

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY: VISAKHAPATNAM**DEPARTMENT OF CIVIL Engineering
PROGRAM STRUCTURE – VR-20****II Year****I Semester**

S. No.	Course Code	Course Title	L	T	P	C
1	1000202101	Complex Variables & Statistical Methods	3	1	0	3
2	1001202101	Fluid Mechanics	3	0	0	3
3	1001202102	Strength of Materials	3	0	0	3
4	1001202103	Building Materials & Concrete Technology	3	0	0	3
5	Open Elective - I		3	0	0	3
6	100120210	Fluid Mechanics Lab	0	0	3	1.5
7	100120211	Strength of Materials lab	0	0	3	1.5
8	100120212	Concrete technology Lab	0	0	3	1.5
9	100120280	CAD detailing of Civil Structures	0	0	4	2
10	1000202120	Life skills	2	0	0	0
Total Credits						21.5

Open Elective-I		
S. No.	Course Code	Course Title
1	1005201203	Data Structures
2	1003202140	Basic Elements of Mechanical Engineering for Civil Engineers
3	1002202140	Digital electronics

II Year
I - Semester

II Year – I Semester	COMPLEX VARIABLES & STATISTICAL METHODS (Common for CIVIL & MECH)	L	T	P	C
1000202101		3	1	0	3

COURSE OBJECTIVES:

1. To understand Differentiation and integration of complex valued functions.
2. Evaluation of integrals using Cauchy’s integral formula and Cauchy’s residue theorem.
3. Expansion of complex functions using Taylor’s and Laurent’s series and to explain the fundamental concepts of probability and random variables.
4. To impact statistical methods in various applications of engineering.
5. The basic ideas of statistical methods of studying data samples, correlation and regression.

COURSE OUTCOMES:

COs	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	<i>Analyze</i> the complex functions with reference to their analyticity.	PO1 PO2	1 2
CO2	<i>Analyze</i> the complex integration by using Cauchy's integral formula and find Taylor's, Maclaurin’s series and Laurent series expansion of complex function. <i>Evaluate</i> contour integrals by using Residue theorem.	PO1 PO2 PO3	2 2 3
CO3	<i>Explain</i> the notation of random variables and <i>Evaluate</i> the expected value and probability of random variables. <i>Evaluate</i> the confidence levels and maximum errors for large and small samplings and <i>Apply</i> the concept of hypothesis testing for large and small samples in real life situations.	PO1 PO2 PO3 PO4	1 2 3 3
CO4	Examine correlation for bi-variate data and <i>Predict</i> the regression analysis.	PO1 PO2 PO3	1 2 3

UNIT- I

FUNCTIONS OF A COMPLEX VARIABLE:

[6 HOURS]

Introduction to complex variable function - Limit – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates- Harmonic and conjugate harmonic functions – Milne – Thomson method to find analytical function.

UNIT- II

COMPLEX INTEGRATION:

[12 HOURS]

Line integral – evaluation along a path and by indefinite integration – Cauchy’s integral theorem (without proof) – Cauchy’s integral formula – Generalized integral formula.

COMPLEX POWER SERIES

Radius of convergence – Expansion of a function as Taylor’s series -Maclaurin’s series and Laurent series (without proof) - types of singularities –Isolated singular point – Pole of order

m – Essential singularity.

UNIT- III

RESIDUE:

[16 HOURS]

Evaluation of residue by formula and by Laurent series - Residue theorem (without proof)- Evaluation of contour integrals by residue theorem of the type: (a) Improper real integrals

$$\int_{-\infty}^{\infty} f(x)dx \quad (b) \int_c^{c+2\pi} f(\cos \theta, \sin \theta) d\theta.$$

RANDOM VARIABLES:

Introduction-Definition of a Random Variable-Discrete and Continuous Distributions- Binomial, Poisson and Normal distributions.

UNIT- IV

SAMPLING DISTRIBUTIONS AND TEST OF HYPOTHESIS: [14 HOURS]

Introduction to sampling distributions, level of significances and confidence limits. - Tests of hypothesis using Z-test -Student's t-test-F-test and χ^2 -test.

UNIT- V

CORRELATION AND REGRESSION:

[10 HOURS]

Determination of correlation coefficients, types, Pearson's coefficient of correlation, Spearman's rank correlation, Regression, Regression lines- Multiple Regression.

TEXTBOOKS:

1. Advanced Engineering Mathematics by H.K. Dass, S. Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, Tata McGraw Hill Publishing Co. Ltd.

REFERENCE BOOKS:

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Textbook of Engineering Mathematics, N.P. Bali, Laxmi Publications (P) Ltd.
4. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

II Year – I emester		L	T	P	C
1001202101	FLUID MECHANICS	3	0	0	3

Course Objectives

The students will be taught

1. The Fundamental properties of fluids and its applications.
2. Principles of Kinematics and Hydro-Dynamics for practical applications
3. The boundary layer, laminar and turbulent flows
4. Basic design of pipes and pipe networks considering flow, pressure and its losses.

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

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Describe the concepts of the physical properties of fluids & their influences on fluid motion.	1 2 3 4 7 8 12	3 3 3 2 2 1 1
CO2	Understand the concepts of kinematics and dynamics of fluid flow and Apply basic knowledge in Compute hydro static forces on various sub merged Surfaces	1 2 3 4 7 8 12	3 3 3 2 2 1 1
O3	Compute the measurement of flow by using flow measuring equipment Pitot tube, venture meter, orifice meter, notches and weirs. and Understand the the concepts of boundary layer theory,	1 2 3 4 7 8 12	3 3 3 2 2 1 1
CO4	Understand the concepts laminar and turbulent flows. Describe and analyze the pipe network problems	1 2 3 4 7 8 12	3 3 3 2 2 1 1

UNIT- I

Introduction: Dimensions and units – Physical properties of fluids -specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure - measurement of pressure. Pressure gauges, Manometers: Differential and Inverted differential monometers. Classification of orifices and Mouth pieces, Hydraulic coefficients and discharge formal

UNIT-II

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – Stream function and velocity potential functions, flow net analysis

Fluid Dynamics: Euler's and Bernoulli's equations for flow along a stream line for 3-D flow. Momentum equation

UNIT-III

Hydro Static Forces on Surfaces: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems. Definition of Buoyancy forces.

Measurement of Flow: Pitot-tube, Venturi meter and orifice meter, Flow over rectangular, triangular and trapezoidal and stepped notches - Broad crested weir.

UNIT-IV

Boundary Layer flow: Boundary layer theory – Concepts, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation for laminar and turbulent Boundary layers. Boundary layer separation.

Laminar and Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows. Flow between parallel plates

UNIT-V

Closed Conduit Flow: Types of flows – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Variation of friction factor with Reynolds number. Water hammer theory and Estimation of Increased pressure due to water hammer valve closed suddenly and gradually only on rigid pipes.

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som & G.Biswas ,Tata McGraw-Hill publishers Pvt. Ltd.
3. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi
4. Fluid Mechanics inclosing Hydraulic machines by Dr. A. K. Jain, Khanna Publishers, New Delhi

Reference Books:

1. Fluid Mechanics by J.F.Douglas, J.M. Gaserek and J.A. Swaffird (Longman)
2. Fluid Mechanics by Frank.M. White (Tata Mc.Grawhill Pvt. Ltd.)
3. Fluid Mehanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi
4. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi

E-Books links

<https://www.cpp.edu/~pbsiegel/supnotes/nts1321.pdf>

<https://www.smartzworld.com/notes/fluid-mechanics-pdf-notes-fm/>

<https://btechbihar.wordpress.com/made-easy-civil-book-material/>

II Year – I Semester		L	T	P	C
1001202102	STRENGTH OF MATERIALS	3	0	0	3

COURSE OBJECTIVES:

The students will be taught

1. The simple stresses and strains in materials like steel bars, thin and thick cylindrical shells
2. The shear force and bending moment of beams
3. The flexural stresses and shear stresses in beams
4. The deflection in beams by various methods and springs as well
5. Torsion in circular shafts, buckling of columns and struts subjected to axial loading for different boundary conditions

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Calculate internal stresses and strains to know mechanical behaviour of solid material under the externally applied loads and forces	PO-1 PO-2 PO-4	3
CO2	Calculate the shear forces and bending moments for beams	PO-1 PO-2	2
CO3	Determine Flexural and shear stresses in beams and deflections in beams and springs.	PO-1 PO-2	2
CO4	Calculate torsional forces developed in components with circular cross sections and analyses columns and struts subjected to axial loading under various end conditions	PO-1 PO-2 PO-4	2

**Strength of mapping (Intensity Scale) – 1(Lightly mapped), 2(Moderately mapped), 3(Heavily mapped)

UNIT- I

TITLE: SIMPLE STRESSES AND STRAINS; THIN CYLINDRICAL SHELLS

[10 Hours]

TOPICS:

Simple Stresses And Strains: Elasticity and plasticity, Types of stresses and strains, Hooke's law, Stress, Strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic constants(E, C , K) and the relationship among them, Bars of varying section, Composite bars, Temperature stresses.

Thin Cylindrical Shells: Introduction, Hoop and Longitudinal stresses and strains, Change in diameter and volume of thin cylinders, Thin spherical shell stresses.

UNIT-II

TITLE: SHEAR FORCE AND BENDING MOMENT [10 Hours]

TOPICS: Definition of beam, Types of beams, Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, Simply supported and overhanging beams subjected to point loads, Uniformly distributed load, Uniformly varying loads and combination of these

loads, Point of contra flexure, Relation between S.F, B.M and rate of loading at a section of a beam.

UNIT-III

TITLE: Flexural and Shear Stresses in Beams:

[10 Hours]

TOPICS:

Flexural stresses: Definitions –Simple or Pure Bending-Theory of Simple Bending-Assumptions-Neutral Axis-Bending Stress-Bending Stress Distribution-Derivation of Bending Equation: $M/I=F/Y=E/R$ -Determination of Bending Stress-Section Modulus of Rectangular and Circular Sections(Solid and Hollow),I,T, Angle and channel Sections.

Shear Stresses: Derivation of formula-Shear Stress Distribution across various beams sections like Circular, Triangular, I, T, angle Sections

UNIT-IV

TITLE: DEFLECTION OF BEAMS AND SPRINGS [12 Hours]

TOPICS:

Deflections of Beams: Determination of slope and Deflection of (i) Cantilever (ii) Simply Supported subjected to point loads, uniformly distributed load and UVL using (a) Double Integration and (b) Macaulay's Method.

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple (only final expression) – springs in series and parallel – Basic Concept of Carriage or leaf springs.

UNIT-V

TITLE: TORSION AND COLUMN AND STRUTS [12 Hours]

TOPICS:

Torsion: Theory of pure torsion, Derivation of Torsion equations, Assumptions made in the theory of pure torsion, Torsional moment of resistance, Polar section modulus, Power transmitted by shafts.

Columns and Struts: Types of columns, Axially loaded compression members, Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory

Textbooks:

1. Introduction to text book of Strength of materials by R.K.Bansal – Laxmi publications Pvt. Ltd., New Delhi
2. Strength of Materials by S.Ramamrutam, Dhanpat Rai Publishing Company, New Delhi
3. "Mechanics of Materials", by Gere and Timoshenko, 4th Edition, PWS Publishing Company, May 1997
4. Mechanics of Materials by Dr. B. C. Punmia, Firewall Media, New Delhi
5. Mechanics of Materials by Egor P Popov , Pearson Publications

Reference Books:

1. Mechanics of Solid, by Ferdinandp Beer and others – Tata Mc.Grawhill Publications 2000.
2. Strength of Materials by Schaum'sout line series – Mc. Grawhill International Editions.

3. Strength of Materials by S. Ramakrishna and R.Narayan – DhanpatRai publications.
4. “Mechanics of Materials”, by Ferdinand Beer Jr., E. Russell Johnston, John DeWolf, David Mazurek, , 6th edition, McGraw Hill Publishers, 2012.
5. “Fundamentals of Solid Mechanics”, by M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.

E-Books: <http://libgen.rs/book/index.php?md5=A2FF1A30657938BE7B5F56A1286BE367>
<http://libgen.rs/book/index.php?md5=559740B18A447796210A8D375C9501DF>
<http://libgen.rs/book/index.php?md5=A3C4333CDB91CF6BCE0AFE7BDEC62E6D>

NPTEL/MOOC: (Specify Links)

<https://nptel.ac.in/courses/105/105/105105108/>

II Year – I Semester		L	T	P	C
10001202103	BUILDING MATERIALS & CONCRETE TECHNOLOGY	3	0	0	3

COURSE OBJECTIVES:

This course provides an understanding of various engineering properties of building materials like stones, bricks, lime, timber, steel and paints. The objective of this course is to provide basic knowledge about properties and testing of various building materials used in civil constructions

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Describe the properties of Building materials	1	3
		4	3
		7	2
		8	2
CO2	Identify the functional role of ingredients of concrete and apply this knowledge to concrete mix design	1	3
		4	3
		7	2
		8	2
CO3	Explain the characteristics of durability, elasticity, creep and shrinkage of concrete	1	3
		4	3
		7	2
		8	2
CO4	Explain properties of concrete in fresh and hardened states	1	3
		4	3
		7	2
		8	2

Unit - I (Stones, Bricks, Tiles, Wood and Paints)

Stones: Classification of Stones – Properties of stones in structural requirements

Bricks: Composition of good brick earth, Various methods of manufacturing of bricks

Tiles: Characteristics of good tile – Manufacturing methods, Types of tiles

Wood: Structure – Properties – Seasoning of timber – Classification of various types of woods used in buildings – Defects in timber

Paints: White washing and distemping, Constituents of paint – Types of paints – Painting of new and old wood – Varnish

Unit – II (Aggregates, Cement and Admixtures)

Aggregates: Classification of aggregate, Bond, Strength and other mechanical properties of aggregate, Physical properties of aggregate, Deleterious substance in aggregate,

Soundness of aggregate, Thermal properties, Sieve analysis – Fineness modulus – Grading curves.

Portland cement: Chemical composition, Hydration, Setting of cement, Fineness of cement, Tests for physical properties, Admixtures: Mineral and Chemical admixtures

Unit - III (Fresh Concrete) Manufacture of concrete – Mixing and vibration of concrete, Workability – Segregation and bleeding – Factors affecting workability, Effect of time and temperature on workability – Quality of mixing water, Ready mix concrete, Shot Crete

Unit - IV (Hardened Concrete) Water / Cement ratio – Abram’s law, Gel space ratio, Nature of strength of concrete – Maturity concept, Strength in tension and compression – Properties of Hardened Concrete (Elasticity, Creep, Shrinkage, Poisson’s ratio, Water absorption, Permeability, etc.), Relating between compression and tensile strength, Curing

Unit - V (Testing of Hardened Concrete) Factors affecting properties of Hardened concrete, Compression tests, Tension tests, Flexure tests, Non-destructive testing methods – Codal provisions for NDT – Rebound hammer and UPV method

TEXT BOOKS:

1. M. S. Shetty, “Concrete Technology”, 1st edition, S.Chand and Co publications, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition, Charotar Publishing House, 2009.

REFERENCE BOOKS:

1. M. L. Gambhir, “Concrete Technology”, 5th edition, Tata McGraw Hill Publishers, NewDelhi, 2013.
2. A.R. Santha Kumar, “Concrete Technology”, 3rd edition, Oxford University Press, NewDelhi, 2009.

EBOOK LINKS:

<http://libgen.li/item/index.php?md5=646E97959EFD9556766B27B82697F598>
<http://libgen.li/item/index.php?md5=D37A8B2EB4BE2743CE8F1BF3DC5CA96C>
<http://libgen.li/item/index.php?md5=069B1B014B4313243DB470377742F4D7>

NPTEL/ MOOC:

<https://nptel.ac.in/courses/105/102/105102088/>
<https://nptel.ac.in/courses/105/102/105102012/>
<https://nptel.ac.in/courses/105/104/105104030/>

II Year – I Semester		L	T	P	C
100120210	Fluid Mechanics Lab	0	0	3	1.5

Course Overview:

The Fluid Mechanics Laboratory is designed to examine the properties of fluids. The laboratory is equipped to conduct experiments like flow measuring equipment's like flow in orifices, mouth pieces, notches, orifice meters, Venturimeter, verification of Bernoulli's, Friction factor in different diameters of pipes

Course Objectives

The students will be taught

1. The Fundamental properties of fluids and its applications.
2. Principles of Kinematics and Hydro-Dynamics for practical applications
3. The boundary layer, laminar and turbulent flows
4. Basic design of pipes and pipe networks considering flow, pressure and its losses.

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

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Apply the knowledge to determine the Coefficient of discharge of a small orifice and external mouth piece.	Applying	L2 L3	PO1 PO2 PO4
CO2	Apply knowledge to prove the Bernoulli's equation.	Applying	L2 L3	PO1 PO2 PO4
CO3	Apply knowledge to determination of the coefficient of loss of head in a sudden contraction and also friction factor	Applying	L2 L3	PO1 PO2 PO4
CO4	Apply knowledge to determination the Coefficient of discharge of Venturimeter. Orifice meter, Rectangular Notch & Triangular Notch,	Applying	L2 L3	PO1 PO2 PO4

List Of Experiments

1. Determination of Coefficient of discharge for a small orifice by a constant and variable head method.
2. Determination of Coefficient of discharge for an external mouth piece by constant and variable head method.
3. Identification of laminar and turbulent
4. Verification of Bernoulli's equation.
5. Verification of continuity equation
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor
7. Identification of total energy line and hydraulic gradient line
8. Calibration of Venturimeter
9. Calibration of Orifice meter
10. Calibration of contracted Rectangular Notch and /or Triangular Notch

List of Equipment:

1. Small orifice
2. Mouth piece
3. Rectangular notch
4. Triangular notch
5. Bernoulli's apparatus
6. Venturi meter
7. Orifice meter
8. Nozzle Meter
9. Open channel apparatus
10. Pipe friction apparatus

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som&G.Biswas ,Tata McGraw-Hill publishers Pvt. Ltd.
3. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi
4. Fluid Mechanics inclosing Hydraulic machines by Dr. A. K. Jain, Khanna Publishers, New Delhi

Reference Books:

1. Fluid Mechanics by J.F.Douglas, J.M. Gaserek and J.A.Swaffird (Longman)
2. Fluid Mechanics by Frank.M. White (Tata Mc.Grawhill Pvt. Ltd.)
3. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi
4. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi

II Year – I Semester		L	T	P	C
100120211	STRENGTH OF MATERIALS LAB	0	0	3	1.5

COURSE OBJECTIVES:

The students will be explained

1. The tension test on steel bar
2. The bending test on cantilever and simply supported beam
3. The Torsion test, spring test, compression test on wood or concrete
4. The impact test and shear test
5. The deflection test on beams include cantilever, simply supported and continuous beam

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Determine the tensile force and shear force on steel bar	PO1, PO2, PO3, PO4	3,2,2,1
CO2	Determine the bending stress on cantilever and simply supported beams	PO1, PO2, PO3, PO4	3,2,2,0
CO3	Determine the deflection on cantilever, simply supported and continuous beams	PO1, PO2, PO3, PO4	3,2,2,0
CO4	Determine the Torsion, deflection in spring, compression force on wood or concrete	PO1, PO2, PO3, PO4	3,2,2,0

LIST OF EXPERIMENTS

S.No.	Name of the experiment	Skill
1	Tension test on Steel bar	Ability to operate UTM, use vernier callipers
2	Bending test on (Steel / Wood) Cantilever beam.	Ability to check deflection using dial-guage
3	Bending test on simple support beam.	Ability to check deflection using dial-guage
4	Torsion test	Ability to check angle of twist in torsion machine
5	Hardness test	Ability to use Vickers hardness apparatus
6	Spring test	Ability to find the stiffness of spring
7	Compression test on wood or concrete	Ability to use CTM and check characteristic strength
8	Impact test	Ability to make Izod specimens and check for impact strength
9	Shear test	Ability to check shear in different planes
10	Verification of Maxwell's Reciprocal theorem on beams.	Ability to numerically examine when two forces are acted on a body
11	Use of Electrical resistance strain gauges	Ability to connect strain gauges and check deflection
12	Continuous beam – deflection test.	Check deflection

List of Equipment:

1. UTM for conducting tension test on rods
2. Steel beam for flexure test
3. Wooden beam for flexure test
4. Torsion testing machine
5. Brinnell's / Rock well's hardness testing machine
6. Setup for spring tests
7. Compression testing machine
8. Izod Impact machine
9. Shear testing machine
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup
12. Electrical Resistance gauges

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Textbooks:

1. Strength of materials Laboratory manual by Keerthi Kumar and Saranya
2. Strength of Materials Lab Manual by Anand Jayakumar A

Reference Books:

https://mrcet.com/downloads/digital_notes/ME/II%20year/strenght%20of%20materials%20lab%20R18A0383.pdf

<https://youtu.be/qPIug2sewFA>

I Year – I Semester		L	T	P	C
100120212	CONCRETE TECHNOLOGY LAB	0	0	3	1.5

COURSE OBJECTIVES:

During the completion of course the students will be explained

- The normal consistency, fineness, Initial setting, final setting time, specific gravity and soundness of cement tests
- The grading, fineness modulus, specific gravity of coarse aggregate tests
- The grading, fineness modulus of fine aggregate and bulking of sand tests
- The workability, compressive strength young's modulus and split tensile strength of concrete tests

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Determine the normal consistency, fineness, Initial setting, final setting time, specific gravity and soundness of cement.	1 4 5 7 8 9 12	3 3 3 2 2 2 2
CO2	Determine the grading, fineness modulus, specific gravity of coarse aggregate	1 4 5 7 8 9 12	3 3 3 2 2 2 2
CO3	Determine the grading, fineness modulus of fine aggregate and bulking of sand.	1 4 5 7 8 9 12	3 3 3 2 2 2 2
CO4	Determine the workability, compressive strength young's modulus and split tensile strength of concrete.	1 4 5 7 8 9 12	3 3 3 2 2 2 2

LIST OF EXPERIMENTS

S.No.	Name of the experiment	Skill
1	Determination of (a) Normal consistency of cement (b) Fineness of cement using microns IS sieve.	Identify consistency and fineness of cement
2	Determination of (a) Specific gravity of cement (b) soundness of cement.	Identify specific gravity and soundness of cement
3	Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.	Calculate fineness modulus of fine aggregate
4	Determination of Initial setting and final setting time of cement.	Identify setting time of cement
5	Determination of workability of concrete by slump test.	Identify workability of concrete
6	Determination of compressive strength of cement concrete and its young's modulus.	Calculate compressive strength of concrete
7	Determination of bulking of sand.	Calculate bulking of sand
8	Determination of specific gravity of fine aggregate and coarse aggregate.	Calculate specific gravity of fine and coarse aggregates.
9	Determination of workability of concrete by Vee-bee test.	Identify workability of concrete
10	Determination of grading and fineness modulus of Coarse aggregate by sieve analysis.	Calculate fineness modulus of coarse aggregate
11	Determination of workability of concrete by compaction factor method.	Identify workability of concrete
12	Determination of split tensile strength of concrete.	Calculate tensile strength of concrete
13	Non-Destructive testing on concrete (for demonstration).	Identify Non-destructive test on concrete

List of Equipment:

1. Standard set of sieves for coarse aggregate and fine aggregate.
2. Vicat's apparatus.
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus.
6. Compaction Factor Test Apparatus.
7. UTM machine

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

TEXT BOOKS:

1. M. S. Shetty, "Concrete Technology", 1st edition, S.Chand and Co publications, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, 2009.

REFERENCE BOOKS:

1. M. L. Gambhir, "Concrete Technology", 5th edition, Tata McGraw Hill Publishers, New Delhi, 2013.
2. A.R. Santha Kumar, "Concrete Technology", 3rd edition, Oxford University Press, New Delhi, 2009.

Open elective	Digital Electronics	L	T	P	C
1002202140		3	0	0	3

COURSE OBJECTIVES:

- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Describe the binary arithmetic and apply to generate various codes	1	3
		2	2
		5	1
		12	1
CO2	Use the concept of Boolean algebra in minimization of logic functions	1	2
		2	2
		3	1
		9	1
CO3	Design different types of combinational logic circuits	12	1
		1	3
		2	2
		3	3
CO4	The operation and design methodology for synchronous sequential circuits and algorithmic state machines.	5	1
		1	3
		2	2
		3	3
		5	1
		12	1

UNIT- I

Introduction to digital logic circuits

[10 Hours]

Representation of Signed numbers, Binary Arithmetic, r's complement, r-1's complement (binary, BCD), ASCII code, Excess -3 code, Gray code, Error detection and correction – Hamming Code, Logic gates 7400-NAND, 7402-NOR, 7404-NOT, 7408-AND, 7432-OR, 7486-EX-OR, 74266-EX-NOR, two-level implementation-AOI, OAI, NAND, NOR implementations.

UNIT- II

Boolean Algebra & Minimization

[10 Hours]

Boolean laws and theorems, min-terms and max-terms, standard sum-of-products and standard product-of-sum representations, minimization of switching functions using Boolean theorem, Karnaugh map, don't-care conditions, prime implicants, minimization of switching functions using K-Map up to 5 variables, tabular method (Quine-McCluskey Minimization Technique).

UNIT- III

Combinational Circuits

[10 Hours]

Design of Half adder, full adder, half subtractor, full subtractor, 4 bit Binary Adder - Subtractor, BCD Adder, comparator-7485, decoders-74138, Priority encoders-74148, multiplexers-74151, demultiplexers-74155. Implementation of higher order circuits using lower order circuits, Realization of Boolean functions using decoders and multiplexers

UNIT- IV

Sequential Circuits-I

[12 Hours]

Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, truth tables and excitation tables with reset and clear terminals, Master-slave flip flops, Edge-triggered flip-flops, Conversion from one flip-flop to another type flip-flop.

Study the following relevant ICs and their relevant functions:

D flip-flop-7474, D latch-7475, JK flip flop-7476

UNIT- V

Sequential Circuits-II

[12 Hours]

Registers, Shift registers, Universal Shift register, Ring counter, Johnson counter, asynchronous counters, synchronous counters, Up-Down counter.

Mealy and Moore machines, conversion of Mealy to Moore model and vice-versa, sequence detector.

Study the following relevant ICs and their relevant functions:

Shift register-7495, Decade counter-7490, 4 bit counter 7493, Universal Shift Register-74194.

Text Books:

1. Switching and Finite Automata Theory, Z. Kohavi, Tata McGraw Hill, 2nd Edition, 2009
2. Digital Design, M. Morris Mano and Michael D. Ciletti, 4th Edition, Pearson Education, 2013.

Reference Books:

1. Switching Theory and Logic Design by A. AnandKumar, PHI Learning pvtltd, 2016.
2. Fundamentals of Logic Design, Charles H Roth (Jr), Larry L. Kinney, Cengage Learning India Edition, 5th Edition, 2010.

Course Code		L	T	P	C
1003202140	BASIC ELEMENTS OF MECHANICAL ENGINEERING FOR CIVIL ENGINEERS	3	0	0	3

UNIT I:

Introduction to engineering materials:

Properties - Metals & Heat treatment of metals – Annealing, Normalizing, Hardening and Tempering- Composite Materials.

UNIT II:

Manufacturing Processes:

Casting: Types, equipment, applications.

Welding: Types – Equipment –Techniques employed –welding positions-defects-applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

UNIT III:

Transmission systems: Belts –Ropes and chain: belt and rope drives, velocity ratio, slip, length of belt, open belt and cross belt drives.

Gear trains: classification of gears, gear trains velocity ratio, simple, compound gear trains.

UNIT IV:

INTERNAL COMBUSTION ENGINES: Classification, Main Components, 2-Stroke and 4-Stroke Petrol Engine, 2-Stroke and 4-Stroke Diesel Engines, Differences between Petrol and Diesel Engines.

REFRIGERATION & AIR CONDITIONING: Refrigeration, Refrigerants and their Desirable Properties, Methods of Refrigeration, Requirements of Comfort Air conditioning, Window Air Conditioner

UNIT V:

EARTH MOVING & EXCAVATING EQUIPMENT: Tractors, Bulldozer, Dump Trucks, Scraper (element/component description, advantages, disadvantages, applications).

MATERIAL HANDLING EQUIPMENT: Introduction, Principles of Material Handling, Conveyors-Belt Conveyors, Roller Conveyors, Chain Conveyors and Screw Conveyors.

TEXT BOOKS:

1. Elements of Mechanical Engineering – Mathur, Mehta & Tiwari- Jain Publications
2. Elements of Mechanical Engineering – S.K. Hajra Chowdary

Course Code		L	T	P	C
1005201203	Data Structures	3	0	0	3

COURSE OBJECTIVES:

1. Basics of data structures including their fundamentals building blocks: arrays and linked list.
2. To solve problems using linear data structures such as linear lists, stacks, queues.
3. To solve problems using searching and sorting techniques.
4. To be familiar with non-linear data structures such as trees.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Apply the C language Concepts: Pointers, Structures, Unions and recursion to solve the problems	PO1 PO2 PO3 PO11	2 2 3 1
CO2	Implement Standard Data Structures like Stack, Queue, List, Trees and Graphs	PO1 PO2 PO3 PO11	2 2 3 2
CO3	Choose appropriate data structure while building new application	PO1 PO2 PO3 PO5	2 2 3 3
CO4	Explain the need for data structuring techniques	PO1 PO2	3 3

UNIT- I

ARRAYS AND LINKED LISTS

The Abstract Data Type (ADT), Dynamic allocation of Arrays, Representation of multidimensional Arrays.

Single Linked List, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Sparse Matrices, Sparse Matrix Representation, Doubly Linked Lists. **[8 Hours]**

UNIT-II

STACKS AND QUEUES

The Stack, Stacks using Dynamic Arrays, Recursion, Linked Stacks, The Queue, Linked Queues, Circular Queues using Dynamic Arrays, De-queue. Application of stacks and queues, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix, Towers Of Hanoi Problem. **[8 Hours]**

UNIT-III

SEARCHING AND SORTING

Searching: Linear Search, Binary Search.

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort [8 Hours]

UNIT-IV

TREES:

Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversals: Inorder Traversal, Preorder Traversal, Postorder Traversal, Binary Search Trees: Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree

[10 Hours]

UNIT-V

GRAPHS:

The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation- Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees- Kruskal's Algorithm, Prim's Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination, All-Pairs Shortest Path.

[10 Hours]

Text Books:

1. Fundamentals of Data Structures in C, Ellis Horowitz, S.Sahni, Andrews Freed, University Press (India). Second Edition.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

Reference Books:

1. Classic Data Structures, Debasis Samanta, PHI. (Second Edition)
2. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition

E-Books:

1. <https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf>
2. <https://vardhaman.org/wp-content/uploads/2018/12/Data%20Structures.pdf>
3. <https://www.ncertbooks.guru/data-structures/>

NPTEL/MOOC:

<https://nptel.ac.in/courses/106/102/106102064/>

I Year – II Semester	Skill Oriented Course - I	L	T	P	C
100120280	CAD detailing of Civil Structures	0	0	4	2

Prerequisites:

Basic knowledge in Building materials and construction, reinforced concrete structures and engineering drawing.

COURSE OBJECTIVES:

1. To be able to draw plans as per by-laws and standards on CAD.
2. To be able to interpret design data to graphical representation.
3. To be able to read and draw CAD drawing w.r.t. electrical detail
4. To be able to give structural drawing of concrete structures following design standards.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	To analyze the structural design in order to prepared the drawing	1,3,5	
CO2	To analyze the surveyed field data to prepare layout drawings	1,3,5	
CO3	To create building plans as per local by-laws	1,3,5	
CO4	To interpret electrical and plumbing requirements to be able to draw in CAD	1,3,5,11	

Detailed Syllabus

S.No	Practical	Theory	Skill
1	AutoCAD Basic engineering drawing, Isometric & Orthographical drawings	Earth work	Drafting and drawing in computer
2	Introduction to RCC detailing	RCC	Industry standard detailing techniques
3	Preparation of Housing plans, sections & Elevations	Shuttering	Basic building planning as per by laws
4	Preparation of layouts & Plots	Scaffolding	Basic layout planning as per by laws
5	Advance editing, dimensional, and 2D drafting applications	Masonry work	Preparation of 2D drawings
6	Preparation of foundation drawings	Plastering	Preparation of sub structure 2d drawings

7	Integration of survey data into AutoCAD	Flooring	Syncing total station data to auto cad
8	Creating a general notes and guidelines for painting, flooring, Plastering and related activities	Painting	Estimation of paint required
9	Creating & Inserting the standard components likes doors & windows	Doors & Windows	Creating blocks in CAD
10	Awareness on plumbing related MEP information	Plumbing Works	Reading plumbing drawings
11	Awareness on electrical related MEP information	Electrical Works	Reading electrical drawings

Text Books:

Reference Books:

II Year – I Semester	Audit Course	L	T	P	C
1000202120	Life Skills	2	0	0	0

COURSE OBJECTIVE:

The students will be able to build self-confidence, encourage critical thinking, foster independence and help people to communicate more effectively.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Build Self Confidence and Interpersonal and Intrapersonal relationships.	PO12 PO10 PO9	3 3 3
CO2	Practice Emotional Competency while communicating with others	PO12 PO10 PO9	3 3 3
CO3	Gain Intellectual Competency by practicing ethics and morals	PO12 PO10 PO8	3 3 3

UNIT1: LIFE SKILLS: Positive Attitude and Positive Work Ethics, Time Management, Goal Setting: Short term, Long Term. (Activity has to be conducted)

UNIT2: EMOTIONAL INTELLIGENCE: Self Awareness through Johari Window and SWOT analysis (Activity has to be conducted)

UNIT3: PROBLEM SOLVING SKILLS: Critical Thinking and Brain Storming, Creative Thinking, Conflict Management. (Activity has to be conducted)

UNIT4: PUBLIC SPEAKING: Body Language, presentation skills, impromptu presentation, interviewing others. (Activity has to be conducted)

UNIT 5: NPTEL Course/ Coursera /Any relevant Certificate Course has to be done

Assessment: In order to clear internal assessment, the student has to submit Project Report and give Presentation on all the activities he/she has done during the course. The student has to do a certificate course also. (Presentation, Project Report and Certificate in total will be the criteria for the assessment)

References:

- Barun K. Mitra; (2011), “Personality Development & Soft Skills”, First Edition; Oxford Publishers.
- Kalyana; (2015) “Soft Skill for Managers”; First Edition; Wiley Publishing Ltd.
- Larry James (2016); “The First Book of Life Skills”; First Edition; Embassy Books.
- Shalini Verma (2014); “Development of Life Skills and Professional Practice”; First Edition; Sultan Chand (G/L) & Company
- John C. Maxwell (2014); “The 5 Levels of Leadership”, Centre Street, A division of Hachette Book Group Inc.