field due to simple magnet like a bar magnet; Magnetic susceptibility ; ferromagnetic , paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

Faraday's Law:
Differential form of Faraday's law expressing curl of electric field in terms of time derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi static approximation. Energy stored in a magnetic field.

Books of reference :

1. Optics – **Eugene Hecht** Pearson Education India Private Limited
2. Introduction to Electrodynamics, **David J. Griffiths**, Pearson Education India Learning Private Limited
3. Waves and Oscillations by **N.K. Bajaj**
4. Principles of Physics, 10ed, **David Halliday, Robert Resnick Jearl Walker** , Wiley
5. Electricity, Magnetism, and Light, **Wayne M. Saslow**, Academic Press
6. Classical mechanics, **Narayan Rana, Pramod Joag**, McGraw Hill Education
7. Introduction to Classical Mechanics, **R Takwale, P Puranik**, McGraw Hill Education
8. Optics, **Ghatak**, McGraw Hill Education India Private Limited
9. Refresher Course in B.Sc. Physics – Vol1 and Vol 2 – **C.L.Arora**

Paper Name: **MATHEMATICS-I**					
Paper Code: **MATH 1101**					
Contact hours per week:	L	T	P	Total	Credit Points
	3	1	0	4	4

After successfully completing this course the students will be able to:

MATH1101.1 Apply the concept of rank of matrices to find the solution of a system of linear simultaneous equations.

MATH1101.2 Develop the concept of eigen values and eigen vectors.

MATH1101.3 Use Mean Value Theorems for power series expansions of functions of one variable.

MATH1101.4 Analyze the nature of sequence and infinite series.

MATH1101.5 Describe the concept of differentiation and integration for functions of several variables with their applications in vector calculus.

MATH1101.6 Combine the concepts of gradient, curl, divergence, directional derivatives, line integrals, surface integrals and volume integrals.

Detailed Syllabus:

Module I: [10L]

Matrix: Inverse and rank of a matrix; Elementary row and column operations over a matrix; System of linear equations and its consistency; Symmetric, skew symmetric and orthogonal matrices; Determinants; Eigen values and eigen vectors; Diagonalization of matrices; Cayley Hamilton theorem; Orthogonal transformation.

Module II: [10L]

Vector Calculus: 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.

Infinite Series: Convergence of sequence and series; Tests for conver gence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test(statements and related problems on these tests), Raabe's test; Alternating series; Leibnitz's Test (statement, definition); Absolute convergence and Conditional convergence.

Module III: [10L]

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

Ordinary differential equations of higher orders: General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods, Method of variation of parameters, Cauchy-Euler equations.

Module IV: [10L]

Calculus of functions of several variables: 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.

Multiple Integration: Concept of line integrals, Double and triple integrals. Green's Theorem, Stoke's Theorem and Gauss Divergence Theorem.

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2000.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2006.

3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

5. K. F. Riley, M. P. Hobson, S. J. Bence. Mathematical Methods for Physics and Engineering, Cambridge University Press, 23-Mar-2006.
6. S. L. Ross, Differential Equations", Wiley India, 1984.

7. G.F. Simmons and S.G. Krantz, Differential Equations, McGraw Hill, 2007.

8. Vector Analysis (Schaum's outline series): M. R. Spiegel, Seymour Lipschutz, Dennis Spellman (McGraw Hill Education)
9. Engineering Mathematics: S. S. Sastry (PHI)

10. Advanced Engineering Mathematics: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition.
11. Linear Algebra (Schaum's outline series): Seymour Lipschutz, Marc Lipson (McGraw Hill Education)

Course Name: Programming for Problem Solving					
Course Code: CSEN 1001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Learning Objectives: 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.

Total load – 40 hours
Module I: [10L]

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. Basic Concepts of Assembly language, High level language, Compiler and Assembler.

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).

Basic concepts of operating systems like MS WINDOWS, LINUX

How to write algorithms & draw flow charts.

Module II: [10L]

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.

Flow of Control:

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

Module III: [10L]
Program Structures in C

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.
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.
Module IV: [10L]

Data Handling in C
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(), fseek(), ftell().

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 outcome:
On completion of this course, students are expected to be capable of solving problems using mathematics and generalize those solutions into flowcharts to form programs. This course is directed towards teaching the students, how to automate those solutions by implementing them in C programming language. It is expected that due to the use of C programming language, the students will learn the basics of how a high-level language works in tandem with memory. The students should be able to identify coding inefficiencies and errors in C code and turn those programs into efficient ones and remove programming bugs, primarily with manual inspection and later with the use of debuggers.

Course Name: Physics Lab – I					
Course Code: PHYS 1051					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course objective:
1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
2. To learn the usage of electrical and optical systems for various measurements.
3. Apply the analytical techniques and graphical analysis to the experimental data.
4. Understand measurement technology, usage of new instruments and real time applications in engineering studies.
5. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

Minimum of six experiments taking at least one from each of the following four groups:

Group 1: Experiments in General Properties of matter
1. Determination of **Young's modulus** by **Flexure Method**
2. Determination of **bending moment** and **shear force** of a rectangular beam of uniform cross- section.
3. Determination of **modulus of rigidity** of the material of a rod by **static method**
4. Determination of **rigidity modulus** of the material of a **wire by dynamic method.**
5. Determination of **coefficient of viscosity** by Poiseulle's capillary flow method.

Group 2: Experiments in Optics
1. Determination of **dispersive power** of the material of a prism
2. Determination of wavelength of light by **Newton's ring** method.
3. Determination of wavelength of light by **Fresnel's biprism method.**
4. Determination of the **wavelength of a given laser** source by diffraction method

Group 3: Electricity & Magnetism experiments
1. Determination of **dielectric constant** of a given dielectric material.
2. Determination of resistance of **ballistic galvanometer by half deflection** method and study of variation of **logarithmic decrement** with series resistance.
3. Determination of the **thermo-electric power** at a certain temperature of the given thermocouple.
4. Determination of **specific charge (e/m)** of electron.

Group 4: Quantum Physics Experiments
1. Determination of **Planck's constant**.
2. Determination of **Stefan's radiation** constant.
3. Verification of **Bohr's atomic orbital** theory through **Frank-Hertz experiment**.
4. Determination of **Rydberg constant** by studying **Hydrogen/ Helium** spectrum.
5. Determination of **Hall co-efficient of semiconductors.**
6. Determination of **band gap** of semiconductors.
7. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

Course Name: Programming for Problem Solving Lab					
Course Code: CSEN 1051					
Contact hrs per week:	L	T	P	Total	Credit Points
	0	0	4	4	2

Course outcome:

After completion of this course the students should be able:

1. To write simple programs relating to arithmetic and logical problems.
2. To be able to interpret, understand and debug syntax errors reported by the compiler.
3. To implement conditional branching, iteration (loops) and recursion.
4. To decompose a problem into modules (functions) and amalgamating the modules to generate a complete program.
5. To use arrays, pointers and structures effectively in writing programs.
6. To be able to create, read from and write into simple text files.

Software to be used: GNU C Compiler (GCC) with LINUX
NB: Cygwin (Windows based) may be used in place of LINUX

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

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

Course Name: Workshop /Manufacturing Practices					
Course Code: MECH 1051					
Contact Hours per week	L	T	P	Total	Credit Points
	1	0	4	5	3

Course Outcomes:

Upon completion of this course

1. The students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

2. The students will be able to fabricate components with their own hands.

3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

4. By assembling different components, they will be able to produce small devices of their interest.

5. The students will be able to describe different components and processes of machine tools.

6. The students will be able to apply the knowledge of welding technology and they can perform arc and gas welding to join the material.

 (i) Lectures & videos: (13 hours)

Detailed contents

1. Introduction on Workshop and Safety Precautions.   **(1 lecture)**

2. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing

methods   **(3 lectures)**

3. CNC machining, Additive manufacturing   **(1 lecture)**

4. Fitting operations & power tools   **(1 lecture)**

5. Electrical & Electronics   **(1 lecture)**

6. Carpentry   **(1 lecture)**

7. Plastic moulding, glass cutting   **(1 lecture)**

8. Metal casting   **(1 lecture)**

9. Welding (arc welding & gas welding), brazing   **(2 lecture)**

10. Viva-voce   **(1 lecture)**

(ii) Workshop Practice: (52 hours) [L: 0; T:0 ; P : 4 (2 credits)]

1. Machine shop	**(12 hours)**
2. Fitting shop	**(8 hours)**
3. Carpentry	**(4 hours)**
4. Electrical & Electronics	**(4 hours)**
5. Welding shop **(Arc welding 4 hrs + gas welding 4 hrs)**	**(8 hours)**
6. Casting	**(4 hours)**
7. Smithy	**(4 hours)**
8. Plastic moulding& Glass Cutting	**(4 hours)**
9. Sheet metal Shop	**(4 hours)**

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

(iii)Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

(iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Title : Basic Electronics					
Course Code: ECEN 1011					
Contact hrs per week:	L	T	P	Total	Credit points
	3	0	0	3	3

Course Outcomes:

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

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 anlayze their performance depending on the type of required output and subsequently the applied input.

Module I [10 L]

Basic Semiconductor Physics:

Crystalline materials, Energy band theory, Conductors, Semiconductors and Insulators, Concept of Fermi Energy level, intrinsic and extrinsic semiconductors, drift and diffusion currents in semiconductor

Diodes and Diode Circuits:

Formation of p-n junction, Energy Band diagram, forward & reverse biased configurations, V-I characteristics, load line, breakdown mechanisms, Zener Diode and its Application.

Rectifier circuits: half wave & full wave rectifiers: ripple factor, rectification efficiency.

Module II [8 L]

Bipolar Junction Transistors (BJT):

PNP & NPN BJT structures, current components in BJT, CE, CB, CC configurations, V-I Characteristics of CB & CE modes, regions of operation, Base width modulation & Early effect, thermal runaway, Concept of Biasing: DC load line, Q-point, basics of BJT amplifier operation,

current amplification factors, different biasing circuits: fixed bias, collector to base bias, voltage divider bias.

Module III [9 L]

Field Effect Transistors (FET):

n-channel Junction Field Effect Transistor (JFET) structure & V-I characteristics.
Metal Oxide Semiconductor Field Effect Transistor (MOSFET): enhancement & depletion type MOSFETs (for both n & p channel devices), drain & transfer characteristics.
MOSFET as a digital switch, CMOS inverter, voltage transfer characteristic (VTC), NAND & NOR gate realization using CMOS logic.
Moore's Law, evolution of process node, state of integration (SSI, MSI, LSI, VLSI, ULSI),
Classification of Integrated circuits (IC) and their applications.

Module IV [9 L]

Feedback in Amplifiers:

Concept of feedback, advantages of negative feedback (qualitative), Barkhausen criteria.

Operational Amplifier:

Ideal OPAMP characteristics, OPAMP circuits: inverting and non-inverting amplifiers, Adder, Subtractor, Integrator, Differentiator, Basic Comparator.

Special Semiconductor Devices:

Light Emitting Diode (LED), Silicon Controlled Rectifier (SCR), Photodiode: Operations, characteristics & applications.

References:

1. Boylestad & Nashelsky:Electronic Devices & Circuit Theory

2. R.A Gayakwad:Op Amps and Linear IC's, PHI

3. D. Chattopadhyay, 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 Title : Basic Electronics Laboratory					
Course Code: ECEN 1061					
Contact hrs per week:	L	T	P	Total	Credit points
	0	0	2	2	1

Course Outcomes:

1. The students will correlate theory with diode behavior.

2. They will design and check rectifier operation with regulation etc.

3. Students will design different modes with BJT and FET and check the operations.

4. They will design and study adder, integrator etc. with OP-AMPs.

List of Experiments

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multi-meters etc.
2. Familiarization 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, Integrators and Differentiators.

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

Course Outcome:

The subject code CHEM1001 corresponds to chemistry theory classes for the first year B. Tech students, which is offered as Engineering Chemistry and is common for all branches of engineering subjects. The course provides basic knowledge of theory based subjects like quantum mechanics, thermodynamics, reaction dynamics, electrochemistry, structure and reactivity of molecules. The course outcomes of the subject are

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 analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.for engineering applications.
3. Have knowledge of synthesizing nano materials and their applications in industry, carbon nano tube technology is used in every industry now-a-days.
4. Understanding of bulk properties and processes using thermodynamic considerations.
5. Elementary knowledge of IR, UV, NMR and X-ray spectroscopy is usable in structure elucidation and characterisation of various molecules.
6. Knowledge of electronic effect and stereochemistry for understanding mechanism of the major chemical reactions involved in synthesis of various drug molecules.

MODULE 1

Atomic structure and Wave Mechanics:

Brief outline of the atomic structure, Duel character of electron, De Broglies's equation, the Heisenberg uncertainty principle, brief introduction of quantum mechanics, the Schrodinger wave equation, Hermitian operator, solution of the Schrodinger equation for particle in a one dimensional box, interpretation of the wave function Ψ, concept of atomic orbital.   3**L**

Thermodynamics:

Carnot cycle, 2nd law of thermodynamics, entropy, Clausius inequality, free energy and work function, Clausius Clapeyron Equation, Chemical Potential, Activity and Activity coefficient. Gibbs Duhem Relation.   4**L**

Specctroscopic Techniques & Application

Electromagnetic spectrum: EMR interaction with matter - absorption and emission of radiation.
Principle and application of UV- visible and IR spectroscopy
Principles of NMR Spectroscopy and X-ray diffraction technique   **3L**

MODULE 2

Chemical Bonding

Covalent bond, VSEPR Theory, hybridization, molecular geometries, Dipole moment, Intermolecular forces, V.B. and M.O. Theory and its application in Homo and Heteronuclear diatomic molecules, Band theory of solids, Pi-molecular orbitals of ethylene and butadiene.   **5L**

Periodicity

Effective nuclear charge, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro-negativity, inert pair effect.   **3L**

Ionic Equilibria

Acid Base Equilibria, Salt Hydrolysis and Henderson Equation, Buffer solutions, pH indicator, Common ion Effect, Solubility product, Fractional Precipitation.   **2L**

MODULE 3

Conductance

Conductance of electrolytic solutions, Strong and Weak electrolytes, effect of temperature and concentration. Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions. Application of conductance Acid-base and precipitation titration.   **3L**

Electrochemical Cell

Thermodynamic derivation of Nernst equation, Electrode potential and its application to predict redox reaction; Standard Hydrogen Electrode, Reference electrode, cell configuration, half cell reactions, evaluation of thermodynamic functions; Reversible and Irreversible cells; Electrochemical corrosion.
Electrochemical Energy Conversion: Primary & Secondary batteries, Fuel Cells.   **4L**

Reaction dynamics

Rate Laws, Order & Molecularity; zero, first and second order kinetics. Pseudo-unimolecular reaction, Arrhenius equation.
Mechanism and theories of reaction rates (Transition state theory, Collison theory).
Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics).   **3L**

MODULE 4

Stereochemistry

Representations of 3- dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis.   **4L**

Structure and reactivity of Organic molecule

Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion, free radicals, aromaticity.   **3L**

Organic reactions and synthesis of drug molecule (4 lectures)

Introduction to reaction mechanisms involving substitution, addition, elimination and oxidation-reduction reactions. Synthesis of commonly used drug molecules.   **3L**

TEXT BOOKS

1. Atkins' Physical Chemistry, P.W. Atkins (10th Edition)
2. Organic Chemistry, I. L. Finar, Vol-1 (6th Edition)
3. Engineering Chemistry, Jain & Jain,(16th Edition)
4. Fundamental Concepts of Inorganic Chemistry, A. K. Das, (2nd Edition)
5. Engineering Chemistry -I, Gourkrishna Dasmohapatra, (3rd Edition)

REFERENCE BOOKS

1. General & Inorganic Chemistry, R. P. Sarkar
2. Physical Chemistry, P. C. Rakshit, (7th Edition)
3. Organic Chemistry, Morrison & Boyd , (7th Edition)
4. Fundamentals of Molecular Spectroscopy, C.N. Banwell, (4th Edition)
5. Physical Chemistry, G. W. Castellan, (3rd Edition)
6. Basic Stereo chemistry of Organic Molecules, Subrata Sen Gupta, (1st Edition)

Paper Name: **MATHEMATICS-II**					
Paper Code: **MATH 1201**					
Contact hours per week:	L	T	P	Total	Credit Points
	3	1	0	4	4

After successfully completing this course the students will be able to:

MATH1201.1 Construct differential equation as a mathematical model of a physical phenomena.

MATH1201.2 Choose proper method for finding solution of a specific differential equation.

MATH1201.3 Discuss the elementary concepts of graph theory, for example, walk, path, cycle, Eulerian graph, Hamiltonian graph and tree.

MATH1201.4 Apply basic graph algorithms for searching and finding minimal spanning tree and shortest path.

MATH1201.5 Solve improper integrals and initial value problems with the help of Laplace transformation.

MATH1201.6 Evaluate distance, angle between planes and shortest distance between two skew lines in three dimension.

Detailed Syllabus:

Module I: [10L]

Basic Probability: Random experiment, Sample space and events, Classical and Axiomatic definition of probability, Addition and Multiplication law of probability, Conditional probability, Bayes' Theorem, Random variables, General discussion on discrete and continuous distributions, Expectation and Variance, Examples of special distribution: Binomial and Normal Distribution.

Module II: [10L]

Basic Numerical Methods: Solution of non-linear algebraic 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, Matrix Inversion Method. Solution of Ordinary differential equations: Euler's Method, Modified Euler's Method, Runge-Kutta Method of 4th order.

Module III: [10L]

Basic Graph Theory: Graph, Digraph, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Sub-graph, Walk, Path, Circuit, Euler Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph, Dijkstra's Algorithm for shortest path problem. Definition and properties of a Tree, Binary tree and its properties, Spanning tree of a

graph, Minimal spanning tree, Determination of spanning trees using BFS and DFS algorithms, Determination of minimal spanning tree using Kruskal's and Prim's algorithms.

Module IV: [10L]

Laplace Transformation: Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. Introduction to integral transformation, Functions of exponential order, Definition and existence of Laplace Transform(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

References:

1. Advanced Engineering Mathematics, E.Kreyszig, Wiley Publications
2. Introduction to Probability and Statistics for Engineers and Scientists, S.Ross, Elsevier
3. Introductory methods of Numerical Analysis, S.S. Sastry, PHI learning
4. Introduction to Graph Theory, D. B. West, Prentice-Hall of India
5. Engineering Mathematics, B.S. Grewal, S. Chand & Co.

Course Name: Basic Electrical Engineering					
Course Code: ELEC 1001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcomes

After attending the course, the students will be able to

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-I:

DC Network Theorem: Kirchhoff's laws, Nodal analysis, Mesh analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star-Delta conversion. [6L]

Electromagnetism: Review of magnetic flux, Force on current carrying conductors, Magnetic circuit analysis, Self and Mutual inductance, B-H loop, Hysteresis and Eddy current loss, Lifting power of magnet. [5L]

Module-II

AC single phase system: Generation of alternating emf, Average value, RMS value, Form factor, Peak factor, representation of an alternating quantity by a phasor, phasor diagram, AC series, parallel and series-parallel circuits, Active power, Reactive power, Apparent power, power factor, Resonance in RLC series and parallel circuit. [10L]

Module-III

Three phase system: Generation of three-phase AC power, Balanced three phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams, power measurement by two wattmeter method. [4L]

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. [7L]

Module-IV

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, Introduction to three phase transformer.   [6L]

Three-phase induction motor: Concept of rotating magnetic field, Principle of operation, Construction, Equivalent circuit and phasor diagram, torque-speed/slip characteristics.   [4L]

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-I,Vol-II,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, Dhanpat Rai

5. Basic Electrical Engineering, Nath & Chakraborti

6. Fundamental of Electrical Engineering, Rajendra Prasad, PHI, Edition 2005.

Course Name: Business English					
Course Code: HMTS 1201					
Contact Hours per week	L	T	P	Total	Credit Points
	2	0	0	2	2

Course Outcome:

The learner will

1. Acquire competence in using English language to communicate.
2. Be aware of the four essential skills of language usage-listening, speaking, reading and writing.
3. Be adept at using various modes of written communication at work.
4. Attain the skills to face formal interview sessions.

Module- I (6hrs.)

Grammar (Identifying Common Errors in Writing)

- Subject-verb agreement
- Noun-pronoun agreement
- Misplaced Modifiers
- Articles
- Prepositions
- Redundancies

Module- II (6hrs.)

Basic Writing Strategies

Sentence Structures

- Use of phrases and clauses in sentences
- Creating coherence
- Organizing principles –accuracy, clarity, brevity
- Techniques for writing precisely
- Different styles of writing: descriptive, narrative, expository
- Importance of proper punctuation

Module- III (8hrs)

Business Communication- Scope & Importance
Writing Formal Business Letters: Form and Structure- Parts of a Business letter, Business Letter Formats, Style and Tone, Writing strategies.

Organizational Communication: Agenda & minutes of a meeting, Notice, Memo, Circular Organizing e-mail messages, E-mail etiquette

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 of Chronological and Functional Resume, Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honors and Achievements, Personal Profile, Special Interests, References

Module- IV (6hrs)

Writing skills

- Comprehension: Identifying the central idea, inferring the lexical and contextual meaning, comprehension passage - practice
- Paragraph Writing: Structure of a paragraph, Construction of a paragraph, Features of a paragraph, Writing techniques/ developing a paragraph.
- Précis: The Art of Condensation- some working principles and strategies. Practice sessions of writing précis of given passages.
- Essay Writing: Characteristic features of an Essay, Stages in Essay writing, Components comprising an Essay, Types of Essays-Argumentative Essay, Analytical Essay, Descriptive Essays, Expository Essays, Reflective Essays

References:

1. Theories of Communication: A Short Introduction, Armand Matterlart and Michele Matterlart, Sage Publications Ltd.
2. Professional Writing Skills, Chan, Janis Fisher and Diane Lutovich. San Anselmo, CA: Advanced Communication Designs.
3. Hauppauge, Geffner, Andrew P. Business English, New York: Barron's Educational Series.
4. Kalia, S. &Agarwal,S. Business Communication,Wiley India Pvt. Ltd., New Delhi, 2015
5. Mukherjee, H.S., Business Communication- Connecting at work., Oxford University Press. 2nd Edition.2015
6. Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed., 2011.

Course Name: Chemistry Lab					
Course Code: CHEM 1051					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course outcome:

The subject code CHEM1051 corresponds to chemistry laboratory classes for the first year B. Tech students. This course enhances the students' experience regarding handling of various chemicals along with various laboratory equipments. Hands on experiments increase the depth of knowledge that is taught in the theory classes as well as it increases research aptitude in students because they can see the direct application of theoretical knowledge in practical field. The course outcomes of the subject are

1. Knowledge to estimate the hardness of water which is required to determine the usability of water used in industries.

2. Estimation of ions like Fe^{2+}, Cu^{2+} and Cl^- present in water sample to know the composition of industrial water.

3. Study of reaction dynamics to control the speed and yield of various manufactured goods produced in polymer, metallurgical and pharmaceutical industries.

4. Handling physico-chemical instruments like viscometer, stalagmometer, pH-meter, potentiometer and conductometer.

5. Understanding the miscibility of solutes in various solvents required in paint, emulsion, biochemical and material industries.

6. Knowledge of sampling water can be employed for water treatment to prepare pollution free water.

List of Experiments:

1. Estimation of iron using KMnO4 self indicator.
2. Iodometric estimation of Cu^{2+}.
3. Determination of Viscosity.
4. Determination of surface tension.
5. Adsorption of acetic acid by charcoal.
6. Potentiometric determination of redox potentials.
7. Determination of total hardness and amount of calcium and magnesium separately in a given water sample.
8. Determination of the rate constant for acid catalyzed hydrolysis of ethyl acetate.
9. Heterogeneous equilibrium (determination of partition coefficient of acetic acid in n butanol and water mixture).

10. Conductometric titration for the determination of strength of a given HCl solution against a standard NaOH solution.
11. pH-metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
12. Determination of chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

Reference Books:

1. Vogel's Textbook of Quantitative Chemical Analysis-G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney.
2. Advanced Practical Chemistry- S. C. Das
3. Practicals in Physical Chemistry- P. S. Sindhu

Course Name: Basic Electrical Engineering Lab					
Course Code: ELEC 1051					
Contact Hours	L	T	P	Total	Credit Points
per week:	0	0	2	2	1

Course Outcomes: The students are expected to

1. Get an exposure to common electrical apparatus and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the application of common electrical measuring instruments.
4. Understand the basic characteristics of different electrical machines.

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 Graphics & Design					
Course Code: MECH 1052					
Contact hrs per week:	L	T	P	Total	Credit Points
	1	0	4	5	3

Course Outcomes:

After going through the course, the students will be able

1. To understand the meaning of engineering drawing.
2. To have acquaintance with the various standards (like lines, dimensions, scale etc.) and symbols followed in engineering drawing.
3. To represent a 3-D object into 2-D drawing with the help of orthographic and isometric projections.
4. To read and understand projection drawings.
5. To draw the section view and true shape of a surface when a regular object is cut by a section plane.
6. To use engineering drawing software (CAD).

Lecture Plan (13 L)

1. Importance and principles of engineering drawing   (1 L)
2. Concepts of Conic sections and Scale   (1 L)
3. Introduction to concept of projection (Projections of points, lines and surfaces)   (4 L)
4. Definitions of different solids and their projections   (1 L)
5. Section of solids and sectional view   (1 L)
6. Isometric projection   (2 L)
7. Introduction to CAD   (2 L)
8. Viva Voce   (1 L)

Detailed contents of Lab hours (52 hrs)

Module 1: Introduction to Engineering Drawing covering**,**
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lines, lettering & dimensioning, Conic section like Ellipse (General method only); Involute; Scales – Plain, Diagonal.   (4 hrs + 4 hrs)

Module 2: Orthographic Projections covering**,**
Principles of Orthographic Projections - Conventions - Projections of Points and lines inclined to both planes; Projections on Auxiliary Planes. Projection of lamina.   (4 hrs+4 hrs + 4 hrs)

Module 3: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views.   (4 hrs + 4 hrs)

Module 4: Sections and Sectional Views of Right Angular Solids covering**,**
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids.   (4 hrs)

Module 5: Isometric Projections covering**,**
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions. (4 hrs + 4 hrs)

Module 6: Overview of Computer Graphics covering,
listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids. (4 hrs)

Module 7: Customisation & CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; (2 hrs)

Annotations, layering & other functions covering
applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation. (2 hrs)

Module 6: Demonstration of a simple team design project that illustrates
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame. (4 hrs)

References:

1. Bhatt, N.D., Panchal V.M. & Ingle P.R., (2014) "Elementary Engineering Drawing" ; Charotan Publishing House

2. Narayana, K.L. and Kannaaiah P "Engineering Graphics"; TMH

3. Lakshminarayanan, V. and Vaish Wanar, R.S "Engineering Graphics" Jain Brothers.

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Edication.

5. Agarwal B. & Agarwal C. M. (2012), Engineering graphics, TMH Publications.

Course Name: Language Lab					
Course Code: HMTS 1251					
Contact hrs per week:	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

The learner will

1. Acquire the techniques to become an effective listener.
2. Acquire the skill to become an effortless speaker.
3. Organize and present information for specific audience.
4. Communicate to make a positive impact in professional and personal environment.
5. Engage in research and prepare authentic, formal, official documents.
6. Acquire reading skills for specific purpose.

Module- I (4hrs)

Listening Skills

- Principles of Listening: Characteristics, Stages.
- Types of Listening: Passive listening, Marginal or superficial listening, Projective Listening, Sensitive or Empathetic Listening, Active or Attentive listening.
- Guidelines for Effective Listening
- Barriers to Effective Listening
- Listening Comprehension

Module- II (8hrs)

- Interviewing
  Types of Interviews, Format for Job Interviews: One-to-one and Panel Interviews, Telephonic Interviews, Interview through video conferencing.
- Interview Preparation Techniques, Frequently Asked Questions, Answering Strategies, Dress Code, Etiquette, Questions for the Interviewer, Simulated Interviews.

Module- III (6hrs)

- Public Speaking: The Speech Process: The Message, The Audience, The Speech Style, Encoding, Feedback.
- Characteristics of a good speech : content and delivery, structure of a speech
- Modes of delivery in public speaking: Impromptu, Extemporaneous, Prepared or Memorized, Manuscript.

- Conversation: Types of conversation: formal and informal, Strategies for effective conversation, Improving fluency.
- Situational conversation practice: Greetings and making introductions, Asking for information and giving instructions, agreeing and disagreeing.
- Conversational skills in the business scenario: One-to-one and Group communication, Gender and Culture Sensitivity, Etiquette, Sample Business Conversation, Telephonic Conversation

Module- IV (8hrs)

Presentation Skills

- 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.
- Project Team/Group Presentations

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. Sen, S.,Mahendra,A. & Patnaik,P., Communication and Language Skills, Cambridge University Press, 2015
5. Locker,Kitty O. Business and Administrative Communication McGraw-Hill/ Irwin.
6. Chaney,L.and Martin,J., Intercultural Business Communication. Prentice Hall

Course Name: Communication for Professionals					
Course Code: HMTS 1011					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcome:

Students will be able to

1. Write business letters and reports
2. Communicate in an official and formal environment.
3. Effectively use the various channels of communication at work place.
4. Use language as a tool to build bridges and develop interpersonal relations in multi-cultural environment.
5. Learn to articulate opinions and views with clarity.
6. Use various techniques of communication for multiple requirements of globalized workplaces.

Module- I (9hrs.)

Introduction to Linguistics

- Phonetics- Vowel and Consonant Sounds (Identification & Articulation)
- Word- stress, stress in connected speech
- Intonation (Falling and Rising Tone)
- Voice Modulation
- Accent Training
- Vocabulary Building
- The concept of Word Formation
- Root words from foreign languages and their use in English
- Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives
- Synonyms, Antonyms and standard abbreviations

Module- II (10hrs.)

Communication Skills

- 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- III (10hrs.)

Professional Writing Skills

- Letter Writing : Importance, Types , Process, Form and Structure, Style and Tone
- Proposal Writing: Purpose, Types of Proposals, Structure of Formal Proposals.
- Report Writing: Importance and Purpose, Types of Reports, Report Formats, Structure of Formal Reports, Writing Strategies.

Module- IV (10hrs.)

Communication skills at Work

- Communication and its role in the workplace
- Benefits of effective communication in the workplace
- Common obstacles to effective communication
- Approaches and Communication techniques for multiple needs at workplace: persuading, convincing, responding, resolving conflict, delivering bad news, making positive connections,
- Identify common audiences and design techniques for communicating with each audience

References:

1 Kumar,S. &Lata, P. Communication Skills, OUP, New Delhi2011
2 Rizvi,Ashraf,M. Effective Technical Communication, Mc Graw Hill Education(India) Pvt. Ltd..Chennai,2018
3 Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed., 2011

Course Name: Professional Communication Lab					
Course Code: HMTS 1011					
Contact hrs per week:	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcome:

Students will be able to

1. Communicate in an official and formal environment.
2. Effectively communicate in a group and engage in relevant discussion.
3. Engage in research and prepare presentations on selected topics.
4. Understand the dynamics of multicultural circumstances at workplace and act accordingly.
5. Organize content in an attempt to prepare official documents.
6. Appreciate the use of language to create beautiful expressions

Module- I (4hrs)

Techniques for Effective Speaking
Voice Modulation: Developing correct tone
Using correct stress patterns: word stress, primary stress, secondary stress
Rhythm in connected speech

Module- II (6hrs.)

Effective Speaking and Social awareness

The Art of Speaking

- Encoding Meaning Using Nonverbal Symbols
- How to Improve Body Language
- Eye Communication, Facial Expression, Dress and Appearance
- Posture and Movement, Gesture, Paralanguage
- Encoding meaning using Verbal symbols: How words work and how to use words
- Volume, Pace, Pitch and Pause
- Cross-Cultural Communication : Multiple aspects/dimensions of culture
- Challenges of cross-cultural communication
- Improving cross-cultural communication skills at workplace.

Module- III (6hrs)

- Group Discussion: Nature and purpose
- Characteristics of a successful Group Discussion
- Group discussion Strategies: Getting the GD started, contributing systematically, moving the discussion along, promoting optimal participation, Handling conflict, Effecting closure.

Professional Presentation Skills

Nature and Importance of Presentation skills

Planning the Presentation: Define the purpose, analyze the Audience, Analyze the occasion and choose a suitable title.

Preparing the Presentation: The central idea, main ideas, collecting support material, plan visual aids, design the slides

Organizing the Presentation: Introduction-Getting audience attention, introduce the subject, establish credibility, preview the main ideas, Body-develop the main idea, present information sequentially and logically, Conclusion-summaries, re-emphasize, focus on the purpose, provide closure.

Improving Delivery: Choosing Delivery methods, handling stage fright

Post-Presentation discussion: Handling Questions-opportunities and challenges.

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. R. Anand, Job Readiness For IT & ITES- A Placement and Career Companion, , McGraw Hill Education.2015
5. Malhotra, A., Campus Placements, McGraw Hill Education.2015

Course Name: FUNDAMENTALS OF STRENGTH OF MATERIALS					
Course Code: CIVL 2101					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Objective:

The course will assist the students to:

1. Provide the basic concepts and principles of strength of materials.
2. Give an ability to calculate stresses and deformations of objects under external loadings.
3. Provide the guidelines to calculate the member forces in truss structures.
4. Give an ability to apply the knowledge of strength of materials on engineering applications and design problems.

Module I [8L]

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 meridional stresses in thin cylindrical, conical and spherical shells.

Module II [14L]

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

Module III [8L]

i. Analysis of determinate two dimensional trusses by Method of joints and Method of section and graphical method.
ii. Torsion in circular solid and hollow shafts

Module IV [14L]

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.

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.

Course Outcome:

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

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

Course Name: **SOIL MECHANICS - I**					
Course Code: **CIVL 2102**					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Objective:

The course will assist the students to:

[1] Indentify different types of rock and understand their properties.
[2] Classify soil as per grain size distribution curve and understand the index properties of soil.
[3] Apply the concept of total stress, effective stress and pore water pressure for solving geotechnical problems.
[4] Apply the knowledge of permeability and seepage in solving flow problems in soil mechanics.
[5] Calculate vertical stress within a soil mass subjected to different types of loading on the ground surface and draw pressure isobar.

Sl. No.	Module	Details of Course Contents	Hours	Total
1	I	**PROPERTIES AND CLASSIFICATION OF ROCKS** **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. **Weathering and Erosion of rocks**: Agents and kinds of weathering, soil formation & classification based on origin. **Engineering properties of rocks**: Porosity, permeability, compressive strength, tensile strength and abrasive resistance. **Structural Geology**: Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints.	10	40
2	II	**PROPERTIES AND CLASSIFICATION OF SOILS** **Soil Formation and Characterization**: Introduction, Origin of Soil, Formation and Types of soil, Formative classification, Typical Indian Soil, Some Special Types of Soils, Structure and Composition, Clay Mineralogy. **Soil Phase Relationships**: Weight - Volume Relationship, Density, Unit weight, Moisture Content,	10	

		Specific Gravity, Relative density, Functional Relationships. **Index Properties:** 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. **Classification**: Classification by Structure, Particle Size Classification, Textural System, PRA System (AASHTO Classification), Unified Classification System, As per IS Code Recommendation, Field Identification of Soils, Classification by Casagrande's Plasticity Chart.		
3	III	**SOIL WATER SYSTEM** **Effective Stress and Pore Water Pressure:** 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 by Constant and Falling Head Methods, Permeability of Stratified Soil Deposits, Field Determination of Permeability for Unconfined and Confined Aquifers. **Seepage**: Introduction, Flow net, Properties and Use of Flow net, Estimation of Seepage loss, Seepage Pressure, Two Dimensional Flow, Laplace's Equations, Flow through Earthen Dam, Piping and Heaving, Uplift pressure, Design of Filters.	10	
4	IV	**STRESS DISTRIBUTION IN SOILS** Introduction, Geostatic Stress, Boussinesq's and Westergaard's Theories regarding Vertical Stress Distribution due to Point Load, Determination of Vertical Stress due to Line and Strip Loads, Vertical Stress under Uniformly Loaded Circular Area, Isobar and Pressure Bulb, Vertical Stress Beneath a Corner of a Rectangular Area, Point Load Method, 2:1 Method, Newmark's Influence Chart, Contact Pressure.	10	

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	Name of the books
1.	Singh, P., *Engineering and General Geology*, Katson Publishing House Delhi.
2.	Reddy, D. V., *Engineering Geology for Civil Engineers*, Oxford, IBH.
3.	Billings, M. P., *Structural Geology*, Wiley Eastern Prentice-Hall, U.S.A.
4.	Murthy, V.N.S., *Textbook of Soil Mechanics and Foundation Engineering (Geotechnical Engineering Series)*, CBS Publishers and Distributors Pvt. Ltd.
5.	Punmia, B.C. and Jain, A. K., *Soil Mechanics and Foundations*, Laxmi Publications (P) Ltd.
6.	Das, B. M., *Principles of Geotechnical Engineering*, Thomson Brooks / Cole

REFERENCE BOOKS	
Sl. No.	**Name**
1.	Tyrell, G. W., *The Principles of Petrology*, Springer.
2.	Lambe T. W. and Whitman, R.V., *Soil Mechanics*, Wiley Eastern Ltd.
3.	Holtz, R. D., Kovacs, W. D. and Sheahan, T. D., *An Introduction to Geotechnical Engineering*, Pearson Publication.
4.	Terzaghi, K., Peck, R. B. and Mesri, G., *Soil Mechanics in Engineering Practice*, A Wiley Interscience Publication (John Wiley & Sons, Inc.).
5.	Singh, A., *Soil Engineering in Theory & Practice (Vol.1, 2 & 3)*, Jain Book Agency Publishers.

Course Outcome:

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

[1] Indentify the properties of rocks and which one is suitable for construction purpose.
[2] Classify soil as per grain size distribution curve and understand the index properties of soil.
[3] Apply the concept of total stress, effective stress and pore water pressure for solving geotechnical problems.
[4] Assess the permeability of different types of soil and solve flow problems.
[5] Estimate the seepage loss, factor of safety against piping failure using flow net related to any hydraulic structure.
[6] 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.

		Course Name: **Construction Materials and Technology**		
		Course Code: CIVL 2103		
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Objective:

The course will assist the students to:

1. To familiarize the students about the characteristics of construction materials used in civil engineering

2. To develop the skills for identification of suitable construction materials for civil engineering projects.

3. To develop the skills for identification of proper technology that deals with the construction.

4. To identify the factors to be considered in construction of buildings and develop the construction practices and techniques.

SL. No	Module	Details of Course Content	Hours	Total
1	**I**	**Construction Materials I** **Bricks** Introduction, Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick earth, Testing of bricks, Fly ash brick.	**2**	**42**
		Cement Introduction, Chemical Composition of Cement, Hydration of Cement, Types of Portland Cement, Tests on Cement and Cement Paste	**4**	
		Aggregates Introduction, Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction. Testing of Aggregates	**3**	
		Lime Introduction, Classification, Slaking and hydration	**1**	
		Steel Composition, properties, manufacturing, uses.	**1**	
		Paints, Enamels and Varnishes Composition of oil paint, characteristic of an ideal paint, enamels, distemper, water wash and colour wash, Varnish	**1**	

2	II	**Construction Materials II: Concrete** **PROPERTIES OF FRESH CONCRETE** Workability, Factors Affecting Workability, Tests on workability Segregation, Bleeding, Setting time, Mixing and Vibration of Concrete, Mixers and Vibrators, Curing Methods, Maturity.	4	
		STRENGTH OF CONCRETE Water/Cement ratio, Gel/Space ratio, Compression Test on Cubes, Cylinders, Flexural strength of concrete	4	
		ADMIXTURES Different types, Effects and uses.	1	
		MIX DESIGN by I.S. 10262(2009)	3	
3	III	**Construction Technology -I** **Foundations** Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations.	4	
		Brick masonry Definitions, Rules for bonding, Type of bonds, Comparison of English Bond and Flemish Bond	4	
		Walls, Doors and Windows Load bearing wall, Partition wall, and Reinforced brick wall. Common types of doors and windows of timber and metal.	2	
4	IV	**Construction Technology -II** **Stairs** Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case.	2	
		Flooring Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing.	2	
		Centering and Shuttering, Plastering and Pointing: Plastering with cement mortar, Defects in plastering, pointing, White washing, colour washing, Distempering.	2	
		Roofs Types, Pitched roofs and their sketches,	1	
		Truss: Various types of trusses, Roof Covering materials: AC sheets GI sheet.	1	

RECOMMENDED BOOKS:

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

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

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.

Course Name: BIOLOGY					
Course Code: BIOT 2105					
Contact Hours per week	L	T	P	Total	Credit Points
	2	0	0	2	2

MODULE-I: BASIC CELL BIOLOGY

Prokaryotic and Eukaryotic cells, Cell theory; Cell structure and function, Cell organelles, Structure and function of DNA and RNA, Central Dogma; Genetic code and protein synthesis.

MODULE-II: BIOCHEMISTRY AND CELLULAR ASPECTS OF LIFE

Biochemistry of carbohydrates, proteins and lipids; Fermentation; Cell cycle; Basics of Mendelian Genetics.

MODULE-III: ENZYMES AND INDUSTRIAL APPLICATIONS

Enzymes – significance, co-factors and co-enzymes, classification of enzymes; models for enzyme action; Restriction enzymes; industrial applications of enzymes.

MODULE-IV: BIODIVERSITY AND BIOENGINEERING INNOVATIONS

Basic concepts of environmental biosafety, bioresources, biodiversity, bioprospecting, bioremediation, biosensors; recent advances in engineering designs inspired by examples in biology.

TEXT BOOKS:

1. Wiley Editorial, "*Biology for Engineers: As per Latest AICTE Curriculum*," Wiley-India, 2018.
2. S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, "*Biology for Engineers*," Tata McGraw-Hill, New Delhi, 2012.

REFERENCE BOOKS:

1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "*Biochemistry*," W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, "*Molecular Biology*," MCGraw-Hill, 5th Edition, 2012.
3. Jon Cooper, "*Biosensors A Practical Approach*" Bellwether Books**,** 2004.
4. Martin Alexander, "*Biodegradation and Bioremediation,*" Academic Press, 1994.
5. Kenneth Murphy, "*Janeway's Immunobiology*," Garland Science; 8th edition, 2011.

Course Outcomes:

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

i)   Understand the basic structure and function of cells and cellular organelles.

ii)   Understand the fundamental concepts of DNA, RNA and central dogma of cells.

iii)   Characterize the different types of proteins, lipids and carbohydrates.

iv)   Analyze the mechanism of inheritance of characters through generations.

v)   Understand and implement the working principles of enzymes and their applications in biological systems and industry.

vi)   Design and evaluate different environmental engineering projects with respect to background knowledge about bioresources, biosafety and bioremediation.

Course Name: ENVIRONMENTAL SCIENCES					
Course Code: EVSC 2016					
Contact Hours per week	L	T	P	Total	Credit Points
	2	0	0	2	0

Module 1

Socio Environmental Impact 6L

Basic ideas of environment and its component
Population growth: exponential and logistic; resources; sustainable development. 3L
Concept of green chemistry, green catalyst, green solvents
Environmental disaster and social issue, environmental impact assessment, environmental audit, environmental laws and protection act of India. 3L

Module 2 6L
Air Pollution
Structures of the atmosphere, global temperature models
Green house effect, global warming; acid rain: causes, effects and control. 3L
Lapse rate and atmospheric stability; pollutants and contaminants; smog; depletion of ozone layer; standards and control measures of air pollution. 3L

Module 3 6L
Water Pollution
Hydrosphere; pollutants of water: origin and effects; oxygen demanding waste; thermal pollution; pesticides; salts.
Biochemical effects of heavy metals; eutrophication: source, effect and control. 2L
Water quality parameters: DO, BOD, COD.
Water treatment: surface water and waste water. 4L

Module 4 6L
Land Pollution
Land pollution: sources and control; solid waste: classification, recovery, recycling, treatment and disposal. 3L
Noise Pollution
Noise: definition and classification; noise frequency, noise pressure, noise intensity, loudness of noise, noise threshold limit value; noise pollution effects and control. 3L

Text/Books
1. GourKrishna Das Mahapatra, Basic Environmental Engineering and Elementary Biology, Vikas Publishing House P. Ltd.
2. A. K. De, "Environmental Chemistry", New Age International.
3. A. K. Das, Environmental Chemistry with Green Chemistry, Books and Allied P. Ltd

References/Books

1. S. C. Santra, Environmental Science, New Central Book Agency P. Ltd
2. D. De, D. De, Fundamentals of Environment & Ecology, S. Chand & Company Ltd.

Course Outcome:

The subject code EVS2016 corresponds to basic environmental chemistry for the 2nd year B.Tech students, which is offered as Environmental Sciences and is mandatory for all branches of engineering. The course provides basic knowledge of various environmental pollutions as well as its impact and ways to curb it. The course outcomes of the subject are

1. Understand the natural environment and its relationships with human activities.

2. Characterize and analyze human impacts on the environment.

3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.

4. Educate engineers who can work in a multi-disciplinary environment to anticipate and address evolving challenges of the 21st century.

5. Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.

6. Design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Course Name: STRENGTH OF MATERIALS LAB					
Course Code: CIVL 2151					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course objective:

The course will assist the students to:

1. Provide the idea about the method of finding out the tensile, compressive and bending strengths of materials.
2. Construct the ability among students about the concepts of torsion test.
3. Explain the procedure of test requirement of hardness and impact tests.
4. Give an ability to have a concept of stiffness of spring and the procedure to find experimentally its value.

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 and concrete beam.
5. Hardness tests on ferrous and non-ferrous metals: Brinnel and Rockwell tests.
6. Test on closely coiled helical spring.
7. Impact tests: Izod and Charpy
8. Demonstration of Fatigue test.

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.

Course Name: **SOIL MECHANICS LAB - I**					
Course Code: **CIVL 2152**					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Objective:

The course will assist the students to:

1. Distinguish different types of soils and rock samples by visual inspection.
2. Identify microscopic structure of rocks and minerals.
3. Determine index properties of different types of soils.
4. Interpret the grain size distribution curve for different types of soils.
5. Identify co-efficient of permeability and compaction characteristics of different types of soils.

List of Experiments:

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

REFERENCE BOOKS & CODES:	
Sl. No.	**Name**
1.	Das, B.M. *Soil Mechanics Laboratory Manual*, Oxford university press.
2.	SP 36 (Part I & II): *Compendium of Indian Standards on Soil Engineering*.

Course Outcome:

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

1. Classify visually different types of soils and rock samples as obtained in the field.
2. Interpret the microscopic nature of rocks involved in the analysis and design of foundations embedded in it.
3. Determine the index properties of soil to understand different types of soils as obtained from field investigation.
4. Identify different types of soils from the nature of grain size distribution.
5. Assess the co-efficient of permeability of different types of soils for analysis of flow problems in soil mechanics.
6. Determine the compaction characteristics of soil to identify whether it is suitable for use in embankment construction.

Course Name: **Construction Materials Lab**					
Course Code: **CIVL 2153**					
Contact hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Objective:

The course will assist the students to develop:

1. the skills on the test of cement
2. the skills on test of aggregates.
3. an ability to perform the test of fresh and hardened concrete.
4. an ability to perform the concrete mix design.

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 modulus, 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

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.

Course Name: BUILDING PLANNING & DRAWING					
Course Code: CIVL 2154					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	4	4	2

Course Objectives:

The course will assist the students to:

1. Increase ability to communicate with people
2. Learn to sketch and take field dimensions.
3. Learn to take data and transform it into graphic drawings.
4. Learn basic Auto Cad skills.
5. Learn basic engineering drawing formats.
6. Prepare themselves for future Engineering positions

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 roofs, 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.

Reference Books:

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

Course Outcomes:

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

1. Draw the plan, section and elevation of a building
2. Select, construct and interpret appropriate drawing scale as per the situation.
3. Draw simple curves like ellipse, cycloid and spiral. Draw Orthographic projections of points, lines and planes.
4. Draw orthographic projection of solids like cylinders, cones, prisms and pyramids including sections and isometric projections of simple objects.
5. layout development of solids for practical situations, architectural and engineering scales will increase.
6. Create, analyze and produce 2D drawings of buildings in AUTO CAD environment, produce engineered drawings.
7. Student's ability to hand letter will improve, to perform basic sketching techniques will improve.
8. Convert sketches to engineered drawings and become familiar with office practice and standards.

Course Name: FLUID MECHANICS					
Course Code: CIVL 2113					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Objective:

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.	4	44
		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).	4	
		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	
2.	II	**WEIRS AND NOTCHES** Rectangular, triangular, trapezoidal and cippoletti notch, sharp crested and broad crested weirs, submerged weirs.	4	
		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.	6	

3.	III	**SPECIFIC ENERGY / NON-UNIFORM FLOW IN OPEN CHANNEL** Definition, Diagram. Critical, Sub-critical and Supercritical flows. Establishment of critical flow, Specific force: Definition and diagram, Hydraulic Jump.	4	
		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~~	2	
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	6	
		characteristics graph for head, discharge and efficiency, hydraulic machines in parallel and series, hydraulic Ram.	6	

RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	Name of the book
1	Modi P.N. and Seth S.M., *Hydraulics and Fluid Mechanics including hydraulics machines,* 19th edition, Standard Book House
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 book
1	Cengel Y. A. and Cimbala J. M., *Fluid Mechanics: Fundamentals and Applications*, 2nd edition, Tata McGraw Hill Education Private Limited
2	Pritchard P.J. and Leylegian J.C., *Fox and McDonald's Introduction to Fluid Mechanics,* 8th edition, John Wiley & Sons
3	Massey B.S. and Ward-Smith John., *Mechanics of Fluids*, 9th edition, Taylor & Francis.
4	Bansal R.K., *A textbook of Fluid Mechanics and Hydraulic Machines,* 9th edition, Laxmi Publications (P) Ltd

Course Outcome:

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

1. Understand basic fluid properties (density, viscosity, bulk modulus), flow forces (pressure, shear stress, surface tension) and flow regimes (laminar/turbulent, compressible/incompressible, steady/unsteady).

2. Use and know limitations of steady and unsteady Bernoulli equation along and normal to a streamline.

3. Explain the conservation of mass and momentum through differential analysis in simple geometries.

4. Study scope, importance, characteristics and various types of flows in an open channel.

5. Understand the techniques of dimensional analysis, similitude and modeling and introduce the important non-dimensional groups in fluid mechanics.

6. Know the concepts to internal and external flows and introduce the boundary layer concept, lift and drag, flow separation, and drag reduction fundamentals.

Course Name: FLUID MECHANICS LABORATORY					
Course Code: CIVL 2163					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Objective:

The course will assist the students 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 method.
4. Get exposure to practical applications, work on a small design project, and the writing of a technical report related to the design 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. To determine the Metacentric height of a floating vessel under loaded and unloaded conditions

4. Determination of Co-efficient of Discharge for Venturimeter

5. Measurement of velocity of water in an open channel using a pitot tube

6. Measurement of water surface profile for flow over Broad crested weir

7. To verify Bernoulli's equation experimentally

8. Measurement of water surface profile for a hydraulic jump

9. Determination of efficiency of a Centrifugal pump

10. Determination of efficiency of a Reciprocating pump

11. Determination of efficiency of a Pelton wheel Turbine

12. Determination of efficiency of a Francis Turbine

13. Determination of efficiency of a Hydraulic Ram

REFERENCE BOOKS:

Sl. No.	Name of the book
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.

Course Outcome:

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

1. Apply the basic equation of fluid statics to determine forces on planar and curved surfaces that are submerged in a static fluid; to manometers; to the determination of buoyancy and stability; and to fluids in rigid-body motion.

2. Use the conservation laws in integral form and apply them to determine forces and moments on surfaces of various shapes and simple machines.

3. Use the conservation laws in differential forms and apply them to determine velocities, pressures and acceleration in a moving fluid. Understand the kinematics of fluid particles, including the concepts of substantive derivatives, local and convective accelerations, vortices and circulation.

4. Determine flow rates, pressure changes, minor and major head losses for viscous flows through pipes, ducts, simple networks and the effects of pumps, fans, and blowers in such systems.

5. Apply principles of fluid mechanics to the operation, design, and selection of fluid machinery such as pumps and turbines.

6. Use Euler's and Bernoulli's equations and the conservation of mass to determine velocities, pressures, and accelerations for incompressible and inviscid fluids.

Course Name: MATHEMATICAL METHODS					
Course Code: MATH 2001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	1	0	4	4

MODULE I : [12L]
Functions of Complex Variables:
Complex numbers and its geometrical representation.

Functions of a complex variable – Limits, Continuity, and 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 : [12L]
Fourier Series , Integrals and Transforms:
Definite Integral , 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 : [12L]
Series Solutions to Ordinary Differential Equations and Special Functions:
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 : [12L]
Partial Differential Equations:
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

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.

Course Name: STRUCTURAL ANALYSIS -I					
Course Code: CIVL 2201					
Contact Hours	L	T	P	Total	Credit Points
per week	3	0	0	3	3

Course Objective:

The course will assist the students to:

1. Introduce themselves to concept of global structural stability, theory of structural analysis, and methods in structural analysis.
2. Develop an idea to model a structure with proper loads and support conditions.
3. Build an ability to idealize and analyze statically determinate and indeterminate structures.
4. Provide knowledge among on moving loads and procedure to calculate the influence line diagram of several functions for beams and truss.

Module I [16L]

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 of energy, principle of virtual work, the first theorem 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.

Module II [6L]

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.

Module III [16 L]

THEOREM OF THREE MOMENTS

Introduction to statically indeterminate structures, advantages of indeterminate structures over determinate structures, solved simple numerical problems on computation of static indeterminacy, Clapeyron's theorem of three moments, derivation of three moment equation, solved numerical problems of continuous beams based on different support conditions and support settlement.

STRAIN ENERGY

Castigliano's 2nd Theorem; solved numerical problems.

ANALYSIS OF STATICALLY INDETERMINATE BEAMS BY FORCE METHOD

Basic introduction to force method of analysis, analysis of statically indeterminate beams by force method, Solved examples, Theorem of Least work, numerical problems on theorem of least work.

TWO HINGED ARCHES

Analysis of two hinged arch, solved problems on two hinged arch.

Module IV [4L]

INFLUENCE LINE DIAGRAM OF INDETERMINATE STRUCTURES

Influence lines for statically indeterminate beams, Muller- Breslau Principle, ILD for continuous beams, Problems on ILD for continuous beam, trusses etc.

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

Course Outcomes

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.

Course Name: **SOIL MECHANICS - II**					
Course Code: CIVL 2202					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Objective:

The course will assist the students to:

1. Gain an in-depth knowledge of the shear strength characteristics of soils.
2. Assess the consolidation and compaction properties of soils.
3. Determine the lateral earth pressure on rigid retaining wall and design it accordingly.
4. Investigate the stability of soil slopes under different conditions.

Sl. No.	Module	Details of Course Content	Hours	Total
1.	I	**SHEAR STRENGTH** Introduction, Basic Concept of Shear Resistance and Shear Strength of Soil, Mohr Circle of Stress, Sign Conventions, Mohr - Coulomb Theory, Relationship between Principal Stresses for both Cohesive and Cohesionless Soils, Stress Controlled and Strain Controlled Tests, Laboratory Determination of Soil Shear Parameters - Direct Shear Test, Unconfined Compression Test, Vane Shear Test, Triaxial Test as per Relevant IS Codes, Classification of Shear Tests Based on Drainage Conditions, Stress - Strain Relationship of Clays and Sands, Concept of Critical Void Ratio. Skempton's Pore Pressure Parameters, Introduction to Stress path.	10	40
2.	II	**CONSOLIDATION & COMPACTION** **Consolidation**: Introduction, Terzaghi's theory of one dimensional consolidation, Compressibility characteristics of soils, Compression index, Coefficients of Compressibility and Volume Change, Coefficient of consolidation, Degree and Rate of Consolidation, Time factor, Settlement computation, Laboratory One Dimensional Consolidation Test as per IS Code, Determination of Consolidation Parameters. **Compaction:** Introduction, Standard and Modified Proctor Compaction tests, Field Compaction methods, Factors affecting compaction, Factors affecting Compaction Characteristics of Soil.	10	

| 3. | III | **EARTH PRESSURE & STABILITY OF CONCRETE RETAINING WALLS**

Lateral Earth Pressure: Introduction, Plastic equilibrium of soil, Earth Pressure at Rest, Active and Passive Earth Pressures, Rankine's and Coulomb's Earth Pressure Theories, Determination of Active and Passive Earth Pressures under different conditions, Analytical and Graphical methods for Determination of Earth pressure against various Earth Retaining Structures.
Stability of Concrete Retaining Walls: Stability checks for Cantilever retaining wall against Overturning, Sliding and Bearing Capacity. | 10 | |
| 4. | IV | **STABILITY OF SLOPES**

Introduction, Types of failure, Different types of Factor of safety, Analysis of infinite and finite slopes, Stability of Clay Slopes under Undrained Condition, Friction circle method, Taylor's stability number, Ordinary or Swedish or Fellenius method of slices, Bishop's simplified method of stability analysis. | 10 | |

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.	Ranjan, G. and Rao, A.S.R., *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.	Holtz, R. D., Kovacs, W. D. and Sheahan, T. D., *An Introduction to Geotechnical Engineering*, Pearson Publication.
3.	Terzaghi, K., Peck, R. B. and Mesri, G., *Soil Mechanics in Engineering Practice*, A Wiley Interscience Publication (John Wiley & Sons, Inc.).
4.	Craig, R. F., *Craig's Soil Mechanics,* Spon Press (Taylor and Francis Group)

Course Outcome:

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

1. Apply the concept of shear strength to analyze different geotechnical problems and determine the shear strength parameters from lab and field tests.
2. Assess the compaction characteristics of soil for solving geotechnical problems.
3. Estimate the consolidation settlement using relevant parameters for a soil.
4. Calculate earth pressure on rigid retaining walls on the basis of classical earth pressure theories.
5. Analyze and design rigid retaining walls (cantilever types) from geotechnical engineering consideration.
6. Compute safety of dams and embankments on the basis of various methods of slope stability analysis.

Course Name: SURVEYING					
Course Code: CIVL 2203					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Objective:

The course will assist the students to:
1. Provide the knowledge of the importance of surveying in the field of civil engineering
2. Study the basics of linear/angular measurement methods like chain surveying, compass surveying, etc.
3. Develop the basic knowledge levelling and theodolite survey in elevation and angular measurements
4. Build an idea about the advanced surveying instruments used in present days.

Module I [8L]

BASICS OF SURVEYING

Introduction to Surveying
Definition, principles of surveying, types of scales (numerical problems), basic concepts of plans and maps.
Chain and compass Surveying
Basic introduction to different types of chains and accessories, errors in chain surveying, Basic concept and terminologies related to compass survey, local attraction and its elimination, open and closed traverse.
Plane Table Surveying
Principle, equipment and methods, two and three point problems.

Module II [12L]

METHODS OF MEASUREMENT

Levelling and Contouring
Definitions and terminology, types and methods of levelling, use of Dumpy level, Auto level 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 levelling, definitions and principles of tacheometry and stadia system, fixed hair stadia method, calculation of horizontal and vertical distance using tacheometer.

Module III [12L]

COMPUTATION PROCEDURE AND SETTING OUT WORKS

Computation of Area and Volume

Computation of area using trapezoidal rule and Simpson's 1/3rd rule. Computation 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 methods. Requirements, types and elements of transition curve.

Setting Out Of Vertical Curves

Introduction to vertical curves and its types.

Module IV [8L]

INTRODUCTION TO HIGHER SURVEYING

Measurement Procedure Using Advanced Instruments

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 photo-theodolite

Reference 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.
4.	Bannister A., Raymond S. and Baker R. *Surveying*. 1st edition, Pearson India.
5.	Subramanian R. *Surveying and Levelling*. 2nd editon, Oxford university Press.

Course Outcome:

After going through this course, the students will be able to:
1. Study the basics of linear/angular measurement methods like chain surveying, compass surveying.
2. Understand the concepts of leveling and contouring.
3. Demonstrate the method of theodolite survey in terms of elevation and angular measurements, along with tacheometry.
4. Calculate the area and volume of any given land using different methods and rules.
5. Understand the method of setting out procedure of horizontal and vertical curves.
6. Explain various methods of higher surveying, such as triangulation, hydrographic survey, areal photogramatry and demonstrate the basic functions of advanced instrument like Total station.

Course Name: HIGHWAY AND TRAFFIC ENGINEERING					
Course Code: CIVL 2204					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Objectives:

The course will assist the students to:

1. Provide the knowledge of Highway Network Planning, Highway alignment and Highway Geometric Design.
2. Study different pavement materials and design different types of pavements.
3. Building and idea about Highway Construction including the drainage and its maintenance and safety.
4. Develop and idea of Traffic engineering, Traffic Signal Design and Design of at grade Intersections:
5. Analyse Parking and Accident in Transport System.

Module I [12L]

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.

Module II [12L]

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.

Module III [8L]

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.

Module IV [10L]

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.

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
1.	I.S Specifications on Concrete , Aggregate & Bitumen Bureau of Indian Standard
2.	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

Course Outcome:

After going through this course, the students will be able to:
1. Plan highway networks and Design highway geometrics.
2. Characterize the properties of soil, aggregate, bitumen, and bituminous mixes.
3. Analyze and design rigid and flexible pavement (IRC Method).
4. Understand the principles of construction, maintenance and safety of highways.
5. Conduct traffic studies, analyze traffic data and design intersections.
6. Design traffic signal and analyze parking & accidents

Course Name: **HUMAN VALUES AND PROFESSIONAL ETHICS**					
Course Code: **HMTS 2001**					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Module I (10 L)

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 II (10L)

Ethics and Ethical Values
Principles and theories of ethics
Consequential and non-consequential ethics
Egotism, Utilitarianism, 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, Gilligan'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 III (10L)

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 safety

Safety regulations and safety engineering

Safety responsibilities and rights

Safety and risk, risk benefit analysis and reducing risk

Technology Transfer: Definition and Types

The Indian Context

Module IV (6L)

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, D.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).

Course Outcome:

The student will

1. be aware of the value system and the importance of following such values at workplace

2. learn to apply ethical theories in the decision making process

3. follow the ethical code of conduct as formulated by institutions and organizations

4. Implement the principles governing work ethics

5. Develop strategies to implement the principles of sustainable model of development

6. Implement ecological ethics wherever relevant and also develop eco-friendly technology

Course Name: SOIL MECHANICS LAB - II					
Course Code: CIVL 2251					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Objective:

The course will assist the students to:

1. Identify the compressibility characteristics of soil.
2. Determine unconfined compressive strength of cohesive soil.
3. Determine shear strength parameters of soil by vane shear, direct shear and triaxial tests.
4. Identify California Bearing Ratio (CBR) of soil.
5. Explain standard penetration test.

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. Standard penetration test.

REFERENCE BOOKS & CODES:	
Sl. No.	**Name**
1.	Das, B.M. *Soil Mechanics Laboratory Manual*, Oxford University Press.
2.	SP 36 (Part I & II): *Compendium of Indian Standards on Soil Engineering*.

Course Outcome:

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

1. Assess the compressibility characteristics of soil to estimate the settlement of the foundation.
2. Interpret the undrained shear strength of cohesive soil from unconfined compression and vane shear tests to evaluate the bearing capacity of proposed foundation to be constructed on the soil.
3. Determine shear strength parameters of both cohesionless and cohesive types of soil by triaxial test for routine geotechnical analysis.
4. Identify friction angle of cohesionless soil by direct shear test for the analysis of geotechnical structures.
5. Assess California Bearing Ratio (CBR) values of soil to select whether that particular soil is suitable for construction of embankment.
6. Analyze the standard penetration test (SPT) results to interpret the type of soil profile and to verify the bearing capacity of foundations from SPT values.

Course Name: SURVEYING LAB					
Course Code: CIVL 2252					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	4	4	2

Course Objective:

The main objective of this course is to

1. Develop the concept of taking linear and angular field measurements using different instruments.
2. Provide the idea about the procedure to draw the traverse survey and topographic plan using field data.
3. Develop an idea about the drawing of leveling data and interpret them to calculate the volume of cutting and filling of soil for a particular road profile.
4. Build an idea about the field procedure of setting out of curve and layout drawing on the ground.

List of Experiments:

1. **Chain and Compass survey:** Preparation of maps, method of ranging-method of taking offsets, measurement of bearings, chain and compass traverse.
2. **Levelling:** Temporary adjustment of Dumpy level, Differential leveling, Profile leveling and plotting of long and cross sections.
3. **Theodolite survey:** Traversing using theodolite, preparation of Gale's traverse table using the field data.
4. **Curve setting:** Setting out of simple circular curve and transition curve by angular method.
5. **Setting out of building:** Setting out procedure of building layout.
6. **Total station:** Demonstration of the instrument and perform Levelling using it.

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 Gale's 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.

Course Name: HIGHWAY ENGINEERING LAB					
Course Code: CIVL 2253					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course objective:

The course will assist the students to:

1. Conduct different tests to find out the properties of various aggregates.
2. Characterize the pavement materials.
3. Know about quality control of the pavement materials.
4. Know about quality control of aggregates.
5. Design and test bituminous mix.

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.
B. Bituminous Mix Design by Marshall Stability Method.
C. Stripping Value 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.

Course Outcome:

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

1. Learn various concepts in highway engineering.
2. Design and test bituminous mix.
3. Gather knowledge about the quality control techniques of various aggregates and pavement materials.
4. Characterize bituminous grade according to their work suitability.
5. Understand the factors influencing road vehicle performance characteristics and design.
6. Access the quality of different bitumen grade.

Course Name: QUANTITY SURVEY, SPECIFICATION AND VALUATION					
Course Code: CIVL 2254					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Objective:

The course will assist the students to:
1. Know the importance of preparing the types of estimates under different conditions.
2. Know about the rate analysis and bill preparations.
3. Study about the specification writing.
4. Understand the valuation of land and buildings.

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 plants 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

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.