

# Civil Engineering



**B.TECH. PROGRAMME**

# Civil Engineering

B.Tech (Civil Engineering) - 1<sup>st</sup> Year 1<sup>st</sup> Semester Syllabus:

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

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

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

**B.Tech (Civil Engineering) - 1<sup>st</sup> Year 2<sup>nd</sup> Semester Syllabus:**

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

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

**2<sup>nd</sup> Year 1<sup>st</sup> Semester:****A.THEORY**

Sl no	Code number	Subject	Contact Hours				Credit point
			L	T	P	Total	
1	MATH 2001	Mathematical Methods	3	1	0	4	4
2	CIVL 2101	Surveying	3	1	0	4	4
3	CIVL 2102	Strength of Materials	3	1	0	4	4
4	CIVL 2103	Building Materials and Construction	3	0	0	3	3
5	CIVL 2104	Engineering Geology	3	0	0	3	2
6	HMTS 2002	Indian Culture and Heritage	2	0	0	2	1
Total Theory			20				18

**B. PRACTICAL**

7	CIVL 2111	Strength of Materials Lab	0	0	3	3	2
8	CIVL 2112	Engineering Geology Lab	0	0	3	3	2
9	HMTS 2011	Language Practice Lab (Level 2)	0	0	3	3	2
Total Practical			9				6

**C.SESSIONAL**

10	CIVL 2121	Building Planning and Drawing	0	0	3	3	2
11	CIVL 2122	CAD Lab	0	0	3	3	2
Total Sessional			6				4

Total of Semester

35

**28****2<sup>nd</sup> Year 2<sup>nd</sup> Semester:****A.THEORY**

Sl no	Code number	Subject	Contact Hours				Credit point
			L	T	P	Total	
1	MATH 2002	Numerical and Statistical Methods	3	0	0	3	3
2	CIVL 2201	Analysis of Structures I	3	1	0	4	4
3	CIVL 2202	Soil Mechanics I	3	1	0	4	3
4	CIVL 2203	Concrete Technology	3	1	0	4	3
5	CIVL 2204	Fluid Mechanics	3	1	0	4	4
6	HMTS 2001	Human Values and Professional Ethics	2	0	0	2	2
Total Theory			21				19

**B. PRACTICAL**

7	CIVL 2211	Fluid Mechanics Lab	0	0	3	3	2
8	CIVL 2212	Surveying Practice	0	0	3	3	2
9	MATH 2012	Numerical and Statistical Methods Lab	0	0	2	2	1
Total Practical			8				5

**C.SESSIONAL**

10	CIVL 2221	Quantity Survey, Specification and Valuation	1	0	3	4	2
11	CIVL 2222	Seminar	0	0	2	2	2
Total Sessional			6				4

Total of Semester

35

**28**

**3<sup>rd</sup> Year 1<sup>st</sup> Semester:****A.THEORY**

Sl no	Code number	Subject	Contact Hours				Credit point
			L	T	P	Total	
1	CIVL 3101	Analysis of structures II	3	1	0	4	4
2	CIVL 3102	Soil Mechanics II	3	1	0	4	3
3	CIVL 3103	Highway & Traffic Engineering	3	1	0	4	3
4	CIVL 3104	Environmental Engineering	3	0	0	3	3
5	CIVL 3105	Design of R.C.C. Structures	3	1	0	4	4
6	HMTS 3101	Economics for Engineers	3	0	0	3	3
Total Theory			22				20

**B. PRACTICAL**

7	CIVL 3111	Soil Mechanics Lab I	0	0	3	3	2
8	CIVL 3112	Concrete Technology Lab	0	0	3	3	2
9	CIVL 3113	Environmental Engineering Lab	0	0	3	3	2
Total Practical			9				6

**C.SESSIONAL**

10	CIVL 3121	R. C. C. Design & Detailing	0	0	3	3	2
Total Sessional			3				2

**Total of Semester****34****28****3<sup>rd</sup> Year 2<sup>nd</sup> Semester:****A.THEORY**

Sl no	Code number	Subject	Contact Hours				Credit point
			L	T	P	Total	
1	CIVL 3201	Design of Steel Structures	3	1	0	4	4
2	CIVL 3202	Foundation Engineering	3	0	0	3	3
3	CIVL 3203	Prestressed Concrete	3	1	0	4	3
4	CSEN 3206	Data Structure and Database Concept	3	0	0	3	3
5	CIVL 323X	Professional Elective I	3	1	0	4	3
6	HMTS 3201	Principles of Management	2	0	0	2	2
Total Theory			20				18

**B. PRACTICAL**

7	CIVL 3211	Soil Mechanics Lab II	0	0	3	3	2
8	CIVL 3212	Transportation Engineering Lab	0	0	3	3	2
9	CSEN 3216	DBMS laboratory	0	0	3	3	2
Total Practical			9				6

**C.SESSIONAL**

10	CIVL 3221	Steel Structure Design & Detailing	0	0	3	3	2
11	HMTS 3221	Personality Development	1	0	0	1	1
Total Sessional			4				3

**Total of Semester****33****27**

**Professional Elective I**

CIVL 3231 - Railway & Airport Engineering

CIVL 3232 - Advanced Surveying

CIVL 3233 - Design of Tall Structures

CIVL 3234 - Remote Sensing and GIS

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

### **Module I – [5L]**

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

### **Module II-[12L]**

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

### **Module III-[10L]**

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

### **Module IV-[3L]**

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

## References

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



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

## **Module I [10 L]**

### **Thermodynamics & Spectroscopy**

#### *Chemical Thermodynamics & Thermochemistry*

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

#### **Spectroscopy**

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

## **Module II [10 L]**

### **Structure & Bonding**

#### *Chemical Bonding*

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

#### *Solid State Chemistry*

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency). Role of silicon and germanium in the field of semiconductor.

#### *Ionic Equilibria and Redox Equilibria*

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

## *Structure and reactivity of Organic molecule*

Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals.

Brief study of some addition, eliminations and substitution reactions.

## **Module III [10 L]**

### **Electrochemistry & Reaction Dynamics**

#### *Conductance*

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance, ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions. Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs AgNO<sub>3</sub>.

#### *Electrochemical Cell*

Cell EMF and thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half-cell and calomel half cell (construction, representation, cell reaction, expression of potential, discussion, application) Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application). Application of EMF measurement on a) the change in thermodynamic function ( $\Delta G$ ,  $\Delta H$ ,  $\Delta S$ ) b) the equilibrium constant of a reversible chemical reaction c) the valency of an ion.

#### *Kinetics*

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

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

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

## **Module IV [10 L]**

### **INDUSTRIAL CHEMISTRY & POLYMERIZATION**

#### *Industrial Chemistry*

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

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

Gaseous fuels: Natural gas, water gas, coal gas, bio gas.

## *Polymerization*

Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly dispersity index (PDI). Polymerization processes (addition and condensation polymerization), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of  $T_m$ ) and amorphicity (Concept of  $T_g$ ) of polymer.

Preparation, structure and use of some common polymers: plastic (PE: HDPE, LDPE, PVC, Bakelite, PP), rubber (natural rubber, SBR, NBR) and Vulcanization., fibre (nylon 6.6, Nylon 6, Polyester).  
Conducting and semi-conducting polymers.

### **Text Books**

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

### **Reference Books**

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

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

### Module I [10L]

#### Matrix:

Matrices and their basic attributes, Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoint of a determinant, Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, Orthogonal matrix and its properties, Special Complex Matrices: Hermitian, Unitary, Normal(definition only), Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by :Cramer's Rule and Matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Characteristic Equation and computation of eigenvalues and eigenvectors of a square matrix (of order 2 or 3), Cayley-Hamilton theorem and its applications(with special reference to higher power of matrices, e.g. Idempotent and Nilpotent matrices)

### Module II [10 L]

#### Mean Value Theorems & Expansion of Functions:

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

#### Infinite Series:

Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test(statements and related problems on these tests), Raabe's test, Proof of  $e$  being irrational, Alternating series, Leibnitz's Test (statement, definition) illustrated by simple examples, Absolute convergence and Conditional convergence,

### Module III [10 L]

#### Successive differentiation:

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

#### Calculus of Functions of Several Variables:

Recapitulation of some basic ideas of limit and continuity of functions of single variable, Introduction to functions of several variables with examples, Knowledge of limit and continuity, Determination of partial derivatives of higher orders with examples, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems.

### Module-IV [10 L]

#### Multiple Integration and Vector Calculus:

Concept of line integrals, Double and triple integrals. Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative, Related problems on these topics, Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications).

#### Reduction formula:

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

#### References

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

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

### **Module-I: [12 L]**

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

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

### **Module-II [8L]**

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

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

### **Module-III [10L]**

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

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

### **Module-IV [10L]**

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

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

**Text Books:**

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
3. Basic Electrical Engineering, Hughes
4. Electrical Technology, Vol-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.

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

### **Module-I [10L]**

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

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

Definition of force vector ; Dot product , cross product and the application ; Important vector quantities (position vector , displacement vector ) ; Moment of a force about a point and about an axis , moment of a couple ; Representation of force and moments in terms of  $\hat{i}, \hat{j}, \hat{k}$ . Principle of transmissibility of force (sliding vector); Varignon’s theorem for a system of concurrent forces with proof; Resolution of a force by its equivalent force-couple system; Resultant of forces.

### **Module-II [10L]**

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

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

### **Module-III [12L]**

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

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

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



### **Module-III [16L]**

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

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

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

Impulse momentum theory: Conservation of linear momentum

### **References:**

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

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

**List of Experiments:**

1. To determine the alkalinity in a given water sample.
2. Estimation of iron using  $\text{KMnO}_4$ : self indicator.
3. Estimation of iron using  $\text{K}_2\text{Cr}_2\text{O}_7$ : redox sensitive indicator.
4. To determine total hardness and amount of calcium and magnesium separately in a given water sample.
5. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
6. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
9. Iodometric estimation of  $\text{Cu}^{2+}$ .
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

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

**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.

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

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

References:

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

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

### **Module I [3P]**

#### **Introduction to Linguistics (Phonology)**

Phonetics-Vowel and Consonant Sounds (Identification & articulation)

Word- stress

Intonation (Falling and rising tone)

Voice Modulation

Accent training

### **Module II [3P]**

#### **Listening Skills**

Principles of Listening

Approaches to listening

Guidelines for Effective Listening

Listening Comprehension

Audio Visual (Reviews)

### **Module III [2P]**

#### **Discourse Analysis-**

Spoken Discourse

Conversational Skills/Spoken Skills

Analysing Speech dynamics

(Political Speeches

Formal Business Speeches)

### **Module IV [9P]**

#### **Writing Skill-**

Descriptive, narrative and expository writing

Writing with a purpose---Convincing skill, argumentative skill/negotiating Skill (These skills will be repeated in oral skills).

Writing reports/essays/articles—logical organization of thoughts

Book review

## References

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

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

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

**Module I:**

**Project Work**

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

**Module II:**

**Action-oriented schemes**

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

**Module III:**

**Society and Youth**

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

**Module IV:**

**Youth and Culture**

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

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

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

### **Module I: [13L]**

#### **Fundamentals of Computer**

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

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

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

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

### **Module II: [5L]**

#### **Basic Concepts of C**

##### *C Fundamentals:*

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

##### *Operators & Expressions:*

Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Standard input and output, formatted output -- printf, formatted input scanf.



## **Module III: [8L]**

### **Program Structures in C**

#### *Flow of Control:*

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

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

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

## **Module IV: [14L]**

### **Data Handling in C**

#### **Arrays and Pointers:**

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

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

#### **User defined data types and files:**

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

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

### **Text Books**

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

### **Reference Books**

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

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

### **Module I: [22 L]**

#### **Optics**

##### *1. Interference :*

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

##### *2 Diffraction:*

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

##### *3. Polarisation & Fibre Optics:*

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

##### *4 Laser*

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

### **Module II : [8L]**

#### *Waves & Oscillation*

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

### **Module III : [9L]**

#### *Quantum Mechanics*

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

### **Module IV: [6L]**

#### *Introduction of Crystallography*

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

### **Text Books**

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

### **Reference Books**

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

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

### **Module I [10 L]**

#### *Ordinary differential equations (ODE)-*

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

#### *Second order and first degree:*

General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations.

### **Module II:[10L]**

#### *Basics of Graph Theory*

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

#### *Tree:*

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

### **Module III [10L]**

#### *Improper Integral:*

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

#### *Laplace Transform:*

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

### **Module IV [10L]**

#### ***Three Dimensional Geometry***

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

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

#### References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, (Wiley Eastern)
2. Graph Theory: V. K. Balakrishnan, (Schaum's Outline, TMH)
3. A first course at Graph Theory: J. Clark and D. A. Holton (Allied Publishers LTD)
4. Introduction to Graph Theory: D. B. West (Prentice-Hall of India)
5. Graph Theory: N. Deo (Prentice-Hall of India)
6. Engineering Mathematics: B.S. Grewal (S. Chand & Co.)
7. Higher Engineering Mathematics: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
8. Calculus: Strauss, Bradley and Smith (3PrdP edition, Pearson Education)
9. Engineering Mathematics (Volume 2): S. S. Sastry (Prentice-Hall of India)
10. Introductory Course in Differential Equations: Daniel A. Murray (Longmans & Green).
11. Co-ordinate Geometry – S. L. Loney.
12. Analytical Geometry And Vector Algebra- R M Khan

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

### **Module I [10 L]**

#### **Semiconductors:**

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

#### **Diodes and Diode Circuits:**

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

### **Module II [10 L]**

#### **Bipolar Junction Transistors:**

Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off, active and saturation modes of operation, transistor action, input & output characteristics, load line & amplifier operation and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor.

### **Module III [9 L]**

#### **Field Effect Transistors:**

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

#### **MOSFETs:**

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

## **Cathode Ray Oscilloscope:**

Construction and working principle of CRO, Lissajous pattern.

## **Module IV [9 L]**

### **Feed Back Amplifier:**

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

### **Operational Amplifier:**

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

### **References:**

1. Boylestad & Nashelsky: Electronic Devices & Circuit Theory
2. R.A Gayakwad: Op Amps and Linear IC's, PHI
3. D. 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.

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

### **Module I [10 L]**

#### **Basic concepts of Thermodynamics:**

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

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

#### **Heat & Work:**

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

Definition of heat; Heat transfer-a path function; Similarities and dissimilarities between heat and work.

### **Module II [8 L]**

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

### **Module III [10 L]**

#### **Second law of Thermodynamics:**

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



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

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

### **Air standard Cycles:**

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

### **Module IV [10 L]**

#### **Properties & Classification of Fluid:**

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

Compressibility and Bulk modulus of elasticity.

Difference between compressible and incompressible fluids.

#### **Fluid Statics:**

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

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

Characteristics and choice of manometric fluid.

### **Module V [10 L]**

#### **Fluid Kinematics:**

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

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

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

## **Dynamics of Ideal fluids:**

Introduction, Euler's equation of motion along a streamline; Bernoulli's equation- assumptions and significance of each term of Bernoulli's equation.

Application of Bernoulli's equation-problem on pipe line. Measurement of flow rate: Venturimeter and orificemeter .

Static pressure, Dynamic pressure, Stagnation pressure-measurement of velocity by Pitot tube.

## **References:**

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

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

### **Basic Computation & Principles of Computer Programming Lab**

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

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

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

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

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

### List of Experiments

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

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

*Job 1: General awareness of a typical workshop.*

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

*Job 2: Making of a wooden pattern.*

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

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

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

*Job 4: Making of an internal and external thread.*

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

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

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

*Job 6: Demonstration of metal melting and casting*

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

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

(2

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

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

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

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

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

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

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

*Job 11 : Sheet Metal forming & Brazing*

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

## **References:**

1. Elements of Workshop Technology (Vol- I and II)- Hajra Choudhury, Media Promoter & Publishers Privet Limited.
2. Workshop Technology (Vol- I and II) – Chapman, Viva Books Privet Limited.

**CIVL 2101: Surveying****Contacts: 3 L + 1 T****Credits: 4**

SL. No	Module	Details of Course Contents	Hours	Total
1	I	<b>BASICS OF SURVEYING</b> Introduction to Surveying Definition, principles of surveying, types of scales (numerical problems), basic concepts of plans and maps. Chain Surveying Types of chains, accessories for chain surveying with their use, methods of ranging and methods of offsets, obstacles in chain surveying. Compass Surveying Definition, instrument and terminology, local attraction and its elimination, Open and closed traverse, adjustment of traverse. Plane Table Surveying Principle, equipment and methods, two and three point problems.	2  2  4  2	44
2	II	<b>METHODS OF MEASUREMENT</b> Levelling and Contouring Definitions and terminology, types and methods of leveling, use of leveling instruments and supporting accessories, different terms used in contouring, characteristics of contour and contour interval. Theodolite Surveying and Tacheometry Components of Theodolite, adjustments, measurement of vertical and horizontal angles, concepts of trigonometric leveling, definitions and principles of tachometry and stadia system, fixed hair stadia method, calculation of horizontal and vertical distance using tachometer.	6  8	
3	III	<b>COMPUTATION PROCEDURE AND SETTING OUT WORKS</b> Computation of Area And Volume Computation of area using trapezoidal rule and Simpson's $\frac{1}{3}$ 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 method. Requirements, types and elements of transition curve. Setting Out Of Vertical Curves Introduction to vertical curves.	2  4  1	



4	IV	<b>INTRODUCTION TO HIGHER SURVEYING</b>	4		
		Measurement Procedure Using Advanced Instruments			2
		Basic concepts of EDMs and GPS instrument (relating to land surveying), Total Station and its different parts. Practical application of Total Station.			
		Triangulation Concepts of triangulation and triangulation systems in brief.			
Hydrographic Survey Shoreline survey, soundings, locating soundings and reduction of soundings. Basic concept of Mean sea level, bathymetry.	3				
		Aerial Photogrammetry Terminology, equipments and phototheodolite.			

## RECOMMENDED BOOKS:

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

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

**Strength of Materials****Code: CIVL 2102****Contact: 3L + 1T = 4****Credit: 4**

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

**Reference books**

Sl. No.	Name of the book	Name of author/authors	Publisher
1	Elements of Strength of Material	S. P. Timoshenko and D. H. Young	EWP Pvt. Ltd
2	Engineering Mechanics of Solids	E. P. Popov	Pearson Education
3	Strength of Materials	R. Subramanian	OXFORD University Press
4	Strength of Materials	S S Bhavikatti	Vikas Publishing House Ltd
5	Strength of Material	A. Pytel & F. L. Singer	AWL Inc
6	Engineering Mechanics	J. L. Mariam	John Willey
7	Engineering Mechanics	I. H. Shames	PHI
8	Strength of Materials	S. S Rattan	McGraw Hill Education Pvt. Ltd.

**CIVL 2103: Building Materials and Construction****Contacts: 3 L + 1 T****Credits: 4**

SL. No	Module	Details of Course Contents	Hours	Total
1	I	<p><b>Building Materials -I</b></p> <p>Bricks Introduction, Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick earth, Different forms of bricks, Testing of bricks, Defects of bricks, Fly ash brick. Cement Introduction, Chemical Composition of Cement, Hydration of Cement. Tests on Cement and Cement Paste – specific gravity, fineness, consistency, setting time, soundness, strength. Types of Portland Cement – Ordinary, Rapid hardening, Low-heat, Sulphate resisting, Portland slag, Portland pozzolana, Super sulphated cement, White cement.</p> <p>Aggregates Introduction, Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction. Testing of Aggregates – Particle size distribution, Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value</p> <p>Lime Introduction, Classification, Slaking and hydration, Hardening, Lime putty, Storage, Handling.</p>	2  5  5  1	42
2	II	<p><b>Building Materials -II</b></p> <p>Ferrous Metals Introduction, Pig Iron- composition, properties, uses. Cast Iron-Properties, Manufacturing, uses. Wrought iron-properties, uses. Steel- composition, properties, manufacturing, uses. Rolled steel sections, Reinforcing steel bars, Rusting and corrosion of steel, Tensile testing of steel, Alloy steel.</p> <p>Mortars Introduction, Classification, Uses, Characteristics of good mortar, Ingredients.</p> <p>Wood and Wood Products Classification of Timber, Structure, Characteristics of good timber, Seasoning of timber, Defects in Timber, Diseases of timber, Decay of Timber, Veneers , Plywood, Applications of wood and wood products.</p> <p>Paints, Enamels and Varnishes Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish, French Polish, Wax Polish.</p> <p>Miscellaneous Materials</p>	5  1  1  1  3	

		Gypsum- Classification, Plaster of Paris, Gypsum wall Plasters, Gypsum Plaster Boards, Adhesives, Heat and sound insulating materials, Anticorrosive, Waterproofing.		
3	III	<b>Building Construction -I</b> Foundations Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations. Brick masonry Definitions, Rules for bonding, Type of bonds – stretcher bond, Header bond, English bond, Flemish Bond, Comparison of English Bond and Flemish Bond (one and one and half brick thick wall) Wall, Doors and Windows Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal.	4 4 2	
4	IV	<b>Building Construction -II</b> Stairs Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case. Flooring Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing. Centering and Shuttering, Plastering and Pointing: Centering and Shuttering, Plastering with cement mortar, Defects in plastering, pointing, white washing, colour washing, Distemping. Roofs Types, Pitched roofs and their sketches, Lean – to roof, King Post – Truss, Queen post truss and Simple steel Truss, Roof Covering materials: AC sheets GI sheet.	2 2 2 2	

## RECOMMENDED BOOKS:

TEXT BOOKS	
Sl. No.	Name of the books
1.	Duggal S.K. <i>Building Materials</i> , New Age International
2.	Varghese P.C. <i>Building Materials</i> , PHI Learning Pvt. Ltd-New Delhi.
3.	Punmia B.C. <i>Building Construction</i> , Laxmi Publications.
REFERENCE BOOKS	
Sl. No.	Name of the books
1.	M. S. Shetty R. <i>Concrete Technology</i> , S. Chand.
2.	Nevile A.M. & Brooks J.J. <i>Concrete Technology</i> , Pearson Education.
3.	S.C. Rangwala <i>Engineering Materials</i> , Charotar Publishing

**CIVL 2104: Engineering Geology**

Contact: 3L

Credits-4

Sl. No.	Module	Details of Course Contents	Hours	Total
1	I	Geology and its importance in Civil Engineering. Mineralogy: Definition, internal and external structure of minerals, study of crystals, Classification and physical properties of minerals. Classification of rocks Igneous Rocks: Origin, mode of occurrence, forms & texture, classification and engineering importance. Sedimentary Rocks: Process of sedimentation, classification and engineering importance. Metamorphic Rocks Agents and types of metamorphism, classification and engineering importance.	9	36
2	II	Weathering and Erosion of rocks: Agents and kinds of weathering, soil formation & classification based on origin. Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition. Structural Geology Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints, importance of geological structures in Civil Engineering.	9	
3	III	Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercalli's intensity scale and Richter's scale of magnitude. Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strength and abrasive resistance. Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing.	9	
4	IV	Geophysical exploration: Methods of Geophysical Exploration, electrical resistivity method: field procedure – sounding and profiling, electrode configuration, and interpretation of resistivity data. Geophysical surveys in ground water and other Civil Engg. Projects. Applied Geology: Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations. Landslides: Types of landslides, causes, effects and prevention of landslides.	9	

Text &amp; Reference Books:

Sl. No.	Title	Author(s)	Publisher
1.	Engineering and General Geology	Parvin Singh	Katson Publishing House Delhi
2.	Engineering Geology for Civil Engineers	D. Venkat Reddy	Oxford, IBH, 1995.

3.	Principles of Petrology	Tyrell	Asia, Bombay
4.	Structural Geology	Marland P. Billings	Wiley Eastern Prentice-Hall, U.S.A.
5.	Ground Water Hydrology	Todd D.K.	John Wiley & Sons

Strength of Materials Lab

Code:CIVL 2111

Contact-3P

Credits-2

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 test: Izod and Charpy
8. Demonstration of Fatigue test.

Engineering Geology Lab  
Code – CIVL 2112  
Contact: 3P

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



## **BUILDING PLANNING & DRAWING**

**Code: CIVL 2121**

**Contact: 3P**

**Credits: 2**

### **FOUNDATIONS**

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

### **DOORS, WINDOWS AND STAIRS**

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

### **ROOFS AND TRUSSES**

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

### **FUNCTIONAL DRAWING OF BUILDINGS**

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

#### References

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

**CAD LAB**  
**Code: CIVL 2122**  
**Contact : 3P**  
**Credit: Point: 2**

**Application of CAD [in Building Planning and Drawing (as per CIVL 2121)**

**REFERENCE:**

AUTOCAD 2014 for Engineers and Designers by Prof. Sham Tickoo and Anurag,  
Publication Jain Book Agency

**Subject Code : MATH 2001**  
**Subject : MATHEMATICAL METHODS**

**Credit: 4**

**Contact: 3L+2T**

**Total Contact Hour: 48**

**Module I : Functions of Complex Variables (12L)**

Complex numbers and its geometrical representation .

Functions of a complex variable – Limits, Continuity , Differentiability .

Analytic Functions , Cauchy- Riemann equations , Necessary and sufficient conditions for analyticity of complex functions(Statement only) , Harmonic functions.

Line Integral on complex plane , Cauchy-Goursat theorem , Cauchy's Integral Formula.

Taylor's and Laurent's series expansion .

Zeros, Different types of Singularities. Definitions of poles and residues , Residue Theorem , Evaluation of real integrals using residue theorem.

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

Definite 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 : Series solutions to Ordinary Differential equations and Special Functions (12L)**

Series solution of ODE: Ordinary point , Singular point and Regular Singular point, series solution when  $x = a$  is an ordinary point, Frobenius method.

Legendre's Equation , Legendre's polynomials and its graphical representation.

Bessel's equation , Bessel's function of first kind and its graphical representation.

Finite Difference Method and its application to Boundary Value Problem.

#### **Module IV: Partial Differential Equations (12L)**

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

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

Solution of Boundary value problems by Laplace and Fourier transforms.

#### **Suggested Books:**

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

9. Advanced Engineering Mathematics  
Kreyszig  
Willey

10. Higher Engineering Mathematics  
B. V. Ramana  
Tata McGraw-Hill

**ANALYSIS OF STRUCTURES - I**

Code: CIVL 2201

Contact hours: 3L+1T

Credits: 4

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

**Text & References:**

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

**CIVL 2202: Soil Mechanics I**

Contact: 3L+1T

Credits-4

SI. No.	Module	Details of Course Contents	Hours	Total
1	I	<p><b>PHYSICAL PROPERTIES OF SOILS</b></p> <p>Soil Formation</p> <p>Introduction, Origin of Soil, Formation and Types of soil, Formative classification, Typical Indian Soil, Some Special Types of Soils, Structure and Composition, Clay Mineralogy.</p> <p>Soil as a Three Phase System</p> <p>Basic Definitions, Weight - Volume Relationship, Measurement of Physical Properties of Soil: Insitu Density, Moisture Content, Specific Gravity, Relative density, Functional Relationships.</p> <p>Index Properties of Soil</p> <p>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.</p> <p>Classification of Soil</p> <p>Classification by Structure, Particle Size Classification, Textural System, PRA System (AASHTO Classification), Unified Classification System, As per IS Code Recommendation, Field Identification of Soil, Classification by Casagrande's Plasticity Chart.</p>	<p>3</p> <p>4</p> <p>4</p> <p>4</p>	
2	II	<p><b>SOIL WATER SYSTEM</b></p> <p>Soil Hydraulics</p> <p>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.</p> <p>Permeability</p> <p>Introduction, Darcy's Law, Coefficient of Permeability, Discharge Velocity, Seepage Velocity, Factors Affecting Permeability. Determination of Coefficient of Permeability – Constant Head and Falling Head Methods, Permeability of Stratified Soil Deposits,</p> <p>Field Determination of Permeability – Unconfined and Confined Aquifers.</p> <p>Seepage Analysis</p> <p>Introduction, Seepage, Seepage Pressure, Two Dimensional Flow, Laplace's Equations, Continuity equation, Flow Nets, Flow through Earthen Dam, Estimation of Seepage, Construction, Properties and Use of Flow Nets, Piping and Heaving, Uplift due to Seepage, Design of Fillers.</p>	<p>4</p> <p>4</p> <p>4</p>	

3	III	<p><b>STRESS DISTRIBUTION IN SOILS</b>  Introduction, Geostatic Stress, Boussinesq's Equation, Determination of Stress due to Point Load, Vertical Stress Distribution on a Horizontal Plane, Isobar and Pressure Bulb, Vertical Stress Distribution on a Vertical Plane, Vertical Stress under Uniformly Loaded Circular Area, Vertical Stress Beneath a Corner of a Rectangular Area, Equivalent Point Load Method, 2:1 Method, Newmark's Influence Chart, Vertical Stress Beneath Line and Strip Loads. Westergaard Analysis, Comparison of Boussinesq and Westergaard Theories, Contact Pressure.</p>	6	40
4	IV	<p><b>SHEARING CHARACTERISTICS OF SOILS</b>  Shear Strength of Soil  Introduction, Basic Concept of Shear Resistance and Shear Strength of Soil, Mohr Circle of Stress, Sign Conventions, Mohr - Coulomb Theory, Relationship between Principal Stresses and Cohesion.</p> <p><b>Determination of Shear Parameters of Soil</b>  Stress Controlled and Strain Controlled Tests, Laboratory Determination of Soil Shear Parameters- Direct Shear Test, Triaxial Test, Classification of Shear Tests Based on Drainage Conditions, Unconfined Compression Test, Vane Shear Test as per Relevant IS Codes.  Stress- Strain Relationship of Clays and Sands, Concept of Critical Void Ratio. Skempton's Pore Pressure Parameters. Sensitivity and Thixotropy of clay. Concept of Stress path.</p>	3  4	

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

### RECOMMENDED BOOKS:

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

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



**CONCRETE TECHNOLOGY**

Code: CIVL 2203

Contact hours: 3L+1T

Credits: 3

Sl.No.	Module	Details of course contents	Hours	Total
1.	I	<b>QUALITY OF WATER</b> Mixing water, Curing Water, Harmful Contents. <b>PROPERTIES OF FRESH CONCRETE</b> Workability, Factors Affecting Workability, Slump test, Compacting Factor Test, Flow Table Test, Segregation, Bleeding, Setting time, Mixing and Vibration of Concrete, Mixers and Vibrators, Curing Methods, Maturity.	3  6	36
2.	II	<b>STRENGTH OF CONCRETE</b> Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress-Strain Relation and Modulus of Elasticity, Poisson's Ratio, Shrinkage and Creep, Compression Test on Cubes, Cylinders.	9	
3.	III	<b>ADMIXTURES</b> Different types, Effects, Uses, Retarders and Admixtures. <b>MIX DESIGN BY I.S. 10262(2009)</b>	9	
4.	IV	<b>SPECIAL CONCRETE &amp; CONCRETING TECHNIQUES</b> Light- weight Concrete, High performance Concrete. Polymer Concrete, Fibre-reinforced Concrete, Waste Material Based Concrete, Shotcrete, Ferrocement, Self Compacting Concrete, Foam Concrete Modification in the Microstructure. Deterioration of reinforced Concrete and its Prevention. Repair Technology and its restoration and health monitoring. <b>INTRODUCTION TO NON-DESTRUCTIVE TESTS</b> (rebound hammer & ultrasonic pulse velocity).	6  3	

**Text & References:**

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

**Codes:**

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

**CIVL 2204: Fluid Mechanics****Contacts: 3 L + 1 T****Credits: 4**

SL. No	Module	Details of Course Contents	Hours	Total
1	I	<b>FLUID STATICS</b> 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
		<b>FUNDAMENTALS OF OPEN CHANNEL FLOW</b> 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	
		<b>STEADY UNIFORM FLOW IN OPEN CHANNEL</b> Characteristics, Chezy's, Manning's formulae, Hydraulically efficient Rectangular and trapezoidal sections. Design features of rigid boundary channels.	4	
2	II	<b>WEIRS AND NOTCHES</b> Rectangular, triangular, trapezoidal and cippoletti notch, sharp crested and broad crested weirs, submerged weirs.	4	44
		<b>FLOW IN PIPES</b> 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	<b>SPECIFIC ENERGY / NON-UNIFORM FLOW IN OPEN CHANNEL</b> Definition, Diagram. Critical, Sub-critical and Super-critical flows. Establishment of critical flow, Specific force: Definition and diagram, Hydraulic Jump.	4	44
		<b>DIMENSIONAL ANALYSIS AND MODEL STUDIES</b> Dimensions and dimensional homogeneity, Importance and use of dimensional analysis.	2	
		Buckingham Pi Theorem: Statement and application, Geometric, Kinematic and Dynamic similarity. Non Dimensional Numbers, Froude and Reynold model laws and applications.	4	

4	IV	<b>MACHINERIES IN FLUID MECHANICS</b> Turbines, Classification and types, power and efficiency, Working Principles of Pelton, Francis and Kaplan turbines, draft tube, Cavitations in pumps and turbines. Application of principles of similarity of hydraulic machines, specific speed of pumps and turbines, centrifugal and reciprocating pumps, performance characteristics graph for head, discharge and efficiency, hydraulic machines in parallel and series, hydraulic Ram.	6	
			6	

### RECOMMENDED BOOKS:

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

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

## **CIVL 2211: Fluid Mechanics Lab**

**Contacts: 3P**

**Credit: 2**

1. Determination of Orifice co-efficient
2. Calibration of Orifice meter
3. Calibration of V- Notch
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. Preparation of discharge rating curve for a sluice
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 Books
1.	Laboratory Manual: Hydraulics and Hydraulic Machines by R. V. Raikar, PHI Learning.
2.	Laboratory manual for Civil Engineering second edition by H S Moondra and R Gupta, CBS Publishers, New Delhi.
3.	Fluid Mechanics by Modi & Seth Standard Book House, New Delhi.
4.	Fluid Mechanics by A.K.Jain, Khanna Publishers, Nath Market, Nai Sarak, New Delhi.
5.	Fluid Mechanics & Machinery by H. M. Raghunath – CBS Publishers, New Delhi.

## CIVL 2212: Surveying Practice Lab

**Contact: 3P**

**Credit: 2**

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

### REFERENCE BOOKS:

Sl. No.	Name of the Books
1.	Basak N.N., <i>Surveying and Leveling</i> , 2 <sup>nd</sup> edition, McGraw Hill Education (India) Pvt. Ltd.
2.	Duggal S. K. <i>Surveying (Vol-1 and 2)</i> . 4 <sup>th</sup> edition, McGraw Hill Education (India) Pvt. Ltd.

## **QUANTITY SURVEY, SPECIFICATION AND VALUATION**

**Code: CIVL 2221**

**Contact : 1L+3P**

**Credit: Point: 2**

### **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. Rate of analysis of different items with specifications**

Specifications for materials and construction of a building

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

### **4. Quantity Estimation of infrastructures**

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

### **5. Valuation**

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

#### **References:**

- 1. Estimating, costing, Specification and Valuation in Civil Engineering by M..Chakroborty**
- 2. Estimating and Costing in Civil Engineering” by B.N.Dutta, USB Publishers & Distributers**
- 3. IS CODE SP34**

**SUBJECT: NUMERICAL AND STATISTICAL METHODS**  
**SUBJECT CODE: MATH 2002**

**Credit: 3**

**Contact: 3L**

**Total Contact Hour: 36**

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

SOLUTION OF NON-LINEAR ALGEBRAIC EQUATIONS AND TRANSCENDENTAL EQUATIONS:

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

SOLUTION OF LINEAR SYSTEM OF EQUATIONS:

Gauss elimination method, Gauss-Seidel Method, LU Factorization Method.

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

INTERPOLATION AND INTEGRATION:

Newton's Forward and Backward Interpolation Method, Lagrange's Interpolation, Trapezoidal and Simpson's 1/3<sup>rd</sup> Rule.

SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

Euler's and Modified Euler's Method, Runge-Kutta Method of 4<sup>th</sup> order.

**MODULE-III – FUNDAMENTALS OF PROBABILITY (5L)**

Prerequisites- Set Theory.

Random experiment, Sample space, Events.

Definition of Probability,

Addition law of probability, Multiplication law and Conditional Probability.

Bayes' Theorem (Statement only)

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

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

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

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

Simple Correlation and Regression.

### **Suggested Books:**

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



**SUBJECT: NUMERICAL AND STATISTICAL METHODS LAB**  
**SUBJECT CODE: MATH 2012**

**Credit: 1**

**Contact: 2P**

Development of computer programs in C for the following problems:

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

## 3<sup>rd</sup> Year 1<sup>st</sup> Semester

### **Analysis of Structures II (CIVL3101)**

**Contact Hours: 3L+1T**

**Credits: 4**

Sl. No.	Module	Details of Course content	Hours	Total
1.	I	Analysis of statically Indeterminate Structures: Moment distribution method-solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway.	6	42
		Slope deflection method: method and application in continuous beams and frames.	4	
		Suspension Bridge and stiffening girders.	2	
2.	II	Curved Beam analysis: Hooks, rings and Bow girders. Unsymmetrical bending.	12	
3.	III	Plastic analysis of structures: beams and portal frames.	8	
4.	IV	Approximate method of analysis of structures: Portal and Cantilever methods.	4	
		Matrix methods of structural analysis – Stiffness and flexibility approaches for analysis of beam.	6	

### **Text & References:**

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

### **Course objective:**

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

- 1) Analyse the indeterminate structures starting from fundamentals.
- 2) Solve examples and problems related to this course.
- 3) Comprehend the concept on structural behaviors.

**Soil Mechanics II (CIVL 3102)****Contact Hours: 3L + 1T****Credits: 4**

<b>Sl. No.</b>	<b>Module</b>	<b>Details of Course Content</b>	<b>Hours</b>	<b>Total</b>
1.	I	<b>Compressibility &amp; Consolidation of Soil :-</b> Terzaghi's theory of one dimensional consolidation, Compressibility characteristics of soils, Compression index, Coefficient of compressibility and volume change, Coefficient of consolidation, Degree and rate of consolidation, Time factor, Settlement computation, Consolidometer and laboratory one dimensional consolidation test as per latest IS Code, Determination of consolidation parameters. <b>Compaction of Soil:</b> - Principles of compaction, Standard and modified proctor compaction test, Field compaction methods, Field compaction control, Factors affecting compaction, Effect of compaction on soil properties.	12	41
2.	II	<b>Earth Pressure Theories :-</b> Plastic equilibrium of soil, Earth pressure at rest, Active and passive earth pressures, Rankine's and Coulomb's earth pressure theories, Different types of backfill, Wedge method of analysis. Analytical and graphical methods for determination of earth pressure against various earth retaining structures. <b>Stability of retaining walls:</b> Cantilever retaining wall.	10	
3.	III	<b>Bearing capacity of shallow foundations :-</b> Bearing capacity, Definition, Factors affecting bearing capacity, Modes of failures, Methods of determining bearing capacity of soils. Terzaghi's bearing capacity theory, Effect of depth of embedment, Eccentricity of load, Foundation shape on bearing capacity, Effect of water table and eccentric loads. Isolated footings with combined action of loads and moments, Bearing capacity as per IS: 6403.	11	
4.	IV	<b>Settlement:-</b> Allowable bearing pressure and settlement analysis (as per IS: 8009), Immediate and consolidation settlements, Rigidity and depth factor corrections, Settlement values as per IS: 1904 recommendations. <b>Stability of slopes :-</b> Types of failure, Analysis of finite and infinite slopes, Swedish and friction circle method, Ordinary method of slices, Factor of safety, Taylor's stability number, Bishop's simplified method of stability analysis.	8	

**RECOMMENDED BOOKS:-**

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

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

**Course Objectives:**

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

1. Understand the characterization of soil.
2. Apply the theories for solving practical problems.
3. Develop the ability to analyze geotechnical problems with the theories.

## Highway & Traffic Engineering (CIVL 3103)

Contact Hours: 3 L + 1 T

Credits: 3

SL. No	Module	Details of Course Contents	Hours	Total
1.	I	<p><b>Highway Network Planning:</b> Different modes of transportation, Role &amp; Development of highway transportation, Classification, Network patterns, Planning surveys, Evaluation by saturation system, Introduction to highway economics.</p> <p><b>Highway Alignment:</b> Factors controlling alignments, Principles of highway alignment, engineering surveys for highway alignment and location.</p> <p><b>Highway Geometric Design:</b> 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.</p>	2 2 8	42
2.	II	<p><b>Pavement Materials:</b> Types and component parts of pavement and their functions, highway and airport pavement materials, basic soil &amp; aggregate properties relevant to pavement application, basic properties of bitumen and tar, Modified Bitumen (PMB, CRMB) tests on pavement materials, Use of geo-synthetics.</p> <p><b>Design of Pavements:</b> Design factors, classification of axle types, contact pressure, EWLF &amp; ESAL concept, Traffic analysis: vehicle damage factor.</p> <p><b>Flexible Pavement Design:</b> Design of flexible pavements (GI method, CBR method, Triaxial method - only introduction), IRC method of design.</p> <p><b>Rigid Pavement Design:</b> Design considerations, Westergaard's theory and assumptions, Design of dowel and tie bars, Joints in Rigid Pavements, IRC method of design.</p>	4 8	
3.	III	<p><b>Highway Construction:</b> Construction of earth roads, gravel roads, WBM roads, Cement Concrete Pavements, Bituminous pavements.</p> <p><b>Highway Maintenance:</b> Pavement failures, causes of failure, routine and periodic maintenance of highways.</p> <p><b>Highway Drainage:</b> Importance of highway drainage, surface and sub-surface drainage, drainage of slopes and erosion control, road construction in water logged areas.</p> <p><b>Highway Safety:</b> 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.</p>	2 2 2 2	

4.	IV	<b>Traffic Engineering:</b> 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.	4	
		<b>Traffic Signal Design and Design of at grade Intersections:</b> 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.	4	
		<b>Parking and Accident Analysis:</b> Parking inventory study, on street and off street parking facilities, introduction to Intelligent Transport System, accident characteristics, accident recording and analysis.	2	

### RECOMMENDED BOOKS:

TEXT & REFERENCE BOOKS	
Sl. No.	Name of the books
1.	High Way Engineering, Khanna& Justo, Nemchand& Brothers, Roorkee
2.	Principles of Transportation Engineering, P. Chakraborty& A. Das - PHI
3.	Transportation Engineering- C.J Khisty& B.K Lall., PHI
4.	Kadiyali L.R. Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, India, 1997
CODES FOR REFERENCE	
Sl. No.	Name of the Codes
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 Objectives:

At the end of the course, the student 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.

## Environmental Engineering (CIVL 3104)

Contact Hours: 3L + 1T

Credits: 3

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

### Recommended books:-

#### Text Books:

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

### Course objectives:

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

1. Design of water supply including the water treatment plant.
2. Design of sewerage system including wastewater treatment plant.
3. Identify the nature and quality of water & waste water as per its characteristics like, physical, chemical & biological.

**Design of RCC Structures (CIVL 3105)****Contact Hours: 3L + 1T****Credits: 4**

SL. No	Module	Syllabus	Hours	Total
1	I	<b>Introduction:</b> Principles of Design of Reinforced Concrete Members - Working Stress and Limit State Method of Design	2	42
		Basic concepts of Balanced, Under-reinforced and Over-reinforced Beam section by Working Stress Method and Limit State Method	1	
		<b>Working Stress Method of Design:</b> Analysis and Design of Beams and Columns.	4	
		<b>Limit State Method of Design:</b> Basic Concepts and IS Code Provisions (IS: 456 2000) for Design against Strength and Serviceability Limit States. Concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP: 16).	4	
2	II	<b>Analysis, design and detailing</b> of singly reinforced rectangular, 'T', 'L' and doubly reinforced beam sections by limit state method.	5	
		<b>Design and detailing</b> of one-way and two-way slab panels as per IS code provisions	3	
		<b>Design and detailing</b> of continuous beams and slabs as per IS code provisions	3	
3	III	<b>Staircases:</b> Types; Design and detailing of reinforced concrete doglegged staircase	2	
		<b>Design and detailing</b> of reinforced concrete short columns of rectangular and circular cross-sections under axial load.	4	
		<b>Design</b> of short columns subjected to axial load with moments (uniaxial and biaxial bending) – using SP 16.	4	
4	IV	<b>Design and detailing</b> of reinforced concrete isolated square and rectangular isolated and combined footing for columns as per IS code provisions by limit state method	6	
		<b>Design and detailing</b> of Pile foundation as per IS code provisions.	4	



### **Recommended books:-**

#### Codes:

1. IS: 456- 2000  
“Indian Standard for Plain and reinforced concrete – code of practice” Bureau of Indian Standard
2. SP: 16 Design Aid to IS 456

#### Text Books:

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

### **REFERENCE BOOKS:**

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

### **Course objectives:**

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

- 1) Understand the basic concepts in the mechanical behavior and design of concrete systems and elements.
- 2) Identify and apply the applicable industrial design codes relevant to the design of Reinforced concrete members.
- 3) Perform the analysis and design of reinforced concrete members.
- 4) Solve the professional and contemporary issues in the design and fabrication of reinforced concrete members.

## **Economics for Engineers (HMTS-3101)**

**Contact Hours: 3L**

**Credits: 3**

### **Module 1:**

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

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

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

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

### **Module 2:**

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

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

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

### **Module 3:**

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

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

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

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

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

### **Module 4:**

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

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

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

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

### **Evaluation:**

Maximum marks-100

Internal Test-30

Semester Test-70

### **Suggested Readings:**

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

## **Soil Mechanics Lab I (CIVL 3111)**

**Contact Hours: 3 P**

**Credits: 2**

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

### **REFERENCES:**

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

## **Concrete Technology Lab (CIVL 3112)**

**Contact Hours: 3P**

**Credits: 2**

1. **Tests on cement** – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes
2. **Tests on fine aggregate** – specific gravity, bulking, sieve analysis, fineness 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

**Environmental Engineering Lab. (CIVL 3113)****Contact Hours: 3P****Credits: 2**

<b>Experiment no.</b>	<b>Experiment name</b>	<b>Type of test</b>
01	Determination of Color & Turbidity in an aqueous sample	Physical
02	Determination of pH and various solids (Total solids, Total suspended solids and Total dissolved solids) in an aqueous sample	
03	Determination of electrical conductivity and chloride in an aqueous sample	
04	Determination of Total & Phenolphthalein alkalinity in an aqueous sample and speciation of different alkalinities	Chemical
05	Determination of total and calcium hardness in an aqueous solution	
06	Determination of concentration of fluorides in an aqueous solution	
07	Determination of total and soluble iron of aqueous sample.	
08	Determination of the optimum coagulant dose for a given sample of water through Jar test	
09	Determination of chlorine demand of a contaminated water sample	
10	Determination of biochemical oxygen demand (BOD <sub>5</sub> at 20 deg C) for a given wastewater sample.	
11	Determination of chemical oxygen demand for a given wastewater sample.	
12	Determination of bacteriological quality of water : presumptive test, confirmative test and determination of Most Probable Number(MPN)	Bacteriological

## **R. C. C. Design & Detailing (CIVL 3121)**

**Contact Hours: 3P**

**Credits: 2**

1. **General considerations:** Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provision.  
General Introduction to IS 1893-2002
2. **Design & detailing of a** Continuous T- Beam.
3. **Design & Detailing of** columns, isolated and combined footing
4. **Design & detailing of a** One way Continuous slab.
5. **Design of different units:** Slab, beam column, roofing and staircase from floor plan of a multistoried frame building, typical detailing of a two way floor slab.

### **References:**

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

### 3<sup>rd</sup> Year 2<sup>nd</sup> Semester

#### **Design of Steel Structures (CIVL 3201)**

**Contact Hours: 3L + 1T**

**Credits: 4**

Sl. No.	Module	Details of Course content	Hours	Total
1	I	<b>Materials and Specification:</b> Rolled steel sections, mechanical properties of steel and their specifications for structural use. Codes of practices. <b>Structural connections:</b> Bolted and welded connections: Introduction to different types of connectors, types of bolted and welded joints, assumptions, failure and efficiency of joints. Design of bolted and welded connections for axial load, torsion and shear, tension and shear, interaction check. High strength friction grip bolted joints.	8	42
2	II	<b>Tension members:</b> Working stress and limit state design of tension members, I.S code provisions, design rules, examples. <b>Compression members:</b> Effective lengths about major and minor principal axes, I.S code provisions. i) Design of axially loaded compression member: Working stress and limit state design of axially loaded compression members using rolled steel and built up sections. Examples. ii) Design of beam – column: Design of rolled steel and built up columns under eccentric loading, design of lacing and batten plates. Design of column bases: Design of slab base, gusseted base, connection detailing.	13	
3	III	<b>Beams:</b> Working stress and limit state design in bending, compression and tension. Design of rolled steel sections, plated beams, concepts of curtailment of flanges. <b>Plate girders:</b> Design of web, flanges and stiffeners. Splices and connections using bolts and welding.	13	
4	IV	<b>Gantry system:</b> Design gantry girder and gantry column considering I.S code provisions.	8	

**Text and References:**

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

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

**Course Objectives:**

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

- 1) Identify the material properties of structural steel.
- 2) Analyse and design different steel members and connections.
- 3) Comprehend the codal guidelines and formuli.
- 4) Solve different industrial problems.
- 5) Cope up with the latest industry design standards.



## Foundation Engineering (CIVL 3202)

Contact Hours: 3L + 1T

Credits: 4

Sl. No.	Module	Details of Course Content	Hours	Total
1.	I	<b>Foundations:</b> - Classification, selection- shallow and deep foundations. <b>Deep foundations:- Pile foundation:</b> Types of piles, material, Suitability and uses, Method of installation of piles - classification of piles based on material, Installation Techniques – Selection and uses, Determination of types and lengths of piles, Load transfer mechanism, Determination of load carrying capacities of piles by static and dynamic formulae as per IS codes, Pile spacing and group action, Group efficiency, Negative skin friction, Pile load test, Settlement of pile group, Lateral load capacity of pile by IS: 2911 and Reese & Matlock methods, Uplift capacity of pile - introduction.	14	40
2.	II	<b>Site Investigation &amp; Soil Exploration:-</b> Planning of sub-surface exploration, Methods of boring, sampling, Different types of samples, Spacing, Depth and number of exploratory borings, Bore log, Preparation of sub-soil investigation report. <b>Insitu tests:-</b> Standard penetration test, Static cone penetration test, Dynamic cone penetration test, Field vane shear test, Plate load test. <b>Indirect methods of soil exploration:-</b> Geophysical method: seismic refraction and electrical resistivity methods.	9	
3.	III	<b>Shallow Foundations:-</b> Bearing Capacity from SPT, SCPT and Plate load Test data. <b>Sheet pile structures: -</b> Type of sheet piling, Design of sheet pile, Cantilever sheet piling, Anchored sheet piling, Free earth and fixed earth support methods, Analysis with anchored bulk heads.	9	
4.	IV	<b>Introduction to Ground Improvement Techniques:-</b> Introduction, Economic considerations, Consolidation by preloading and sand drains, Stone columns, Compaction by vibrofloatation, Grouting techniques and principles, Applications of geosynthetics, Ground anchors and soil nailing.	8	

## Recommended books:-

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

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

## Course Objective:

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

1. Develop the ability to interpret field and laboratory test data to get design parameters for foundation analysis.
2. Develop skills for performing design and analysis of shallow and deep foundations.
3. Understand application of various types of ground improvement methods.

**Prestressed Concrete (CIVL 3203)****Contact Hours: 3L + 1T****Credits: 3**

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

## **Recommended books:-**

Code: IS 1343:1980

Text Books:

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

Reference Books:

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

## **Course objective:**

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

- 1) Learn the analysis and design of prestressed concrete members and their connections.
- 2) Identify and apply the industrial design codes relevant to the design of prestressed concrete members.
- 3) Perform the professional and contemporary design issues and fabrication of prestressed concrete members

## **Data Structure and Database Concept (CSEN 3206)**

**Contact Hours: 3L**

**Credits: 3**

### **Module I: (11L)**

Linear Data structures:

Singly Linked List- Insertion at beginning, at end and any position of the List. Deletion by value, by position: beginning, end and any position of the List

Stack and Queue: Both array and Linked Representation, Circular queue using array only.

Application of stack: Infix to postfix conversion, Evaluation of postfix expression.

### **Module II: (10L)**

Recursion: Design of Recursive algorithm.

Non-Linear Data Structures:

Trees: Binary Trees: Array and Linked representation, Binary tree Traversal Techniques, reconstruction of binary tree using traversal sequence.

Binary Search Trees - Insertion and Deletion algorithms.

Sorting Algorithms: Bubble sort, Insertion sort, Selection sort, Quick sort and their comparison.

Searching Algorithms: Linear search, Binary search and their comparison.

## **Database Concept**

### **Module III: (10L)**

Introduction to Database Concepts, File Processing System and Database Management System, DBMS Architecture and Data Independence.

Data Model: Basic Concepts, Entity-Relationship Diagram, Keys, Cardinality, Weak Entity Set.

Introduction to relational algebra & SQL: Operators like select, project, rename, Cartesian product, join, union, intersect, minus, DDL, DML.

### **Module IV: (10L)**

Relational Database Design: Functional Dependencies, Normalization: Different anomalies in database designing

1NF, 2NF, 3NF and BCNF.

Introduction to Transaction Processing Concepts: ACID properties, Serializability and Recoverability

## **Text Books:**

### **Data Structures:**

I) Title: Data Structures.

Author: Seymour Lipschutz.

Publication: Tata McGraw-Hill (India)

II) Title: Data Structures and Program Design in C.

Author: Kruse Robert L., Robert Kruse, Cl Tondo.

Publication: Pearson Education India.

### **Database Concept:**

I) Title: Fundamentals of Database Systems

Author: Elmasri Ramez and Navathe Shamkant

Publication: Pearson.

II) Title: Database System Concepts

Author: A. Silberschatz, H.F Korth, S.Sudarshan

Publication: McGraw Hill Education (India) Private Limited

**Reference Books:****Data Structure:**

I) Title: Data Structures using C.

Author: Tanenbaum A. S, Langsam Y., Augenstein M.J.

Publication: Pearson.

II) Title: The Art of Computer Programming

Author: Donald E. Knuth

Publication: Addison-Wesley Professional

**Database Concept:**

I) Title: Introduction to Database Management Vol. I, II, III,

Author: Date C.J.

Publication: Addison Wesley.

II) Title: Principles of Database Systems

Author: UllmanJD.

Publication: Galgottia Publication

**Railway & Airport Engineering (CIVL 3231)****Contact Hours: 3 L + 1 T****Credits: 3**

<b>SL. No</b>	<b>Module</b>	<b>Details of Course Contents</b>	<b>Hours</b>	<b>Total</b>
1.	I	<b>Railways in India:</b> <i>Introduction</i> - Role of Indian railways in National Development, Railways for urban transportation. <i>Alignment of Railway Lines</i> - Location survey, Engineering surveys for track alignment- Obligatory points, Conventional and modern methods. (Remote sensing, GIS). <b>Permanent Way components and Functions:</b> Rails- Types of rails, Rail fastenings, Concept of gauges, Coning of wheels, Sleepers- Functions, Materials, Density, Ballast - Functions, Materials, Ballast less tracks. <b>Geometric Design of railway tracks:</b> Grade compensation and gradient, Widening of gauges in curves, Super elevation, Horizontal, Vertical and Transition curves.	2  8  4	42
2.	II	<b>Track Maintenance:</b> Points and Crossings- Design of Turnouts, Working principles, Various types of track junctions. <b>Rolling Stock, Railway Section and Yards:</b> Rolling Stock. Tractive power, Track resistance, Layouts of railway stations and yards, Re-laying of tracks, Level crossings. <b>Signalling and Interlocking:</b> Signalling, Interlocking and Track circuiting- Construction and Maintenance. <b>Design of tracks for high speed:</b> Geometrical requirements, Ballasted or Ballast less, Design methodology, Maintenance considerations.	2  2  2  2	
3.	III	<b>Aircraft component and Airport planning:</b> Component parts and its function, aircraft characteristics and their influence on airport planning, air traffic characteristics, development of new airports, factors affecting airport site selection, Airport Maintenance. <b>Airport obstruction:</b> Zoning laws, classification of obstructions, imaginary surfaces, approach zones, turning zones. <b>Design of Runway and Taxiway:</b> Runway orientation, wind rose diagrams, basic runway length, corrections for runway length, airport classification, geometric design, airport capacity, runway configuration, taxiway design, geometric standards, exit taxiways, holding aprons, location of terminal buildings, aircraft hangers parking.	2  4  6	

4.	IV	<b>Terminal area &amp; airport layout:</b> Terminal area, planning of terminal buildings, apron, size of gate position, number of gate position, aircraft parking system, hanger, general planning considerations blast considerations.	2	
		<b>Airport drainage:</b> Requirement of airport drainage, design data, surface drainage design.	2	
		<b>Airport marking and lighting:</b> Marking lighting of runways, taxiway, approach other areas.	2	

### RECOMMENDED BOOKS:

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

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

1. Understand the importance of railway infrastructure, planning and design and identify the factors governing the design.
2. Design and analyze the railway track system.
3. Get an idea about components of aircraft, airport planning and obstruction.
4. Design Runways and Taxiways.
5. Have a brief knowledge of airport layout and airport maintenance.



**Advanced Surveying (CIVL 3232)****Contact Hours: 3L + 1T****Credits: 3**

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

## **Recommended books:-**

### TEXT BOOKS:

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

### REFERENCE BOOKS:

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

## **Course Objectives:**

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

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

**Design of Tall Structures (CIVL 3233)****Contact Hours: 3L + 1T****Credits: 3**

<b>SL. No</b>	<b>Module</b>	<b>Details of Course Content</b>	<b>Hours</b>	<b>Total</b>
1	I	<b>INTRODUCTION</b>  Concept of tall buildings, factors affecting growth, height and structural forms. Tall building structure- design process, strength and stability, stiffness and drift limitation, creep, shrinkage and temperature effects.  <b>BASIC STRUCTURAL FORMS</b>  Braced frame structures, rigid frame structures, in filled frame structure, flat plate and flat- slab structures, shear wall structures, wall- frame structures, framed-tube structures, outrigger –braced structures, suspended structures, core-structures, space and hybrid structures. Modelling concept of 2D and 3D structures, exposure to the design philosophy of Staad software.	10	44
2	II	<b>WIND ANALYSIS</b>  Design considerations for nature of wind, use of Gust Factor Method to assess the dynamic effect of wind on structures.  Introductory concept of wind tunnel test, objectives of wind tunnel tests.	10	
3	III	<b>SEISMIC ANALYSIS</b>  Tall building behaviour during earthquakes, use of Response Spectrum Method to assess the dynamic effect of earthquake on structures. Basic concept of Time History Analysis.	12	
4	IV	<b>DESIGN PHILOSOPHY OF A TALL BUILDING WITH SHEAR WALLS</b>  Concept of P-delta effects. Concepts of ductile detailing of building, referring to IS 13920-1993.  Detailed concept of shear wall design for a Tall building.	12	

## **Recommended books:-**

### TEXT BOOKS:

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

### REFERENCE BOOKS:

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

### CODES:

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

## **Course Objectives:**

After attending the course, students will be able to:

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

## Soil Stabilization & Ground Improvement Techniques (CIVL 3234)

Contact Hours: 3L + 1T

Credits: 3

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

### Recommended books:-

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

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

### Course Objective

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

1. Understand the various types of methods for improving engineering properties of soils.
2. Apply engineering methods for analysis and design of ground improvement projects.
3. Design soil reinforcement for various applications.

# **Principles of Management (HMTS-3201)**

**Contact Hours: 2L**

**Credits: 2**

## **Module 1:**

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

## **Module 2:**

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

## **Module 3:**

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

## **Module 4:**

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

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

## **Evaluation:**

Maximum Marks-100

Internal Test-30

Semester End Test-70

## **Suggested Readings:**

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

## **Soil Mechanics Lab II (CIVL 3211)**

**Contact Hours: 3 P**

**Credits: 2**

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

### **REFERENCES:**

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

## **Transportation Engineering Lab (CIVL 3212)**

**Contact Hours: 3P**

**Credits: 2**

### **Details of Course Contents:**

#### **A. Test on Highway Materials:**

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

#### **B. Bituminous Mix Design by Marshall Stability Method.**

#### **C. Stripping Value Test.**

#### **D. Benkelman Beam Deflection Test.**

#### **References:**

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

### **Course Objectives:**

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

1. Characterize the pavement materials.
2. Perform tests on aggregates.
3. Perform tests on bitumen.
4. Design bituminous mixes by Marshall Method.
5. Get an overall idea about Benkelman Beam deflection test.



## **DBMS Laboratory (CSEN 3216)**

**Contact Hours: 3P**

**Credits: 2**

### **Experiments on Database on RDBMS Platform (Oracle):**

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

DML: Inserting rows, Updating rows, Deleting rows

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

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

### **Books:**

#### **DBMS Laboratory**

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

Author: Ivan Bayross

Publisher: BPB Publications

## **Steel Structure Design and Detailing (CIVL 3221)**

**Contact Hours: 3P**

**Credits: 2**

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

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

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

### **Text & References:**

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

## **Personality Development (HMTS 3221)**

**Contact Hours: 1L**

**Credits: 1**

### **Module I**

#### **Self-Growth**

- i) Self Growth- Maslow's Hierarchy of Needs Theory
- ii) Anger, Stress & Time Management- Theories and application
- iii) SWOT Analysis

### **Module II**

#### **Stepping Up**

- i) Growth & Environment
- ii) Competitive Spirit
- iii) Responsibility Factor

### **Module III**

#### **Professional Communication**

- i) Impression Management- theory on social psychology
- ii) Employability Quotient
- iii) Cross-cultural communication

### **Module IV**

#### **Leadership & Team Playing**

- i) Leadership & Team Playing: Theories, Styles, Stages
- ii) Motivation, Negotiation Skills, Conflict Management
- iii) Planning & Envisioning: Initiative and Innovation in the Work Environment- De Bono's Six Thinking Hats

#### **Evaluation:**

Max.Marks-100(sessional)

25 marks/ module

**Methodology:** Assignment and project

#### **Suggested Reading:**

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