AICTE MODEL CURRICULUM

Name of the Programme (UG): B.E.

Syllabus for III – Semester and IV – Semester

(With effect from the academic year 2019-20)

DEPARTMENT OF CIVIL ENGINEERING

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A),

HYD-75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
CIVIL ENGINEERING

SEMESTER – III

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
	THEORY								
1	18MT C05	Mathematics -III	3	1	-	3	30	70	4
2	18CE C02	Building Construction Practice	3	-	-	3	30	70	3
3	18CE C03	Solid Mechanics	3	1	-	3	30	70	4
4	18CE C04	Surveying and Geomatics	3	1	-	3	30	70	4
5	18CE C05	Fluid mechanics	3	-	-	3	30	70	3
6	18EG M01	Indian Constitution	2	-	-	2	-	50	Non-Credit
7	18EE A01	Indian Traditional Knowledge	2	-	-	2	-	50	Non-Credit
	PRACTICALS								
8	18CE C06	Surveying and Geomatics Lab	-	-	3	3	15	35	1
9	18CE C07	Fluid Mechanics Lab	-	-	3	3	15	35	1
		Total	**19**	**03**	**06**		**180**	**420**	**20**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18MT C05

MATHEMATICS - III

Instruction	4 (3L+1T) Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: To enable the student

1. To form PDE and to find its solution.
2. To solve wave and heat equations.
3. To learn the Laplace and Inverse Laplace transforms for solving engineering problems.
4. To learn Fourier transform and Z-transforms for solving engineering problems.
5. Learning the basic concepts of probability and Statistical Analysis.

Course outcomes: On successful completion of this course the students shall be able to

1. Solve Linear and Non-Linear PDE's.
2. Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation.
3. Find Laplace transform and inverse Laplace transform and can solve Linear Differential equations.
4. Find the solutions of various Transforms.
5. Find moments of discrete and continuous random variables as well as familiar with distribution.

UNIT-I:

Partial Differential Equations: Formation of Partial Differential Equations, Solution of First Order Linear Partial Differential Equations by Lagrange's Method, Solution of First Order Non-linear Partial Differential Equation by Standard types and Charpits Method.

UNIT-II:

Applications of Partial Differential Equation: Solution by Method of Separation of Variables, Solution of One dimensional Wave equation, One dimensional Heat equation, Two dimensional Laplace equation and its related problems.

UNIT-III:

Laplace Transform: Laplace Transform of standard functions, Linearity property, change of scale property. Shifting theorems, Laplace Transform of Periodic

Function, Unit step function and Unit impulse function. Transforms of derivatives, Transforms of integrals, Multiplication by t^n and division by t. Inverse Laplace Transform properties, Inverse Laplace Transform by partial fractions and Convolution theorem, Applications of Laplace Transform (Solution of Linear Differential Equations).

UNIT-IV:

Fourier Transforms and Z-Transforms: Fourier Transforms: Fourier integral theorem (statement), Complex form of Fourier integrals. Fourier transforms, Inverse Fourier Transforms, Fourier Sine and Cosine transforms, Inverse Fourier Sine and Cosine Transforms. Properties of Fourier transforms: Linear property, change of scale property, shifting property and Modulation theorem.

Z-Transforms: Z-transforms of standard functions, linearity property, damping rule, shifting theorems, multiplication by 'n', initial and final value theorems. Inverse Z-Transform: Inverse Z-transform by Convolution theorem, partial fractions. Z-transform application to difference equations.

UNIT-V:

Basic Statistics: Random variable, Discrete probability distribution and continuous probability distribution. Expectation, Addition theorem and Multiplication theorem of expectation, properties of variance, Poisson distribution (Mean, variance, MGF& CGF), Normal distribution (Mean, variance, MGF& CGF), Properties of Normal distribution, Areas of under normal curve. Correlation and regression.

Text Books:

1. Erwin kreyszig, "*Advanced Engineering Mathematics*", 9th Edition, John Wiley & Sons, 2006.
2. B.S. Grewal, "*Higher Engineering Mathematics*", Khanna Publishers, 35th Edition, 2000.
3. S.C.Gupta, V.K.Kappoor, "*Fundamentals of Mathematical Statistics*", Sultan Chand and Sons, 2014.

Suggested Reading:

1. S. J. Farlow, "*Partial Differential Equations for Scientists and Engineers*", Dover Publications, 1993.
2. Ian Snedon, "*Elements of Partial Differential equations*", McGraw Hill, 1964.

18CE C02

BUILDING CONSTRUCTION PRACTICE

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student

1. To study about the basic building materials, properties and their applications.
2. To study about smart and Eco-friendly building materials.
3. To understand different types of masonries and their applications
4. To acquire concepts in building planning and to draw, plan, section, elevation of buildings with a flat /sloped roof.
5. To understand the concepts of framed RCC Structures, Roof trusses and formwork.

Course outcomes: At the end of the course the student is able

1. To identify various building materials and select suitable type for given situation.
2. To know different types of masonry, types of bonds used in construction of walls of buildings.
3. To know the different types of roofs, stair used in building works.
4. To plan suitable types of building and to prepare plan, section and elevation of building with flat / sloped roof.
5. To know the various components of RCC framed structure, RCC Structures, Roof trusses and formwork.

UNIT-I:

Traditional Building Materials: Properties, Types, Applications and testing of traditional building materials - Stone, Timber, Brick, Cement, Fly Ash, Sand, Coarse Aggregates, Mortar, Concrete and Steel.

Emerging Building Materials: Smart and Eco-Friendly materials - Sustainable materials - Recycled materials.

UNIT-II:

Concepts of Building Planning: Types of Buildings, Functional needs and differences in their planning requirements - Introduction to building byelaws - Provisions of National Building code - Conventional Representation of building materials and elements in plans and sections - Representations of electrical and plumbing services.

Drawing of plans, sections and elevations and sections of a single storey 1, 2 and 3- bed room residential buildings in AUTOCAD.

UNIT-III:

Sub-structure Construction: Introduction, Site clearance-Marking, Earthwork, and Foundations - Function of Foundations, Essential requirements of good foundations, Types of foundations- Open Foundations or Shallow Foundations, Raft Foundations, Deep Foundations, Well Foundations, Coffer Dams. General procedure in foundation design.

UNIT-IV:

Masonry Construction: Introduction, **Stone Masonry**: Elevation, sectional plans and cross sections of walls of Ashlar, CRS I and II sort and RR stone masonry
Brick Masonry: Plan and isometric view of external main wall junctions, Stretcher Bond, Header Bond; English Bond& Flemish Bond – for half brick, one & one and a half brick wall.
Composite Masonry: Stone Composite Masonry, Brick Stone Composite Masonry, Cement Concrete Masonry, Hollow Clay tile Masonry, Reinforced Brick Masonry.

UNIT-V:

Super-structure Construction: Reinforced Concrete Framed structure – Introductory concepts, Types of roofs, beams, columns, and stairs.
Different types of roof trusses. Formwork –Shuttering for Beams, Columns, slabs and stairs.

Text Books:

1. S.P. Arora & S. P. Bindra, "*A text book of Building Construction*", Dhanpat Rai Publications, 2010.
2. B.C Punmia, Ashok Kumar Jain &Arun Kumar Jain "*Building Construction*", Laxmi Publications (P) LTD, 2016.

Suggested Reading:

1. P.C. Varghese, "*Building construction*" PHI, 2016.
2. CBRI Roorkee, "*Advances in Building Materials and construction*".
3. Sushil Kumar, "*Building Construction*", Standard Publishers, 1992.
4. National Building Code of India, 2006.

18CE C03

SOLID MECHANICS

Instruction	4(3L+1T) Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: To enable the student

1. Understand the stress - strain behaviour of different materials and temperature stresses, statically indeterminate problems in compression and tension.
2. Analyze the statically determinate beams and sketch shear force and bending moment diagrams,
3. Comprehend compound stresses, direct and bending stresses in beams.
4. Analyze thin and thick cylinders for fluid pressure and /or shrink fit pressures.

Course Outcomes: At the end of the course the students are able to

1. Evaluate the strength of various Civil Engineering materials, against structural actions such as compression, tension, shear and bending.
2. To analyze statically determinate beams and sketch SFD and BMD.
3. To suggest suitable material and sections from among the available, for use in Civil Engineering context.
4. To evaluate the behaviour and strength of Civil Engineering materials under the action of compound stresses and thus understand failure concepts.
5. To design thin and thick cylinders for resisting internal and external pressures.

UNIT-I:

Simple Stresses and Strains: Various types of stresses and strains. Hooke's law, Modulus of Elasticity, Stress-Strain curve for ductile & brittle materials, Working stress and factor of safety. Deformation of bars of uniform, varying and tapering sections under axial loads, Elongation of bars due to self weight, Bars of uniform strength, Compound bars and temperature stresses. Statically indeterminate problems in tension and compression.
Elastic Constants: Poisson's ratio, volumetric strain and derivation of relationship between elastic constants.

UNIT-II:

Shear force and Bending moment: Different types of beams and loads, Shear force and bending moment diagrams for cantilever, and simply supported beams with and without over hangs subjected to different kinds of loads viz, point loads, uniformly distributed loads, uniformly varying loads and couples- Relation between loading, shear force and bending moments.

UNIT-III:

Bending stresses in Beams: Assumptions in theory of simple bending- Derivation of bending equation, Moment of resistance -Calculation of stresses in statically determinate beams for different loads and different types of structural sections.

Shear stresses in Beams: Equation of shear stress, shear stress distribution across rectangular, circular, triangular, I, T, and diamond sections.

UNIT-IV:

Direct and bending stresses: Basic concept, Eccentric loading, limit of eccentricity - core of sections-rectangular, circular, solid and hollow sections.

Compound Stresses and Strains: Stresses on oblique planes, principal plane and principal stresses. Ellipse of stress and Mohr's circle of stress.

UNIT-V:

Thin cylinders: Thin cylinders subjected to internal fluid pressure, volumetric change, Wire winding of thin cylinders.

Thick cylinders: Lame's equations, stresses under internal and external fluid pressures. Compound cylinders-shrink fit pressure.

Text Books:

1. B. C. Punmia," *Mechanics of Materials*", Laxmi publishers, Delhi, 2017.
2. S. Ramamrutham, "*Strength of Materials*", Dhanpat Rai & Sons, Delhi, 2014.

Suggested Reading:

1. S.B. Junnarkar, "*Mechanics of structures (Vol-I &Vol-II)"*, Charotar Publishing house, 2016.
2. D.S. Prakash Rao, "*Strength of Materials-A Practical Approach*", Universities Press, 1999.
3. E.P. Popov, "*Engineering Mechanics of solids*", Pearson, 2015.
4. G.H. Ryder, "*Strength of Materials*", 3rd Edition in SI units, Macmillan India Ltd, 1969.
5. A. Pytel and F.L. Singer, "*Strength of Materials*", Harper & Row, 4 Edition, New York, 1999.

18CE C04

SURVEYING AND GEOMATICS

Instruction	4(3L+1T) Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: To enable the student to

1. Understand the basics of Surveying
2. Know and read the topo sheets.
3. Use the topo sheets for taking appropriate decisions.
4. Expose to various Surveying instruments.
5. Develop the maps required for various applications accurately.

Course Outcomes: At the end of the course the student is able to

1. Know the estimation of various parameters required for execution of a project.
2. Be in a position to choose appropriate instruments for carrying Surveying.
3. Can identify the data required for preparation of topo sheets.
4. Acquiring the data accurately and quickly with proper checks.
5. Knows the way of transferring data from topo sheets to ground and vice versa.

UNIT-I:

Introduction to Surveying *:* Principles and objectives of surveying, Linear, angular and graphical methods, concept of Survey stations, Survey lines- ranging, brief introduction to offsets-types and uses; Bearing of survey lines using prismatic compass, concepts of whole circle bearing system and quadrantal bearing system.

Levelling: principles, terms used in levelling, bench marks and types, booking and reduction of levels, types of levelling; contouring: Contours- definition, contour interval, characteristics, methods of contouring and interpolation and uses of contours, estimation of areas and volumes using Trapezoidal and Simpson's method.

Plane table surveying: concepts, methods of plane table surveying.

Triangulation and Trilateration: Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Trigonometric levelling - Axis signal correction.

UNIT - II:

Curves: Elements of simple and compound curves – Method of setting out, Elements of Reverse curve, Transition curve – length of curve – Elements of

transition curve, Vertical curves-types, setting out of vertical curves-tangent correction method and chord gradient method.

UNIT - III:

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Diatomite, Total station-Parts of a Total Station – Accessories, Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey-concepts of consecutive coordinates- Total coordinates-balancing of traverse-Plotting of traverse.

Global Positioning: Systems- Segments, GPS measurements, errors and biases, surveying with GPS, Co-ordinate transformation, accuracy considerations.

UNIT - IV:

Photogrammetric Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial Photogrammetric, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

UNIT - V:

Remote Sensing: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.

Visual image interpretation: introduction, fundamentals of visual image elements, image interpretation strategies and keys, wavelength of sensing, temporal aspects of image interpretation. Introduction to types of digital image processing.

Text Books:

1. Subramanian,"
2. *Surveying and Levelling*", Oxford Higher Education, 2012.
3. K. R. Arora, "*Surveying, Vol-I, II and III*", Standard Book House, 2015.
4. GopiSatheesh and R.Sathikumar, "*Advanced Surveying: Total Station, GIS and Remote Sensing*", Pearson India, 2006.

Suggested Reading:

1. K. Manoj K. Arora and R. C. Badjatia," *Geomatics Engineering*", Nem Chand & Bros, 2011
2. A. M. Chandra, "*Higher Surveying"*, Third Edition, New Age International (P) Limited, 2002.
3. M. Anji Reddy, "*Remote sensing and Geographical information system*", B.S. Publications, 2001.

18CE C05

FLUID MECHANICS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objective of this course is

1. To introduce the concepts of fluid mechanics and fluid properties useful in Civil Engineering applications.
2. To understand fluid pressure and forces, pressure measuring devices and stability of floating bodies.
3. To understand the fluid motion, energy equation, analyze the forces on various objects.
4. To know various measuring instruments in finding the fluid velocity, and discharge in pipe and channel flow. To understand dimensional analysis, model and prototype and models applied to practical applications.
5. To understand and analyze different flow characteristics of laminar and turbulent flow.

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

1. Apply fluid flow concepts and evaluate the various properties of fluid.
2. Use of pressure gauges, design hydraulic gates.
3. Apply the continuity, momentum and energy principles in hydraulic applications.
4. Measure velocity and Discharge of fluid flow in pipes, channels, and tanks. Apply model studies to practical applications.
5. Quantify losses and design pipes

UNIT – I:

Basic Concepts and Fluid properties: Distinction between a fluid and a solid, conservation principles applied in fluid mechanics, ideal fluid, real fluid, fluid continuum, density, specific weight, specific gravity, dynamic viscosity, kinematic viscosity, variation of viscosity with temperature, Newton law of viscosity; vapour pressure, surface tension, cohesion, adhesion, capillarity, bulk modulus of elasticity and introduction to compressible fluids.

UNIT – II:

Fluid Statics: Fluid pressure-pressure at a point, Pascal's law, pressure variation, absolute and gauge pressure, piezometer, u-tube manometer, single column

manometer, u-tube differential manometer, inverted u-tube differential manometer, pressure gauges-bourdon's pressure gauge, hydrostatic pressure and force-horizontal, vertical, inclined and curved surfaces. Buoyancy, metacentre, metacentric height and stability of floating bodies.

UNIT – III:

Fluid Kinematics: Classification of fluid flow-steady and unsteady flow; uniform and non-uniform flow, laminar and turbulent flow, rotational and irrotational flow, compressible and incompressible flow, one, two and three dimensional flows, stream line, path line, streak line and stream tube, stream function, velocity potential function, flow net, three -dimensional continuity equations in Cartesian coordinates.

Fluid Dynamics: Forces causing motion, equations of motion - Euler's equation, Bernoulli's equation-derivation, momentum principle, forces exerted by fluid flow on pipe bend, impact of jets-force exerted by a liquid jet on a stationary, moving flat plate and curved vanes.

UNIT – IV:

Measurement of Velocity and Discharge: Pitot tube, and current meter, measurement of discharge in pipes and tanks: venturimeter, orifice meter, flow through mouthpiece and orifice. Measure discharge in free surface flows: notches and weirs.

Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity, Rayleigh method, Buckingham's p-Theorem method, dimensionless groups, dimensionless numbers, similitude, model studies, types of models, scale effect in models, application of Reynold's and Froude's model laws.

UNIT – V:

Flow through Pipes: Loss of head through pipes, major loss-Darcy's Weisbach equation, minor losses, total energy equation, hydraulic gradient line, pipes in series, equivalent pipes, pipes in parallel, power transmission through pipes, water hammer in pipes and control measures.

Text Book:

1. P. N. Modi and S. M. Seth, "*Hydraulic and Fluid Mechanics*", Standard Book House, Delhi, 2013.
2. Victor Streeter and E. Benjamin Wylie, "*Fluid Mechanics*", Mc-Graw Hill, Newyork, 2017

Suggested Reading:

1. K.L. Kumar, "*Engineering Fluid Mechanics"*, S. Chand, , Delhi, 2010.
2. Frank M. White, "*Fluid Mechanics*", Mc-Graw Hill, Newyork, 2011.
3. Yunus A. Cengel& John M. Cimbla, "*Fluid Mechanics Fundamentals and Applications*", Tata Mc Graw Hill Education private Ltd, 2012.

18EG M01

INDIAN CONSTITUTION

Instruction	2L Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: The course will introduce the students to

1. The history of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes: After successful completion of the course the students will be able to

1. Understand the making of the Indian Constitution and its features.
2. Have an insight into various Organs of Governance - composition and functions.
3. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
4. Be aware of the Emergency Provisions in India.
5. Understand the Right To equality, the Right To freedom and the Right To Liberty.

Unit-I:

Constitution of India: Introduction and salient features .Constitutional history. Directive Principles of State Policy - Its importance and implementation.

Unit -II:

Union Government and its Administration: Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.

Parliamentary form of government in India. President: role, power and position.

Unit- III:

Emergency Provisions in India: National emergency, President rule, Financial emergency

Unit- IV:

Local Self Government: District's Administration Head: Role and Importance. Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

Panchayati Raj: Introduction, ZillaPanchayat, Elected officials and their roles, CEO ZillaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and officials.

Unit- V:

Scheme Of The Fundamental Rights and Duties: Fundamental Duties - the legal status.

Scheme of the Fundamental Rights - To Equality, to certain Freedom under Article 19, to Life and Personal Liberty under Article 21.

Suggested Reading:

1. **"***The Constitution of India***"**, 1950 (Bare Act), Government Publication.
2. S. N. Busi S. N., Ambedkar B. R, "*Framing of Indian Constitution***"**, 1st Edition,2015.
3. Jain M. P., "*Indian Constitution Law"*, 7th Edn., Lexis Nexis,2014.
4. Basu D. D**, "***Introduction to the Constitution of India"*, Lexis Nexis,2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

18EE A01

INDIAN TRADITONAL KNOWLEDGE

Instruction	2L Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: To enable the student

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: After completion of this course, students will be able to:

1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

UNIT-I:

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT-II:

Indian Languages, Culture and Literature:

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT-III:

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT-IV:

Fine arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science

and Technology in India, development of science in ancient, medieval and modern India

UNIT-V:

Education system in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Text Books:

1. KapilKapoor, "*Text and Interpretation: The India Tradition*", ISBN: 81246033375, 2005
2. "*Science in Samskrit*", Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007
3. Narain S., "*Examinations in ancient India*", Arya Book Depot, 1993
4. Satya Prakash, "*Founders of Sciences in Ancient India*", Vijay Kumar Publisher, 1989
5. M. Hiriyanna, "*Essentials of Indian Philosophy*", MotilalBanarsidass Publishers, ISBN-13: 978-8120810990, 2014

Suggested Reading:

1. KapilKapoor,"*Language, Linguistics and Literature: The Indian Perspective*", ISBN-10: 8171880649, 1994.
2. Karan Singh, "A Treasury of Indian Wisdom: An Anthology of Spiritual Learn", ISBN: 978-0143426158, 2016.

18CE C06

SURVEYING AND GEOMATICS LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	35 Marks
CIE	15Marks
Credits	1

Course Objectives: To enable the student

1. To know the use of simple survey instruments in the field.
2. To develop topo maps from the field data.
3. To get exposure to modern surveying instruments for solving the problems
4. To understand the concepts of automation in surveying.
5. To be in a position to set the curves by using various methods and identifying the data required to be computed for the same.

Course Outcomes: At the end of the course the student should have learnt

1. To use simple as well as modern surveying instruments.
2. To develop L.S and C.S for road works, Canal works, using Auto levels and to develop contour map of the given area.
3. To use Total Station for locating ground details and plotting.
4. To set simple curves using Total Station.
5. To locate ground features using GPS.

LIST OF EXPERIMENTS:

1. Ranging, running perpendicular lines and types of offsets by using chain, tape, cross staff.
2. Use of prismatic compass for measuring the area of a given land by using compass traverse.
3. Introduction to plane table work. - Radiation and intersection methods.
4. Introduction to levelling - Fly levelling using Auto level.
5. Development of L.S. and C.S after obtaining levels by using Auto levels.
6. Developing contour maps.
7. Measurement of horizontal angles using theodolite.
8. Study of Total station operations.
9. Traversing by Total station.
10. Setting of simple curve with the help of Total Station.
11. Study of GPS operations.
12. Establishing control points using GPS.
13. Demonstration of Remote Sensing Data processing software

Suggested Reading:

1. B. C. Punmia and A. K. Jain," *Surveying and Levelling", Vol. I and II*, Laxmi Publications, 2016.
3. Subramanian, "*Surveying and Levelling*", Oxford Higher Education, 2012.

18CE C07

FLUID MECHANICS LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	35 Marks
CIE	15Marks
Credits	1

Course Objectives: To enable the student

1. To enable the student to understand the governing parameters for the discharge measurement for flow through pipes, channels and tanks.
2. To enable the student to understand viscosity.
3. To understand flow visualization, Energy and Momentum principles by conducting experiments.
4. To understand stability of floating bodies by conducting experiments.
5. To understand Hydrostatic forces on flat and curved surfaces by conducting experiments.

Course Outcomes: At the end of the course, the student should have learnt

1. Ability to find the coefficient of discharge for flow through pipes, channels and tanks.
2. To differentiate between viscous and non-viscous flows and identify the governing parameters for both.
3. Applies the concept of energy and momentum principles.
4. Ability to find the stability and metacentre of floating body.
5. Applies the concept of hydrostatic forces on flat and curved surfaces.

List of experiments (Max 10 to be conducted):

1. Measurement of viscosity
2. Stability of Floating Body
3. Hydrostatics Force on Flat Surfaces/Curved Surfaces
4. Verification of Bernoulli's Theorem
5. Venturimeter
6. Orifice meter
7. Impacts of jets
8. Flow Visualization
9. Determination of C_d for mouthpiece (constant Head method).
10. Determination of C_d for V notch.
11. Determination of C_d of a mouth piece for unsteady flow in a hemi – spherical tank.

Suggested Reading:

1. N. Kumara Swamy, "*Fluid Mechanics and Machinery Laboratory Manual*", Charotar Publishing House Pvt. Ltd., Anand, Gujarat, 2008.
2. Sarbjit Singh, "*Experiments in Fluid Mechanics*", PHI Learning Private Limited, New Delhi, 2012.

SEMESTER – IV

S. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
	THEORY								
1	18CS C05	Basics of Data Structures	2	-	-	2	20	50	2
2	18CE C08	Hydraulic Engineering	3	1	-	3	30	70	4
3	18CE C09	Reinforced Concrete Design -I	3	1	-	3	30	70	4
4	18CE C10	Structural Analysis-I	3	-	--	3	30	70	3
5	18 ME C09	Principles of Management	3	-	-	3	30	70	3
6	18CE M01	Environmental Science	2	-	-	2	-	50	Non-Credit
	PRACTICALS								
7	18CS C06	Basics of Data Structures Lab	-	-	2	2	15	35	1
8	18CE C11	Solid Mechanics lab	-	-	3	3	15	35	1
9	18CE C12	Hydraulic Engineering Lab	-	-	3	3	15	35	1
10	18EG C03	Soft Skills Lab	-	-	2	2	15	35	1
		Total	**16**	**02**	**10**		**200**	**470**	**20**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18CS C05

BASICS OF DATA STRUCTURES
(Common for other Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	20 Marks
Credits	2

Pre-requisites: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce

1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The Student will be able to

1. Understand the basic concepts of data structures.
2. Understand the notations used to analyze the performance of algorithms.
3. Choose and apply an appropriate data structure for a specified application.
4. Understand the concepts of recursion and its applications in problem solving.
5. Demonstrate a thorough understanding of searching and sorting algorithms.

UNIT – I:

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time- space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT – II:

Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT – III:

Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications.

UNIT – IV:

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT – V:

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees.
Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort.

Text Books:

1. Narasimha Karumanchi, "*Data Structures and Algorithms Made Easy*", Career Monk Publications, 2017
2. Horowitz E, Sahni S., and Susan Anderson-Freed," *Fundamentals of Data structures in C*", Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, "*Data Structures using C*", Oxford, 2014.

Suggested Reading:

1. Kushwaha D. S. and Misra A. K, "*Data structures A Programming Approach with C*", PHI.
2. Seymour Lipschutz," *Data Structures with C*", McGraw Hill Education, 2017.

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS

18CE C08

HYDRAULIC ENGINEERING

Instruction	4(3L+1T) Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: The objective of this course is

1. To understand and analyze the laminar and turbulent flow.
2. Exposure to the basic principles of Aerodynamic forces, boundary layer.
3. Understand and analyze the open channel flows, steady uniform flow and computation.
4. Understand and analyze the non-uniform flows and flow profile, energy dissipation.
5. Familiarize with hydraulic machinery and its design, understand performance of hydraulic machinery.

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

1. Analyze the fluid effect related to laminar and turbulent flow in pipes.
2. Interprets the basics of computation of drag and lifts forces in the field of aerodynamics, boundary layer effect.
3. Apply the concepts of open channel flow and design the efficient channel.
4. Apply the concepts of non-uniform open channel flow to the field problems.
5. Design the turbines and pumps, should be able to run the turbines and pumps for efficient conditions.

UNIT – I:

Laminar Flow and Turbulent Flow: Laminar Flow: Laminar flow through circular pipes, annulus and parallel plates, measurement of viscosity. Turbulent Flow-Reynolds experiment, transition from laminar to turbulent flow, definition of turbulence, scale and intensity, causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes.

UNIT – II:

Boundary Layer Analysis, **Drag and Lift**: Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum and energy thickness, laminar and turbulent boundary layers on a flat plate, laminar sub-layer, smooth and rough boundaries, local and average friction coefficients, separation and control.

Drag and Lift: Fundamental concepts of drag and lift forces, Magnus effect, drag on sphere, cylinder, flat plate and aerofoil.

UNIT – III:

Introduction to Open Channel Flow and Uniform Flow: Introduction to Open Channel Flow: Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channel flow, velocity and pressure distribution of channel section.

Uniform Flow: Continuity equation, energy equation and momentum equation, characteristics of uniform flow, Chezy's formula, Manning's formula, factors affecting Manning's roughness coefficient, most economical section of channel, computation of uniform flow, normal depth.

UNIT- IV:

Non-Uniform Flow and Hydraulic Jump: Non-Uniform Flow-Specific energy, specific energy curve, critical flow, discharge curve, critical depth. channel transitions, measurement of discharge and velocity –venture flume, standing wave flume, gradually varied flow-dynamic equation of gradually varied flow, classification of channel bottom slopes, classification of surface profile, characteristics of surface profile, computation of water surface profile-direct step method.

Hydraulic Jump: Theory of hydraulic jump, elements and characteristics of hydraulic jump in a rectangular channel, length and height of jump, location of jump, types and energy dissipation.

UNIT- V:

Hydraulic turbines and Centrifugal Pumps: Hydraulic turbines-Classification, specific speed, unit quantities velocity triangles, power developed and efficiencies, principles of design of reaction and impulse turbines, characteristics curves, selection of turbines. Centrifugal Pumps- Components, work done and efficiency, minimum starting speed, Euler head equation, specific speed and characteristic curves of centrifugal pumps.

Text Books:

1. P. N. Modi and S. M. Seth, "*Hydraulic and Fluid Mechanics*", Standard Book House, Delhi, 2013.
2. K. Subramanya, "*Flow in Open Channels*", Tata McGraw-Hill Education, 2009.

Suggested Reading:

1. K. Subramanya, "*1000 Solved Problems in Fluid Mechanics*", Tata Mc-Graw Hill Publications 2005.
2. Ven Te Chow, "*Open-Channel Hydraulics"*, McGraw-Hill, New York, 1959.

18CE C09

REINFORCED CONCRETE DESIGN – I

Instruction	4(3L+1T) Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: The student is able to

1. Understand general mechanical behavior of reinforced concrete, design philosophies, design requirements get introduced to IS: 456 code and working stress method of design applied to RC rectangular beams.
2. Understand the basic principles of Limit state design, assumptions made in theory of flexure and flexural design procedures for singly reinforced and doubly reinforced rectangular beam.
3. Grasp the fundamentals of analysis and design of rectangular beams for shear and torsion, checking for bond and applying serviceability check for beams.
4. Know the procedures for analysis and design of one-way simply supported and cantilever slabs and two-way simply supported and continuous slabs.
5. Learn the design and detailing of columns and footings of rectangular and circular sections.

Course Outcomes: At the end of the course, student is able to

1. Use and suggest Reinforced concrete for various practical applications, interpret the clauses of IS:456 and apply the working stress method of design for rectangular beams.
2. Design RC beams of rectangular and flanged sections/ for flexure using limit state method.
3. Design RC beams for shear and torsion and check for bond and serviceability.
4. Analyze and design solid rectangular RC slabs of one way (cantilever, simply supported and continuous) and two way (simply supported and continuous).
5. Design RC columns (short and long) and axially loaded footings of circular and rectangular sections.

UNIT - I:

Introduction to Reinforced Cement concrete: Concept of reinforced concrete - basic requirement of RC structures-Stresses, loads & combinations- Design

Philosophies: Development of design philosophies - working stress method - Ultimate load method - Limit state method - Merit and demerits. Introduction to IS: 456- General design requirements and specifications. Working Stress method: Assumptions made in design of flexural members –Theory of bending in RC beams - Balanced, under and over reinforced sections. Analysis and design for flexure of singly and doubly reinforced rectangular beams-Analysis and design T-beams using WSM.

UNIT- II:

Limit state method of design: Introduction to limit state method - classification of limit states – characteristic loads - partial safety factors – Factors for material and load - design stress – stress and strain diagram of concrete and steel - Assumptions made in design of flexural members - Stress block parameter - Analysis and flexural design of singly reinforced, doubly reinforced rectangular beams and flanged beams.

UNIT - III:

Limit state of collapse in shear and torsion: Types of shear reinforcement – analysis and design for shear and torsion in beams - Bond - development length and curtailment of reinforcement in beams and detailing of bars: IS a code provision. Limit state of serviceability: Short term, long term, total deflection - check for deflection - cracking - IS code provisions.

UNIT - IV:

Analysis and design of slabs: Solid rectangular slabs - cantilever slab – simply supported and cantilever one way and two way slabs subjected to uniformly distributed loads - IS code method of design of these slabs - Detailing of reinforcement and check for serviceability in slabs. Design of stair: Design and detailing of dog legged slab type staircase.

UNIT - V:

Analysis and design of columns: Short and long columns - End conditions-effective length of columns assumptions made in design - analysis - design and detailing of axially loaded square, rectangular and circular columns with lateral ties and helical bar - Design of axially loaded short columns subjected to uni-axial and bi-axial moments , using interaction diagrams – design principles for long columns. Footings: Types of Foundations and IS Specifications, Design and detailing of isolated rectangular and circular footings for axial loads.

Text Books:

1. N. Subramanian, "*Design of Reinforced Concrete Structures*" Oxford University Press. First Published in 2013, Second impression 2014.

2. S. Unni Krishnan Pillai and Devadas Menon, "*Reinforced Concrete Design*", Tata McGraw-Hill Publishing Co Ltd, (Third Edition), 2009.

Suggested Reading:

1. V. L. Shah and S. R. Karve, "*Limit State Theory and Design of Reinforced Concrete*", Structures Publications, 7th Edition,2014.
2. A.K. Jain, "*Reinforced Concrete: Limit State Design*", Nem Chand & Brothers-Roorkee; Seventh edition, paperback – 2012.
3. Sushil Kumar, "*Treasure of RCC Designs"*, Standard Book House; Edition: 19th, Year-2014 edition (1 December 2009).
4. N. Krishna Raju, "*Design of Reinforced Concrete Structures*", CBS Publishers and Distributors, New Delhi, 4th edition, 2016.

18CE C10

STRUCTURAL ANALYSIS-I

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the students

1. Comprehend the concept of determination of flexural deflections statically determinate beams using various methods.
2. Analyze the indeterminate beams.
3. Understand the behavior of circular shafts subjected to torsion and also to the combined effect of bending & torsion and compute the strain energy in bars subjected to the action of various types of loads.
4. Understand the failure behavior of compression members and the significance & analysis of types of springs.
5. Gain the knowledge on unsymmetrical bending and shear center determination in different types of sections.

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

1. Compute deflections in determinate beams, under various types of static loads, using a suitable method.
2. Analyze the indeterminate beams subjected to various types of loads.
3. Analyze & design circular shafts subjected a given torque and also to determine the strain energy in members under various loading situations.
4. Analyze various types of springs and also the columns.
5. Analyze the members subjected to unsymmetrical bending and locate shear center for different sections.

UNIT - I:

Slopes and Deflections: Determination of Slope and deflections by double integration method and Macaulay's Method for cantilever, simple supported beams and overhanging beams carrying point loads, uniformly distributed loads, uniformly varying loads and couples. Application of Moment area method and Conjugate beam method for determination of Slope and deflections in simple cases.

UNIT - II:

Propped Cantilevers: Analysis of propped cantilever beams with elastic and rigid props for point loads and uniformly distributed loads, and determination of slope and deflections.

Fixed beams: Analysis of fixed beams subjected to point loads, uniformly distributed loads, uniformly varying loads. Slope and deflections in fixed beams with and without sinking of supports.
Continuous beams: Theorem of three moments and its derivation. Analysis of continuous beams with and without sinking of supports using theorem of three moments.

UNIT - III:
Torsion: Theory of pure torsion, solid and hollow circular shafts, strength and stiffness of shafts, Transmission of power. Combined torsion and bending with and without end thrust. Determination of principal stresses and maximum shear stresses. Equivalent Bending and Torsional Moments.
Strain energy: Strain energy, proof resilience and modulus of resilience. Strain energy in bars subjected to gradually applied loads, suddenly applied and impact loads. Strain energy due to shear, bending and torsion.

UNIT - IV:
Springs: Types of springs & significance, analysis of Closed and open coiled helical springs under axial load and twist and leaf springs.
Columns and Struts: Columns and classification, Empirical formulae Column & Struts, Failure of short, medium & slender column, Different end conditions of columns, Euler's theory for long columns. Rankine - Gordon's formula. Eccentrically loaded columns, Secant and Prof. Perry's formulae.

UNIT- V:
Unsymmetrical bending of beams: Unsymmetrical bending - Location of neutral axis, maximum stresses for rectangular section, Symmetric channel section.
Shear Centre: Shear stress, shear flow, locating of shear center for angle section, channel section and T-section, with one axis of symmetry.

Text Books:

1. B .C. Punmia, "*Strength of Materials*", Laxmi publishers, Delhi, 2011.
2. S. Ramamrutham, "*Strength of* Materials", Dhanpat Rai & Sons, Delhi, 2012.

Suggested Reading:

1. S.B. Junnarkar,*" Mechanics of structures (Vol-I &Vol-II)"*, Charotar Publishing house, Anand, 2002.
2. D.S. Prakash Rao, "*Strength of Materials-A Practical Approach"*, Universities Press, 1999.
3. E.P. Popov, "*Engineering Mechanics of solids*", 1993.
4. G.H. Ryder, "*Strength of Materials"*, 3 Edition in SI units, Macmillan India Ltd, Delhi, 2012.
5. A. Pytel and F. L. Singer, "*Strength of Materials"*, Harper & Row, 4 Editions, New York.1999.

18ME C09

PRINCIPLES OF MANAGEMENT

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Objectives: To make the students to
1. Understand basic fundamentals and insights of management
2. Understand the nature and purpose of planning
3. Gain the knowledge about the frame work of organizing
4. Understand the essence and significance of directing
5. Recognize the importance of controlling and its outcomes

Outcomes: At the end of the course, student will be able to understand
1. Identify and evaluate the principles of management
2. Demonstrate the ability to have an effective and realistic planning
3. Identify the nature and the type of organization
4. Apply the tools and techniques of directing
5. Explain and evaluate the necessity for controlling and further refinement of an organization.

UNIT – I:
Management: Definition of management**,** science or art, manager vs entrepreneur; managerial roles and skills;. Evolution of management, Basic management theories by FW Taylor, Henry Fayol, Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management.

UNIT – II:
Planning: Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Planning plant location and layout, Decision making steps & processes.

UNIT – III:
Organizing: Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.

UNIT – IV:

Directing: Individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT – V:

Controlling: system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Text Books:

1. S.P. Robins and M. Couiter, "*Management*", 10/e., Prentice Hall India, 2009.
2. JAF Stoner, RE Freeman and DR Gilbert, "*Management*", 6/e., Pearson Education, 2004.

Suggested Reading:

1. P.C. Tripathy and P.N. Reddy, "*Principles of Management*", Tata McGraw Hill, 1999
2. Harold Koontz and Cyril O'Donnell "*Principles of Management*", Tata McGraw Hill, 2017

18CE M01

ENVIRONMENTAL SCIENCE

Instruction	2L Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: To enable the student

1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.
2. Become aware about the importance of eco system and biodiversity for maintaining ecological balance
3. To identify the importance of interlinking of food chain
4. Learn about various attributes of pollution management and waste management practices.
5. To make the students contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes: At the end of the course, the student should have learnt

1. To define environment, identify the natural resources and ecosystems and contribute for the conservation of bio-diversity.
2. To suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
3. To relate the social issues and the environment and contribute for the sustainable development.
4. To follow the environmental ethics.
5. To contribute for the mitigation and management of environmental disasters.

UNIT – I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem,

food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu," *Introduction to Environmental Science"*, B S Publications, **2004**.
2. Suresh K. Dhameja, "*Environmental Studies"*, S. K. Kataria& Sons, **2009**.

Suggested Reading:

1. C. S. Rao," *Environmental Pollution Control Engineering"*, Wiley, **1991**.
2. S. S. Dara, "*A Text Book of Environmental Chemistry &Pollution Control"*, S. Chand Limited, 2006.

18CS C06

BASICS OF DATA STRUCTURES LAB
(Common for other Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Pre-requisites: Any Programming Language(C)

Course Objectives: To enable the student

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The Student will be able to

1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Understand and implement non-linear data structures such as trees, graphs and its traversal techniques.
4. Implement various kinds of searching, sorting techniques.
5. Develop the suitable data structure for real world problem.

List of Experiments

1. Implementation of operations on arrays.
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of sorting techniques.
7. Case study like Banking System, Students Marks Management, Canteen Management etc.

Text Books:

1. Brian W Kernighan, Dennis Ritchie, "*The C Programming Language*", PH PTR, 2nd Edition.
2. Richard M Reese, "*Understanding and Using C Pointers*", O`Reilly, 2013.

Web links:

https://nptel.ac.in/courses/106102064/

18CE C11

SOLID MECHANICS LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: To know and understand the mechanical characteristics of various engineering materials by conducting different tests.

1. Mechanical properties of engineering materials under different structural actions like direct tension, compression, flexure and torsion.
2. Measurement of deflections and hence there by finding elastic behaviours.
3. To assess the behaviour of steel rods under impact loads and shear.
4. To conduct and understand bendable property of steel bar.
5. To understand the working principle of equipment to determine shear force and bending moment in statically determinate beams.

Course Outcomes: At the end of the course, the students will be able

1. To determine the strength of various materials under structural actions like direct tension, compression, flexure and torsion.
2. To compute the elastic property of the materials of the determinate beams by measurement of deflections.
3. To determine the impact/ shear strength of steel specimen.
4. Conduct bend test of steel bars.
5. Determine the shear force and bending moment in determinate beams.

List of Experiments:

1. Tension Test
2. Deflection test on Simply Supported beam
3. Deflection test on Cantilever beam
4. Compression test on Concrete
5. Impact test
6. Shear Test
7. Torsion Test
8. Bend test of steel bar
9. Determination of Shear forces in beams
10. Determination of Bending moments in beams.

Suggested Reading:

1. William Kendrick Ha, "*Laboratory Manual of Testing Materials*", Bibliolife, 2009.

18CE C12

HYDRAULIC ENGINEERING LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: To enable the student

1. To understand uniform and non-uniform flows in open channel flows.
2. To understand drag and lift of a flow around an Aerofoil and circular cylinder.
3. To enable the student to understand major and minor losses through pipes.
4. To understand the performance and efficiencies of turbine and centrifugal pump.
5. To understand the significance of viscosity and its role in laminar flow through pipes.

Course Outcomes: At the end of the course, the student should have learnt

1. Ability to compute the velocity, discharge, channel roughness coefficient, and energy loss in uniform flows and non- uniform flows.
2. Ability to find drag and lift forces and coefficients.
3. To differentiate between major loss and minor loss and find the losses.
4. Ability to construct characteristic curves and find performance, efficiency of turbine and pumps.
5. Ability to find viscosity, shear stress, velocity changes and loss in a laminar flow.

List of experiments (Max 10 to be conducted):

1. Uniform Flow
2. Venture flume
3. Hydraulic Jump
4. Laminar flow through pipes
5. Major losses
6. Minor losses in pipe
7. Pelton Wheel turbine-find efficiency and construct performance characteristics of a Pelton wheel turbine.
8. Francis Turbine-find efficiency and construct performance characteristics of a Francis turbine.

9. Kaplan Turbine-find efficiency and construct performance characteristics of a Kaplan turbine.
10. Centrifugal Pump-find efficiency and construct operating characteristic curves of a constant speed pump.
11. Studies in Wind Tunnel
12. Flow around an Aerofoil / circular cylinder

Suggested Reading:

1. N. Kumara Swamy, "*Fluid Mechanics and Machinery Laboratory Manual"*, Charotar Publishing House Pvt. Ltd., Anand, Gujarat, 2008.
2. Sarbjit Singh, "*Experiments in Fluid Mechanics*", PHI Learning Private Limited, New Delhi, 2012.

18EG C03

SOFT SKILLS LAB

Instruction	2P Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: The course will introduce the students to

1. Imbibe an impressive personality, etiquette, professional ethics & values, effective time management & goal setting.
2. Understand the elements of professional update & upgrade through industry exposure in a mini-live project. Understand confidence building strategies and thereby to make effective presentations through PPTs.
3. Learn what constitutes proper grooming and etiquette in a professional environment. Acquire the necessary skills to make a smooth transition from campus to corporate.

Course Outcomes: After successful completion of the course the students will be able to

1. Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
2. Win in professional communication situations and participate in group discussions with confidence. Write abstracts.
3. Write effective resumes. Plan, prepare and face interviews confidently.
4. Adapt to corporate culture by being sensitive - personally and sensible - professionally. Draft an SOP.
5. Apply the soft skills learnt in the mini-live project, by collecting and analyzing data and making oral and written presentations on the same.

Exercise 1:

Main Topics: Thinking Skills, Personality Development – Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.

Flipped Sessions: Personal Sensitivity & Professional Sensibility (Reading & Discussion)

Writing Input: Writing to Express - Drafting & Delivering a Speech (Free Writing Exercise)

Exercise 2:

Main Topics: Advanced Group Discussion with Case studies: Dynamics of group discussion, intervention, summarizing, and modulation of voice, body language, relevance, fluency and coherence.

Flipped Sessions: Importance of Professional Updating & Upgrading (Reading & Discussions)
Writing Input: Writing with Precision - Writing Abstracts
Exercise 3:
Main Topics: Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews. Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skills.
Flipped Sessions: Mock Interviews (Video Sessions & Practice)
Writing Input: Writing to Reflect - Resume Writing

Exercise 4:
Main Topic: Corporate Culture – Grooming and etiquette, communication media, academic ethics and integrity
Flipped Sessions: Corporate Culture, Etiquette & Grooming (Video Sessions & Practice through Role-play)
Writing Input: Writing to Define - Writing an effective SOP.

Exercise 5:
Main Topic: Mini Project – General/Technical. Research, developing a questionnaire, data collection, analysis, written report and project seminar. Elements & Structure of effective presentation. Presentation tools – Body language, Eye-contact, Props & PPT.
Flipped Sessions: Effective Presentations (Video & Writing Sessions, Practice through Emulation)
Writing Input: Writing to Record - Writing minutes of meeting.

Suggested Reading:

1. Madhavi Apte , "**A Course in English communication**", Prentice-Hall of India, 2007
2. Dr. Shalini Verma, **"Body Language- Your Success Mantra**", S Chand, 2006
3. Ramesh, Gopalswamy, and Mahadevan Ramesh, "**The ACE of Soft Skills",** New Delhi: Pearson, 2010
4. Van Emden, Joan, and Lucinda Becker, "**Presentation Skills for Students**", New York: Palgrave Macmillan, 2004

*Flipped Class-room: Students explore the concept first and then trainer explains it, students work on their own.

Web Resources:

1. https://www.goskills.com/Soft-Skills
2. https://www.trainerbubble.com
3. https://www.skillsconverged.com