Hyderabad Karnataka Education Society's

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING

Aiwan-E-Shahi Area, Kalaburagi-585102, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi.)
Grant-in- Aid Institution
(Government of Karnataka) Accredited by NBA, New Delhi.
Approved by AICTE, New Delhi.
Website: www.pdacek.ac.in
Email ID: principal@pdaengg.com

SCHEME & SYLLABUS (1ST YEAR)

BACHELOR DEGREE IN ENGINEERING

CIVIL ENGINEERING STREAM

(With effect from 2022 Academic Year)

Out Come Based Education With

Choice Based Credit System

PREFACE

Poojya Doddappa Appa College of Engineering, Kalaburagi is the first institution established by the society in 1958. The college has celebrated its golden jubilee year, setting new standards in the field of education and achieving greater heights.

The college started with 50% central assistance and 50% state assistance, with a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degrees offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 12 undergraduate courses, 10 post Graduate courses and 13 recognized research centres, offering Ph.D. programs. All the courses are affiliated to Visveswaraya Technological University, Belagavi.

At present the total intake at UG level is 930 and PG level 184. The college receives grant in aid funds from state government. A number of projects have been approved by MHRD/AICTE, Govt. of India for Research and Modernization of laboratories. The Karnataka State Council for Science and Technology, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College twice once in the year 2004 with 09 UG programs out of which 08 programs were accredited for three years and 01 course was accredited for five years. At present the college is reaccredited by National Board of Accreditation for 05 UG programs.

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belagavi reposed abundant confidence in the capabilities of the College and conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programs are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belagavi. A separate examination section headed by a Controller of Examinations conducts the examinations.

One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

PDA College of Engineering is one among the top 25 Institutions at National Level and Top Two Institutions at State Level as per ATAL Ranking of Technical Institutions. The rank is awarded for Innovation activities, Publications of faculty and students, Patents, Start-ups, Incubation Centers, reserving the budget for innovation activities, and involvement of Faculty and Students in Innovative and Skill Enrichment Activities.

Vision of the Institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to national and multinational industries and communities through educational, technical and professional activities.

A. Program Outcomes

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI

SCHEME OF TEACHING AND EXAMINATION 2022

OUTCOME-BASED EDUCATION(OBE) AND CHOICE BASED CREDIT SYSTEM (CBCS)

(WITH EFFECT FROM THE ACADEMIC YEAR 2022-23)

I Semester CIVIL ENGJINEERING **Chemistry Group**

Sl.No.	Course Code		Course Title	Teaching Dept. / PSB	Teaching Hours/Week				Examination				
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in Hours	CIE MARKS	SEE MARKS	TOTAL MARKS	Credits
					L	T	P	S					
1.	*ASC(IC)	22MATC11	Mathematics for Civil Engg. Stream-I	Maths	3	0	2	0	03	50	50	100	04
2.	#ASC(IC)	22CHEC12	Chemistry for Civil Engg. Stream	Chemistry	3	0	2	0	03	50	50	100	04
3.	ESC	22CED13	Computer Aided Engineering Drawing	Civil/Mech Dept.	2	0	2	0	03	50	50	100	03
4.	ESC-I(IC)	22ESC145	Introduction to C Programming	Respective Engg. Dept.	2	0	2	0	03	50	50	100	03
5.	ETC	22ETC15X	Emerging Technology Courses	Any Engg. Dept.	3	0	0	0	03	50	50	100	03
6.	AEC	22ENG16	Communicative English	Humanities	1	0	0	0	1.5	50	50	100	01
7.	HSMS	22ICO17	Indian Constitution	Humanities	1	0	0	0	1.0	50	50	100	01
8.	HSMS	22SFH18	Scientific Foundation of Health	Any Department	1	0	0	0	1.5	50	50	100	01
				TOTAL						400	400	800	20

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

All 01 Credit- courses shall have the SEE of 01 hour 30 Minutes duration and the pattern of the question paper shall be MCQ

***-22MATS21** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers

#-22CHES22- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required experimental learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0),

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI

SCHEME OF TEACHING AND EXAMINATION 2022

OUTCOME-BASED EDUCATION(OBE) AND CHOICE BASED CREDIT SYSTEM (CBCS)

(WITH EFFECT FROM THE ACADEMIC YEAR 2022-23)

II Semester CIVIL ENGJINEERING **Physics Group**

Sl.No.	Course Code		Course Title	Teaching Dept. / PSB	Teaching Hours/Week				Examination				
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in Hours	CIE MARKS	SEE MARKS	TOTAL MARKS	Credits
					L	T	P	S					
1.	*ASC(IC)	22MATC21	Mathematics for Civil Engg. Stream-II	Maths	3	0	2	0	03	50	50	100	04
2.	#ASC(IC)	22PHYC22	Physics for Civil Engg. Stream	Physics	3	0	2	0	03	50	50	100	04
3.	ESC	22CIV23	Engineering Mechanics	Civil Engg. Dept.	3	0	0	0	03	50	50	100	03
4.	ESC-II	22ESC242	Introduction to Electrical Engg.	Respective Engg. Dept.	3	0	0	0	03	50	50	100	03
5.	PLC (IC)	22PLC25X	Progrmming Language Courses	Any Engg. Dept.	2	0	2	0	03	50	50	100	03
6.	AEC	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	0	1.5	50	50	100	01
7.	HSMS	22KSK17/27 22KBK17/27	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	0	1.5	50	50	100	01
8.	AEC/SDC	22IDT28	Innovation and Design Thinking	Any Department	1	0	0	0	1.5	50	50	100	01
				TOTAL						400	400	800	20

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

All 01 Credit- courses shall have the SEE of 01 hour 30 Minutes duration and the pattern of the question paper shall be MCQ

***-22MATS21** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers

#-22CHES22- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required experimental learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0),

ESC-I - Engineering Science Courses - I				
Code	Title	L	T	P
22ESC141	Introduction to Civil Engineering	3	0	0
22ESC142	Introduction to Electrical Engineering	3	0	0
22ESC143	Introduction to Electronics Engineering	3	0	0
22ESC144	Introduction to Mechanical Engineering	3	0	0
22ESC145	Introduction to C Programming	2	0	2

ETC-I - Emerging Technology Courses - I				
Code	Title	L	T	P
22ETC15A	Green Buildings	3	0	0
22ETC15B	Introduction to Solar PV Systems	3	0	0
22ETC15C	Renewable Energy Sources	3	0	0
22ETC15D	Introduction to Internet of Things (IoT)	3	0	0
22ETC15E	Introduction to Cyber Security	3	0	0

PLC-I - Programming Language Courses - I				
Code	Title	L	T	P
22PLC15A	Introduction to Web Programming	2	0	2
22PLC15B	Introduction to Python Programming	2	0	2
22PLC15C	Introduction to C++ Programming	2	0	2
22PLC15D	C and UNIX Programming	2	0	2
22PLC15E	Basics of JAVA Programming	2	0	2

The course 22ESC145/245, Introduction to C Programming and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT

ESC-II - Engineering Science Courses - II				
Code	Title	L	T	P
22ESC241	Introduction to Civil Engineering	3	0	0
22ESC242	Introduction to Electrical Engineering	3	0	0
22ESC243	Introduction to Electronics Engineering	3	0	0
22ESC244	Introduction to Mechanical Engineering	3	0	0
22ESC245	Introduction to C Programming	2	0	2

ETC-II - Emerging Technology Courses - II				
Code	Title	L	T	P
22ETC25A	Green Buildings	3	0	0
22ETC25B	Introduction to Solar PV Systems	3	0	0
22ETC25C	Renewable Energy Sources	3	0	0
22ETC25D	Introduction to Internet of Things (IoT)	3	0	0
22ETC25E	Introduction to Cyber Security	3	0	0

PLC-I - Programming Language Courses - I				
Code	Title	L	T	P
22PLC25A	Introduction to Web Programming	2	0	2
22PLC25B	Introduction to Python Programming	2	0	2
22PLC25C	Introduction to C++ Programming	2	0	2
22PLC25D	C and UNIX Programming	2	0	2
22PLC25E	Basics of JAVA Programming	2	0	2

The course 22ESC145/245, Introduction to C Programming and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT

MATHEMATICS FOR CIVIL STREAM - I

[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2022-23)

Course Code	22MATC11	CIE Marks	50
Credits	04	SEE Marks	50
Course Type	Integrated		
Lecture Hours/Week (L-T-P)	3-0-2	Total Marks	100
Total Hours	40 Hours Theory+12 Lab Hours	SEE Hours	03

Course Objectives:

Familiarize the importance of calculus associated with one variable and two variables, the importance of Integral calculus for civil engineering.

Analyze Civil engineering problems applying Ordinary Differential Equations.

Develop the knowledge of Linear Algebra refereeing to matrices.

MODULES	Hours
Module-1 Calculus **Introduction to polar coordinates and curvature relating to Civil engineering.** Polar coordinates, Polar curves, angle between the radius vector and the tangent, and angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Simple Problems.**Self-study:** Center and circle of curvature, evolutes and involutes.**Applications:** Applied Mechanics, Structural design and paths, Strength of materials, Elasticity.	**08 Hours**
Module-2 Series Expansion and Multivariable Calculus **Introduction to series expansion and partial differentiation in the field of Civil engineering applications.** Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms – L'Hospital's rule, problems. Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables – Simple Problems. **Self-study:** Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint. **Applications:** Computation of stress and strain, Errors and approximations, Estimating the critical points and extreme values	**09 Hours**
Module-3 Ordinary Differential Equations (ODEs) of first order **Introduction to first-order ordinary differential equations pertaining to the applications for Civil engineering.** Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations -Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$ Orthogonal trajectories and Newton's law ofcooling. **Nonlinear differential equations:** Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, reducible to Clairaut's equations - Problems**.**	**08 Hours**

Modules	Hours
Self-Study: Applications of ODE's in Civil Engineering problems like bending of the beam, whirling of shaft, solution of non-linear ODE by the method of solvable for x and y. **Applications:** Rate of Growth or Decay, Conduction of heat.	**08 Hours**
Module-4 Integral Calculus **Introduction to Integral Calculus in Civil Engineering applications.** **Multiple Integrals:** Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Problems. **Beta and Gamma functions:** Definitions, properties, relation between Beta and Gamma functions. Problems. **Self-Study:** Volume by triple integration, Center of gravity. **Applications:** Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models.	**08 Hours**
Module-5 Linear Algebra **Introduction of linear algebra related to Civil Engineering applications.** Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigen values and Eigenvectors, Rayleigh's power method to find the dominant Eigen value and Eigenvector. **Self-Study:** Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **Applications:** Structural Analysis, Balancing equations.	

List of Laboratory experiments (2 hours/week per batch/ batch strength 15)
10 lab sessions + 1 repetition class + 1 Lab Assessment

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first-order differential equation and plotting the graphs
6	Program to compute surface area, volume and centre of gravity
7	Evaluation of improper integrals
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigen values and eigenvectors and find the largest and smallest eigen value by Rayleigh power method

Suggested software's: Mathematica/MatLab/Python/Scilab

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO 1	Apply the knowledge of calculus to solve problems related to polar curves
CO 2	Learn the notion of partial differentiation to compute rate of change of multivariate functions
CO 3	Analyze the solution of linear and nonlinear ordinary differential equations
CO 4	Apply the knowledge of multiple integrals to compute area and volume.
CO 5	Make use of matrix theory for solving for system of linear equations and compute eigen values and eigen vectors. Familiarize with modern mathematical tools namely MATHEMATICA/ MATLAB/ PYTHON/SCILAB

CHEMISTRY FOR CIVIL ENGINEERING STREAM

Course Code:	**22CHEC12/22**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03
Total Hours of Pedagogy	40 Hours Theory + 12 Lab Hours	Credits	04

Pre-requisite

Course Objectives

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

Module-1: Structural Materials **Metals and Alloys:** Introduction, Properties and application of Iron and its alloys, Aluminium and its alloys. **Cement:** Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement. **Refractories:** Introduction, classification based on chemical composition, properties and application of refractory materials. **Glass:** Introduction, Composition, Types, Preparation of Soda-lime glass, properties and applications of glass. **Self-learning:** Chemistry of reinforced concrete from various sources of water (seawater, groundwater, treated water).	**08 Hours**

Module-2: Energy Conversion and Storage, Corrosion **Energy conversion:** Introduction, construction, working, and applications of Na-ion cell, methanol-oxygen fuel cell. **Storage devices:** Introduction, construction and working of Li-ion battery. **Corrosion:** Introduction, mechanism of electrochemical corrosion with iron as an example, types (differential metal and aeration), Stress corrosion, corrosion control galvanization, anodization and sacrificial anode method. Factors affecting corrosion (EMF, Temperature, pH, relative area of anode and cathode and polarization). **Self-learning:** Corrosion inhibitors.	**08 Hours**
Module-3: Water Technology and Nanotechnology **Water technology:** Introduction, sources and nature of impurities of water, hardness of water, determination of temporary, permanent and total hardness by EDTA method, numerical problems, softening of water by Lime-Soda Process, determination of COD, numerical problems. Purification of water by Reverse osmosis and chlorination methods. **Nanotechnology:** Introduction, properties and engineering application of carbon nanotubes, graphene and nanomaterials for water treatment(metal oxide) **Self-learning:** Introduction, classification, properties and application of silicon carbide. **Module-4:Polymer and Composites**	**08 Hours**
Polymers: Introduction, types of polymerization, free radical mechanism of addition polymerization, techniques of addition polymerization, molecular weight; number average and weight average, numerical problems. Synthesis, properties and industrial applications of polyvinylchloride (PVC) and polystyrene. **Conducting polymers** – synthesis and conducting mechanism of Polyacetylene **Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar and Polyester. **Plastics:** Introduction, synthesis, properties and industrial applications of poly(methyl methacrylate) (PMMA) and Teflon. **Adhesives:** Introduction, synthesis, properties and application of epoxy resin. **Polymer Composite:** Introduction, properties and applications of fibre reinforced polymer composites. **Self-learning: Biopolymer**: Introduction, structural properties, and applications of cellulose and lignin, synthesis of polylactic acid and their application.	**08 Hours**
Module-5:Phase Rule and Analytical Techniques **Phase rule:** Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component-lead-silver system. **Analytical techniques**: Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetry); its application in the estimation of the copper, pH-sensor (Glass electrode); its application in the determination of pH of beverages. **Self-learning:** Determination of viscosity of biofuel and its correlation with temperature.	**08 Hours**

PRACTICAL MODULE

A – DEMONSTRATION (ANY TWO) OFFLINE/VIRTUAL:

A1. SYNTHESIS OF POLYURETHANE
A2. QUANTITATIVE ESTIMATION OF ALUMINIUM BY PRECIPITATION METHOD A3. SYNTHESIS OF IRON OXIDE NANOPARTICLES
A4. DETERMINATION OF CHLORIDE CONTENT IN THE GIVEN WATER SAMPLE BY ARGENTOMETRIC METHOD

B – EXERCISE (COMPULSORILY ANY 4 TO BE CONDUCTED):

B1. CONDUCTOMETRIC ESTIMATION OF ACID MIXTURE
B2. POTENTIOMETRIC ESTIMATION OF FAS USING $K_2CR_2O_7$
B3. DETERMINATION OF PKA OF VINEGAR USING PH SENSOR (GLASS ELECTRODE)
B4. DETERMINATION OF RATE OF CORROSION OF MILD STEEL BY WEIGHT LOSS METHOD
B5. ESTIMATION OF TOTAL HARDNESS OF WATER BY EDTA METHOD

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry) C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method C4. Estimation of Sodium present in soil/effluent sample using flame photometry
C5. Determination of Chemical Oxygen Demand(COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1. Gravimetric estimation of gypsum in Portland cement D2. Electroplating of desired metal on substrate
D3. Estimation of manganese dioxide in pyrolusite
D4. Analysis of cement for its components

Course outcome (Course Skill Set)

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

CO 1	Identify the terms and processes involved in scientific and engineering applications
CO 2	Explain the phenomena of chemistry to describe the methods of engineering processes
CO 3	Solve for the problems in chemistry that are pertinent in engineering applications
CO 4	Apply the basic concepts of chemistry to explain the chemical properties and processes
CO 5	Analyze properties and processes associated with chemical substances in multidisciplinary situations

COMPUTER AIDED ENGINEERING DRAWING

Course Code	**22 CED13/23**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	THEORY	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	42 hours theory	Credits	03

Pre-requisite

Course Objectives

Engineering drawing is an important tool for all Engineers and for many others professionals. It is the language of Engineers. Engineering Drawing communicates all needed information from the engineer who designed a part to the workers who will manufacture it. The aim of the subject is to equip students with the fundamentals of Computer Aided Engineering Drawing and to further the ability to communicate information by graphical means.

MODULES	Teaching Hours
Module-1 **Introduction: for CIE only** Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. **Orthographic Projections of Points, Lines and Planes:** Introduction to Orthographic projections: Orthographic projections of points in 1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only). Orthographic projections of planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (Placed in First quadrant only using change of position method). **Application on projections of Lines & Planes (For CIE only)**	**09 Hours**
Module-2 **Orthographic Projection of Solids:** Orthographic projection of right regular solids (**Solids Resting on HP only**): Prisms & Pyramids (square, pentagon, hexagon), Cylinders, Cones, Cubes . **Projections of Frustum of cone and pyramids (For practice only, not for CIE and SEE).**	**09 Hours**

Module-3 **Isometric Projections:** Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. **Conversion of simple isometric drawings into orthographic views**. Problems on applications of Isometric projections of simple objects / engineering components. **Introduction to drawing views using 3D environment (For CIE only).**	**08 Hours**
Module-4 **Development of Lateral Surfaces of Solids:** Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations.	**08 Hours**
Module-5 **Multidisciplinary Applications & Practice (For CIE Only):** **Free hand Sketching;** True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc **Drawing Simple Mechanisms;** Bicycles, Tricycles, Gear trains, Ratchets, two-wheeler cart & Four-wheeler carts to dimensions etc **Electric Wiring and lighting diagrams;** Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software **Basic Building Drawing;** Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or suitable software, **Electronics Engineering Drawings**- Like, Simple Electronics Circuit Drawings, practice on layers concept. **Graphs & Charts**: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.	**08 Hours**

Text Book

Text book:1) Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005- Charotar Publishing House, Gujarat. 2) "Computer Aided Engineering Drawing" by Dr. M H Annaiah, Dr C N Chandrappa and Dr B Sudheer Premkumar Fifth edition, New Age International Publishers

Reference Book

1. 1) Computer Aided Engineering Drawing - S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006. 2) Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore. 3) Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production- Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi. 4) A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.

Course Outcomes

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

CO 1. Draw and communicate the objects with definite shape and dimensions

CO 2. Recognize and Draw the shape and size of objects through different views

CO 3. Develop the lateral surfaces of the object

CO 4. Create a Drawing views using CAD software.

CO 5. Identify the interdisciplinary engineering components or systems through its graphical representation.

INTRODUCTION TO C PROGRAMMING

Course Code:	**22ESC145/245**	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	30 Hours Theory + 12 Hours Practical	Credits	03

Course Objectives

- Learn the concepts of C Language.
- Develop skills to solve computational problems

MODULES	Teaching Hours
Module-I **Algorithms, Flowcharts, Introduction to C:** Algorithms, Flowcharts, Basic Structure of C Program, Executing a "C" program, Constants, Variables and Data types. **Operators and Expressions, Managing Input/ Output:** Arithmetic operators, relational operators, logical operators, assignment operators, increment/ decrement operators, conditional operators, bit wise operators, special operators. Evaluation of expression, precedence of arithmetic operators, type conversions in expression, operator precedence and associativity. Formatted Input and Output. Examples & exercises.	**09 Hours**
Module-II **Decision making and branching:** Decision Making with if statement, Simple if statement, the if else , nested if statements, the else if ladder, Switch statement, The ? : operator, Unconditional control Statements. **Decision Making and Looping:** While statement, Do-While statement, For statement, jumps in loop. Examples & exercises.	**09 Hours**
Module-III **Arrays:** One dimensional Array, declaration, Initialization, Two dimensional Arrays declaration, Initialization, examples and exercises. **Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing strings to Screen, Arithmetic Operations on Characters, String-handling functions, examples and exercises.	**08 Hours**
Module -IV **Functions and Recursion :** Need for User-defined Functions, A multi-function program, Elements of User-defined Functions, Definition of functions, Return value and their types, Function calls, Function declaration, Category of functions, Recursion, examples and exercises.	**08 Hours**

Structures and Unions: Defining a Structures, Declaration of Structure variables, Accessing Structure Members, Structure Initialization, Copying and comparing structure variables, operations on individual members, array of structures. **Unions**: Union**,** Size of Structures, bit fields , examples & exercises.	**08 Hours**
Module-V **Pointers:** Introduction, Understanding pointers, Accessing the address of a variable, Declaring pointer variables, Initializing of pointer variables, accessing a variable through its pointer, Examples & exercises. **File Management:** Defining and opening a file, closing file, input, output operations on files, error handling during I/O operations. Examples & exercises.	**08 Hours**

Text book:

1. E. Balagurusamy, "Programming in ANSI C", Tata Mcgraw Hill Education Private Limited– V Edition, 2016

Reference books:

1. Herbert Schildt, **"**Complete Reference in C",Fourth Edition, Tata McGraw Hill Publication, 2017
2. Yashwant P. Kanetakar, "Let us C**",** Fifth Edition, BPB Publications, 2016.
3. Brian W Kernighan & Dennis M Ritchie**"** The C Programming Language", Prentice Hall Publisher, Second Edition, 2004.
4. Behrouz A.Forouzan and Richard F.Gilberg,"Computer Program: A structured programming Approach Using C.", Third edition, Thomson Learning, 2005.

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	Develop Algorithm and flowcharts and understand the different data types and Operators in C language
CO2	Identify and use proper decision /control constructs for solving different type of problems
CO3	Apply arrays and Strings functions to develop programs for a given problem.
CO4	Demonstrate the use of structures and apply modular programming concepts
CO5	Develop C program for real world problems using pointers and file operations.

List of Programs – 22ESC145/245

Practice Programs:

1. Write a C program using printf statement:
   a) Print your name and Address.
   b) Print the pattern:

```
        +
    +       +
  +     +       +
    +       +
        +
```

2. Write a C Program using Scanf statements
   a) Read int, char and float values from the keyboard and display the same.
3. Write a c program to find :
   i) Area of rectangle
   ii) Area of Square
   iii) Area of circle
4. Write a c program using if , if…else , nested if and else…if ladder.
   i) To find whether number is odd or even.
   ii) To find whether number is +ve or –ve.
   iii) To find largest of two numbers.
   iv) To find largest of three numbers.
5. Write a c program using while , do-while and for looping statement.
   i) Print 1 to 10 numbers using all the three looping statements.
6. Write a c program using arrays:
   i) Read 1 to 10 array elements and display the same.
   ii) Read float elements and display the same.
   iii) Read character and display the same.
7. Write c program using strings:
   i. Read a string from keyboard and display the same.

Programming Assignments:

1. C Program to find Mechanical Energy of a particle using $E = mgh+1/2\ mv^2$.
2. C Program to convert Kilometers into Meters and Centimeters.
3. C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4. Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b1, b2, b3 such that the equation is balanced on both sides and it must be the reduced form.
5. Implement Matrix multiplication and validate the rules of multiplication.
6. Compute sin(x)/cos(x) using Taylor series approximation. Compare you result with the built-in library function. Print both the results with appropriate inferences.
7. Sort the given set of N numbers using Bubblesort.
8. Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.
9. Implement structures to read, write and compute average-marks and the students scoring above and below the average marks for a class of N students.
10. Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers

COMMUNICATIVE ENGLISH

Course Code	**22ENG16**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	THEORY	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	1:0:0:0	Exam Hours	1:30Min.
Total Hours of Pedagogy	15 Hours Theory	Credits	01

Prerequisite: Nil

Course objectives: The course Communicative English (22ENG16) will enable the students,

1. To know about Fundamentals of Communicative English and Communication Skills in general.
2. To learn sensible writing
3. To impart basic English grammar and essentials of important language skills.
4. To enhance with English vocabulary and language proficiency for better Communication skills.
5. To learn employment communication.

MODULES	Teaching Hours
Module-I **Introduction to Communication English**: Meaning, Definition, Purpose of Communication, Types of Communication, 7c's of communication, Barriers to Communication. Interpersonal Communication Skills – Teamwork – Definition, Advantage and Disadvantages of utilizing the team work, Stages of the development of a team, Characteristic of Successful teams, challenges in team working,	**03 Hours**
Module-II **Nature and Style of sensible writing:** Writing - Purpose of Writing, Clarity in Writing, Principle of Effective Writing. Sensible writing – Types of writing styles, Writing Introduction and Conclusion.	**03 Hours**
Module-III **Basic English Communicative Grammar and Vocabulary PART - I**: Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes. Introduction to Vocabulary - Definition and Importance of vocabulary, All Types of Vocabulary, ways to improve vocabulary – Exercises on it	**03 Hours**
Module-IV **Basic English Communicative Grammar and Vocabulary PART - II**: Words formation - Prefixes and Suffixes -– Exercises, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Homonyms, Homographs, and Homophones -– Exercises, Tense and Types of tenses,	**03 Hours**

MODULES	Teaching Hours
Module-V **Communication Skills for Employment:** What is a presentation – Essential Element of Presentation, Designing and delivering Presentation/Public Speaking, Effective power point presentation, Communication through telephonic, videoconference & Skype. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence.	**03 Hours**

Text Books:

1. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd - 2019.
2. A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.
3. Scotofer, contemporary business communication, Biztant ra
4. Chaturvedi P D & Mukesh chaturvedi - Business communication:Concepts, cases & applications-2/e, pearson education.
5. Essential of Business communication – Rajendra Pal and J.S Korlhall – Sultan Chand & Sons, New Delhi.

Reference Books:

1. Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN- 978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
2. English for Engineers by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978- 93-86668-45-5), 2019.
4. A Course in Technical English – D Praveen Sam, KN Shoba, Cambridge University Press – 2020.
5. Practical English Usage by Michael Swan, Oxford University Press – 2016.
6. Business Communication – K.K. Sinha – Galgotio Publishing Company, New Delhi.

Course outcome (Course Skill Set)

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

CO 1	Understand and apply the Fundamentals of Communication Skills in their communication skills.
CO 2	Learn sensible writing
CO 3	To impart basic English grammar and essentials of language skills as per present requirement.
CO 4	Understand and use all types of English vocabulary and language proficiency
CO 5	Adopt the Techniques of Information Transfer through presentation.

INDIAN CONSTITUTION

Course Code	**22ICO17/27**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	1:0:0:0	Exam Hours	1.0
Total Hours of Pedagogy	15 Hours Theory	Credits	01

Prerequisite: Nil

Course Objectives :

To enable the students to obtain the basic knowledge about Indian Constitution in the following topics:-

- To know about the basic structure of Indian constitution
- To know the Fundamental Rights (FR's) & Fundamental Duties (FD's) , And DPSP's of our constitution.
- To know the State Executive
- To know about our Union Government
- To Learn emergency provisions and Elections process/system of India

MODULES	Teaching Hours
Module-I **Introduction to Indian constitution** : The Constituent Assembly of India. Sources and Features of the Indian Constitution. Preamble to the Constitution of India.	**03 Hours**
Module-II **Fundamental rights & duties and Directive Principles of the State Policy** Salient Features of Fundamental Rights and their classification. General exercise of Fundamental Rights and their limitations. Fundamental Duties. and Directive Principles of the State Policy	**03 Hours**
Module-III **The State Executive**: The Governor- Appointment, Powers and Functions of the Governor. The Chief Minister - Appointment, Powers and Functions of CM. The State Council of Ministers and their Functions. The State legislature(MLA) and The State Council(MLC). The High Court of the State - Appointment and Qualifications of High Court Judges., its Powers and Jurisdiction	**03 Hours**
Module-IV **The Union Executive**: The President of India - His Election, Powers and Functions. The Vice-President of India - His Election, qualifications, Powers and Functions. The Supreme Court of India - Appointment and Qualification of Supreme Court Judges and its Powers and Jurisdiction..The Parliament of India. The Prime Minister - His Appointment, Qualification ,Powers and Functions. Union cabinet – Its Functions	**03 Hours**

MODULES	Teaching Hours
Module-V **Emergency Provisions and Election Process** : Different types of Emergencies under Article 352, 356 and 360 of the Constitution of India. The Election Commission of India- its Powers and Functions. The State Election Commission	**03 Hours**

Text Books :

1. An introduction to the constitution of India and Profession Ethics. By B. R. Venkatesh and Merunandan K. B. Publisher : Idea International Publication Bangalore.
2. The Constitution of India and Professional Ethics. By K. R. Phaneesh. Publisher : Sudha Publication Bangalore.
3. Professional Ethics. By S. Chand. Publisher : S. Chand & Company Ltd. Ram Nagar, New Delhi - 110055.

Reference Books :

1. Constitution of India and Professional Ethics
   By : M Raja Ram. Publisher : New Age International(P) Limited, New Delhi.
2. The Constitutional law of India
   By : J.N.Pandhey . Publisher : Central Law agency , Allahabad.

https://legislative.gov.in/constitution-of-india
https://www.constitutionofindia.net/

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO 1	Analyse the basic structure of Indian Constitution - Constituent Assembly , Sources, features and preamble to the Constitution of India
CO 2	Describe the Fundamental rights & duties and Directive Principles of the State Policy
CO 3	Understand our State Executive
CO 4	Understand our Union Executive
CO 5	Explain the types of emergencies and election process in India

SCIENTIFIC FOUDATIONS OF HEALTH

Course Code	**22SFH18/28**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	1:0:0:0	Exam Hours	
1:30Min Total Hours of Pedagogy	15 Hours Theory	Credits	01

Pre-requisite : NIL

Course Objectives : The course Scientific Foundations of Health (22SFH18/28) will enable the students:

1. To know about Health and wellness (and its Beliefs) & its balance for positive mindset.
2. To build the healthy lifestyles for good health for their better future.
3. To Create a Healthy and caring relationships to meet the requirements of good/social/ positive life.
4. To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future
5. To Prevent and fight against harmful diseases for good health through positive mindset

MODULES	Teaching Hours
Module-I **Good Health & It's balance for positive mindset:** Health -Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Methods to improve good psychological health, Changing health habits for good health.	**03 Hours**
Module-II **Building of healthy lifestyles for better future:** Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries.	**03 Hours**
Module-III **Creation of Healthy and caring relationships :** Building communication skills, Friends and friendship - Education, the value of relationship and communication skills, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering.	**03 Hours**

Module-IV **Avoiding risks and harmful habits:** Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, How addiction develops, Types of addictions, influencing factors of addictions, Differences between addictive people and non addictive people & their behaviors. Effects of addictions Such as..., how to recovery from addictions.	**03 Hours**
Module-V **Preventing & fighting against diseases for good health:** How to protect from different types of infections, How to reduce risks for good health, Reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life, Health & Wellness of youth :a challenge for upcoming future, Measuring of health & wealth status.	**03 Hours**

Text book:

1. "Scientific Foundations of Health" – Study Material Prepared by Dr. L Thimmesha, Published in VTU- University Website.
2. "Scientific Foundations of Health", (ISBN-978-81-955465-6-5) published by Infinite Learning Solutions, Bangalore – 2022.
3. Health Psychology - A Textbook, FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press.

Reference books:

1. Health Psychology (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.
2. HEALTH PSYCHOLOGY (Ninth Edition) by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press.
3. SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos and other materials / notes.
4. Scientific Foundations of Health (Health & Welness) - General Books published for university and colleges references by popular authors and published by the reputed publisher.

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	To understand and analyse about Health and wellness (and its Beliefs) & It's balance for positive mindset.
CO2	Develop the healthy lifestyles for good health for their better future.
CO3	Build a Healthy and caring relationships to meet the requirements of good/social/positive life
CO4	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.
CO5	Prevent and fight against harmful diseases for good health through positive mindset.

GREEN BUILIDNG

Course Code	**22ETC15A/25A**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	THEORY	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours Theory	Credits	03

Pre-Requisite: NIL

Course objectives: This course will enable students to:

- Understand the Definition, Concept & Objectives of the terms cost effective construction and green building
- Apply cost effective techniques in construction
- Apply cost effective Technologies and Methods in Construction
- Understand the Problems due to Global Warming · State the Concept of Green Building · Understand Green Buildings

MODULES	Hours
Module-I Environmental implications of buildings energy, carbon emissions, water use, waste disposal. Introduction to green building, benefits, site selection, selection of materials.	**09 Hours**
Module - II Resources, efficiency, Materials impacts increasing energy efficiency, recycling of industrial and building waste, biomass resources for building, use of renewable energy systems and impacts.	**09 Hours**
Module-III Comforts in buildings, thermal, light ventilation in buildings, heat transfer characteristics in buildings, incidence of solar energy in materials for lightening and ventilation comfort.	**08 Hours**
Module -IV Energy conservation, concepts of solar passive cooling and heating of building, low energy cooling, Case studies on residential and commercial buildings	**08 Hours**
Module-V Water conservation, Rain water harvesting: definition, types and advantages, concepts of green composite	**08 Hours**

Text book:

1. K.S. Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Michael Bauer, Peter Mösle and Michael Schwarz "Green Building - Guidebook for Sustainable Architecture" Springer, 2010
3. Environmental Engineering vol-II By S.K.Gerg, Khanna publications

Reference books:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010. Michael F. Ashby Materials and the Environment, Elsevier, 2009.
3. Jerry Yudelson Green building Through Integrated Design.McGraw Hill, 2009.
4. Mili M. Ajumdar (Ed) Energy Efficient Building in India.Teri and Mnes, 2001 / 2002.
5. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
6. Green My Homel: 10 Steps to Lowering Energy Costs and Reducing Your Carbon Footprint,by Dennis

C. Brewer, ISBN:9781427798411, Publisher: Kaplan Publishing, Publication Date: October 2008.

7. B. Givoni, Man, Climate and Architecture Elsevier, 1969.
8. T. A. Markus and E. N. Morris Buildings Climate and Energy. Pitman, London, 1980. ArvindKishan et al (Ed)

Course Outcomes

CO1: To understand the Concepts, Benefits, and the materials for Green building.

CO2: To know the energy efficiency, recycling of wastes for Green building.

CO3: To understand the Thermal, Heat Transfer and ventilation of Buildings

CO4: To acquire knowledge of energy conservation in buildings

CO5: To understand the practices for water conservation.

INTRODUCTION TO SOLAR PV SYSTEMS

Course Code	**22ETC15B/25B**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	THEORY	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours Theory	Credits	03

Prerequisite: Students should have the knowledge of

1. Energy Fundamentals.
2. Renewable energy sources

Course objectives.

- Understanding the need of energy and basics of solar radiations.
- Study different solar thermal energy applications.
- Expose to PV Industry and different PV technologies.
- Study Inverters and different components of PV system.
- Study the installation of PV systems and O&M.

MODULES	Hours
Module-I **Solar Resource and Radiation** **An introduction to Energy Sources:** Energy consumption as a measure of Prosperity, world energy futures and energy sources and their availibity. **Solar Resource and Radiation:** Solar resources, Quantifying solar radiation, The effect of the Earth's atmosphere on solar radiation, Sun geometry, Geometry for installing solar arrays.	09 Hours
Module - II **Solar thermal energy The solar energy option – An overview of thermal applications:** Devices for thermal collection and storage, thermal applications and some observations.	09 Hours
Module-III **PV Industry and Technology** **PV Industry and Technology:** Semiconductor devices, Mainstream technologies, Mono crystalline silicon, Multi crystalline/polycrystalline silicon, Thin film solar cells, Contacts, Buying solar modules, Standards, Certifications, Warranties, Emerging technologies, Dye-sensitized solar cells, Sliver cells, Hetero junction with intrinsic thin layer (HIT) photovoltaic cells, Solar concentrators. **PV Cells, Modules and Arrays:** Characteristics of PV cells, Graphic representations of PV cell performance, Connecting PV cells to create a module, Specification sheets, Creating a string of modules, Creating an array, Photovoltaic array performance, Irradiance, Temperature, Shading.	08 Hours
Module -IV **Inverters and Other System Components** **Inverters and Other System Components:** Introduction, Inverters, Battery inverters, Grid-interactive inverters, Transformers, Mainstream inverter technologies,	

MODULES	Hours
String inverters, Multi-string inverter, Central inverter, Modular inverters, Inverter protection systems, Self-protection, Grid protection. Balance of system equipment: System equipment excluding the PV array and inverter, Cabling, PV combiner box, Module junction box, Circuit breakers and fuses, PV main disconnects/isolators, Lightning and surge protection, System monitoring, Metering, Net metering, Gross metering. Mounting Systems: Roof mounting systems, Pitched roof mounts, Pitched roof mounts for tiled roofs, Pitched roof mounts for metal roofs Rack mounts, Direct mounts, Building-integrated systems, Ground mounting systems, Ground rack mounts, Pole mounts, Sun-tracking systems, Wind loading.	08 Hours
Module-V **Installing Grid-connected PV Systems** **Installing Grid-connected PV Systems:** PV array installation, DC wiring, Cabling routes and required lengths, Cable sizing, PV combiner box, System grounding/earthling, Inverter installation, Installation checklist, Interconnection with the utility grid, Required information for installation, Safety. **System Commissioning:** Introduction, Final inspection of system installation, Testing, Commissioning, System documentation. **System Operation and Maintenance:** System maintenance, PV array maintenance, Inverter maintenance, System integrity, Troubleshooting, Identifying the problem, Troubleshooting PV arrays, Troubleshooting underperforming systems, Troubleshooting inverters, Other common problems.	08 Hours

Question paper pattern:
Total ten questions will be asked, two from each module. The student has to answer five questions, selecting at least one from each module.

Reference Books

1. Chetan Singh Solanki, Solar Photovoltaic Technology And Systems - A Manual For Technicians, Trainers And Engineers, PHI Publication New Delhi- 2013 Edition.

2.Geoff Stapleton Susan Neill, Grid-connected Solar Electric Systems: The Earthscan Expert Handbook for Planning, Design and Installation, Routledge; 1st edition 2021.

3. Chetan Singh Solanki, Solar Photovoltaic's: Fundamentals, Technologies And Applications , PHI Publication New Delhi, 3rd Edition

4. GD Rai, Non Convention Sources of Energy, Khanna Publishers, New Delhi, 5th Edition

5..SP Sukhatme, JK Nayak, Solar Energy, TMH Publishing Company limited New Delhi, 3rd Edition

Course outcomes: On completion of the course, the student will have the ability to

CO1	Understand the needs of energy and discuss the solar radiation.
CO2	Appreciate the solar thermal energy applications.
CO3	Discuss the PV technology and Industry.
CO4	Identify the components of PV system and Inverters.
CO5	Understand the installation of PV system and O&M of PV systems

RENEWABLE ENERGY SOURCES

Course Code	**22ETC15C/25C**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	THEORY	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours Theory	Credits	03

Prerequisite: Nil

Course objectives:

- To understand energy scenario, energy sources and their utilization.
- To explore society's present needs and future energy demands.
- To Study the principles of renewable energy conversion systems.
- To exposed to energy conservation methods.

MODULES	Hours
Module-I **Introduction: INTRODUCTION:** Principles of renewable energy and there types. energy and sustainable development,– Environmental Aspects of Energy Utilization– Renewable Energy Scenario in India and around the World and Potentials – Achievements / Applications	09 Hours
Module - II **SOLAR ENERGY:** Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors - Fundamentals of Solar Photo Voltaic Conversion – Solar PV Power Generation – Solar energy Applications	09 Hours
Module-III **WIND ENERGY:** Wind Data and Energy Estimation – Wind Energy Conversion Systems – Performance – Site Selection— Safety and Environmental Aspects. **BIOMASS ENERGY:** Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome and floating type; Urban waste to energy conversion. Biomass Applications.	08 Hours
Module -IV **Tidal Power:** Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations. **Ocean Thermal Energy Conversion:** Principle of working, OTEC power stations in the world, advantages and disadvantage with OTEC.	08 Hours
Module-V **Green Energy:** Introduction, Fuel cells: Classification of fuel cells – H_2; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy.	08 Hours

Suggested Learning Resources:

Text Books:

1. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition,
2. Energy Technology, S.Rao and Dr. B.B. Parulekar, Khanna Publication.Solar energy, Subhas P Sukhatme, Tata McGraw Hill, 2nd Edition,1996.

Reference Books:

1. Principles of Energy conversion, A. W. Culp Jr.,, McGraw Hill, 1996
2. Non-Convention EnergyResources, Shobh Nath Singh, Pearson, 2018

Course outcome (Course Skill Set)

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

CO1	Describe the environmental aspects of renewable energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
CO2	Describe the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation.
CO3	Understand the conversion principles of wind and tidal energy
CO4	Understand the concept of biomass energy resources and green energy
CO5	Acquire the basic knowledge of ocean thermal energy conversion and hydrogen energy.

INTRODUCTION TO INTERNET OF THINGS

Course Code	**22ETC15D/25D**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	THEORY	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours Theory	Credits	03

Prerequisite: NIL

Course objectives:

- Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.
- Understand the recent application domains of IoT in everyday life.
- Gain insights about the current trends of Associated IOT technologoes and IOT Anlaytics

MODULES	Hours
Module-I **Basics of Networking:** Introduction, Network Types, Layered network models **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components Textbook 1: Chapter 1- 1.1 to 1.3 Chapter 4 – 4.1 to 4.4	**09 Hours**
Module - II **IoT Sensing and Actuation:** Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. Textbook 1: Chapter 5 – 5.1 to 5.9	**09 Hours**
Module-III IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading. Textbook 1: Chapter 6 – 6.1 to 6.5	**08 Hours**
Module -IV ASSOCIATED IOT TECHNOLOGIES Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service. IOT CASE STUDIES Agricultural IoT – Introduction and Case Studies Textbook 1: Chapter 10– 10.1 to 10.6; Chapter 12- 12.1-12.2	**08 Hours**

MODULES	Hours
Module-V IOT CASE STUDIES AND FUTURE TRENDS Vehicular IoT – Introduction Healthcare IoT – Introduction, Case Studies IoT Analytics Introduction Textbook 1: Chapter 13– 13.1; Chapter 14- 14.1-14.2; Chapter 17- 17.1	**08 Hours**

Text book:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.

Reference:

Reference books:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Course outcome (Course Skill Set)

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

CO1	Describe the evolution of IoT, IoT networking components, and addressing strategies in IoT.
CO2	Classify various sensing devices and actuator types.
CO3	Demonstrate the processing in IoT.
CO4	Explain Associated IOT Technologies
CO5	Illustrate architecture of IOT Applications

INTRODUCTION TO CYBER SECURITY

Course Code	**22ETC15E/25E**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	THEORY	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours Theory	Credits	03

Course objectives:

- To familiarize cybercrime terminologies and perspectives.
- To understand Cyber Offenses and Botnets.
- To gain knowledge on tools and methods used in cybercrimes.
- To understand phishing and computer forensics

MODULES	Hours
Module-I **Cybercrime:** Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives Textbook:1 Chapter 1 (1.1 to 1.5, 1.7-1.9)	**09 Hours**
Module - II **Cyber Offenses:** **How Criminals Plan Them:** Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercaafe & cybercrimes. **Botnets:** The fuel for cybercrime, Attack Vector. Textbook:1 Chapter 2 (2.1 to 2.7)	**09 Hours**
Module-III **Tools and Methods used in Cybercrime:** Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks. Textbook:1 Chapter 4 (4.1 to 4.9, 4.12)	**08 Hours**
Module -IV **Phishing and Identity Theft:** Introduction, methods of phishing, phishing,phising techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft Textbook:1 Chapter 5 (5.1. to 5.3)	**08 Hours**
Module-V **Understnading Computer Forensics:** Introdcution, Historical Background of Cyberforensics, Digital Foresics, Science, Need for Computer Foresics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics. Textbook:1 Chapter 7 (7.1. to 7.5, 7.7 to 7.9)	**08 Hours**

Text book:1.

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

Reference books:

Course outcome (Course Skill Set)

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

CO1	Explain the cybercrime terminologies
CO2	Describe Cyber offenses and Botnets
CO3	Illustrate Tools and Methods used on Cybercrime
CO4	Explain Phishing and Identity Theft
CO5	Justify the need of computer forensics

MATHEMATICS FOR CIVIL ENGINEERING STREAM - II

[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2022-23)

Course Code	22MATC21	CIE Marks	50
Credits	04	SEE Marks	50
Course Type	Integrated		
Contact Hours/Week (L-T-P)	2-2-2	Total Marks	100
Contact Hours of Pedagogy	42 hours Theory +10 Lab slots	Exam Hours	03

Prerequisite: Nil

Course objectives:

Familiarize Vector calculus essential for civil engineering.

Analyze Civil engineering problems by applying Partial Differential Equations.

Develop the knowledge of solving civil engineering problems numerically.

MODULES	Hours
Module-1 Vector Calculus **Introduction to Vector Calculus in Civil Engineering applications.** **Vector Differentiation:** Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force andflux. Statement of Green's theorem and Stoke's theorem. Problems. **Self-Study:** Volume integral and Gauss divergence theorem. **Applications:** Heat and mass transfer, oil refinery problems, environmental engineering. Analysis of streamlines, velocity and acceleration of a moving particle.	**09 Hours**
Module-2 Ordinary Differential Equations of higher order **Importance of higher-order ordinary differential equations in Civil Engineering applications.** Higher-order linear ODEs with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations - Problems. **Self-Study:** Formulation and solution of Cantilever beam. Finding the solution by the method of undetermined coefficients.**Applications:** Oscillations of a spring, Transmission lines, Highway engineering.	**08 Hours**
Module-3 Partial Differential Equations (PDEs) **Importance of partial differential equations for Civil Engineering applications** Formation of PDE's by elimination of arbitrary constants and functions. Solution of nonhomogeneous PDE by direct integration. Homogeneous PDEs involving derivatives	**08 Hours**

with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation. **Self-Study:** Solution of one-dimensional heat equation and wave equation by the method of separation of variables. **Applications:** Design of structures (vibration of rod/membrane)	
Module-4 Numerical Methods -1 **Importance of numerical methods for discrete data in the field of Civil Engineering.** Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof). Problems. N**umerical integration**: Trapezoidal, Simpson's (1/3)rd and (3/8)th rules (without proof). Problems. **Self-Study:** Bisection method, Lagrange's inverse Interpolation**.** **Applications:** Estimating the approximate roots, extremum values, Area, volume, and surface area. Finding approximate solutions to civil engineering problems.	**09 Hours**
Module-5 Numerical Methods -2 **Introduction to various numerical techniques for handling Civil Engineering applications.** **Numerical Solution of Ordinary Differential Equations (ODE's):** Numerical solution of ordinary differential equations of first order and first degree – Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (No derivations of formulae). Problems. **Self-Study:** Adam-Bashforth method. **Applications:** Finding approximate solutions to ODE related to civil engineering fields	**08 Hours**

Suggested Learning Resources:
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)
Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press,3rd Ed., 2016.
3. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.

6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
7. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.
CO2	Analyze the solution of higher order ordinary differential equations.
CO3	Demonstrate partial differential equations and their solutions for physical interpretations.
CO4	Apply the knowledge of numerical methods in solving physical and engineering phenomena.
CO5	Get familiarize with modern mathematical tools namely Mathematica/MatLab/Python/Scilab

Practical Module

1. Finding gradient, divergent, curl and their geometrical interpretation
2. Verification of Green's theorem
3Solutions of Second-order ordinary differential equations with initial/boundary conditions
4. Solution of a differential equation of oscillations of a spring/deflection of a beam with different loads
5. Solution of one-dimensional heat equation and wave equation
6. Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method
7. Interpolation/Extrapolation using Newton's forward and backward difference formula
8. Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9. Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10. Solution of ODE of first order and first degree by Runge-Kutta 4th order and Milne's predictor-corrector method

Suggested software's: Mathematica/MatLab/Python/Scilab

PHYSICS FOR CIVIL ENGINEERING STREAM

Course Code:	**22PHYC12/22**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours Theory + 12 Hours Lab	Credits	04

Prerequisite:
Basics of Oscillations, Elasticity, Stress & Strain,
Basics of Sound, Waves & light properties, Properties of light. Oscillations.

Course objectives.

- To understand the types of oscillation, shock waves & its generation, and applications.
- To Study the elastic properties of materials and failures of engineering materials
- To Study the acoustics buildings and the essentials of radiometry and photometry.
- To understand the principles photonic devices and their application relevant to civil engineering.
- To understand the various natural disaster and safety

Modules	Teaching Hours
Module-1 **Module -I: Oscillations and Shock waves:** **Oscillations:** Simple Harmonic motion (SHM), Differential equation for SHM (No derivation), Sprigs: Stiffness Factor and its Physical Significance, Series and Parallel combination of springs (Derivation), Types of Springs and their applications. Theory of Damped oscillations (Qualitative), Types of Damping (Graphical Approach). Engineering applications of Damped oscillations, Theory of Forced oscillations (Qualitative), Resonance, Sharpness of resonance. Numerical Problems. **Shock waves:** Mach number and Mach Angle, Mach Regimes, Definition and Characteristics of Shock waves, Construction and working of Reddy Shock tube, Applications of Shock Waves, Numerical problems. **Pre-requisites: Basics of Oscillations** **Self-learning: Simple Harmonic motion, Differential equation for SHM**	**08 Hours**
Module-2 **Elasticity** Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Y, n and ó (with derivation), mention relation between K, Y and ó, limiting values of Poisson's ratio. Beams, Bending moment and derivation of expression, Cantilever and I section girder and their Engineering Applications, Elastic materials (qualitative). Failures of engineering materials - Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), Numerical problems. **Pre requisites: Elasticity, Stress & Strain Self-learning: Stress-Strain Curve**	**08 Hours**

Module-3 **Acoustics, Radiometry and Photometry:** **Acoustics:** Introduction to Acoustics, Types of Acoustics, Reverberation and reverberation time, Absorption power and Absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), Measurement of absorption coefficient, Factors affecting the acoustics and remedial measures, Sound Insulation and its measurements. Noise and its Measurements, Impact of Noise in Multi-storied buildings. **Radiometry and Photometry:** Radiation Quantities, Spectral Quantities, Relation between luminance and Radiant quantities, Reflectance and Transmittance, Photometry (cosine law and inverse square law). **Prerequisites: Basics of Sound, Waves & light properties. Self-learning: Introduction to acoustics.**	**08 Hours**
Module-4	
Photonics: **LASER** Properties of a LASER Beam, Interaction of Radiation with Matter, LASER action, Population Inversion, Metastable State, Requisites of a LASER System, Semiconductor LASER, LASER Range Finder, LIDAR, Road Profiling, Bridge Deflection, Speed Checker, Numerical Problems. **Optical Fiber** Principle and Construction of Optical Fibers, Acceptance angle and Numerical Aperture (NA), Expression for NA, Modes of Propagation, Attenuation and Fiber Losses, Fiber Optic Displacement Sensor, Fiber Optic Temperature Sensor, Numerical Problems **re requisite: Properties of light.** **Self-learning: Total Internal Reflection.**	**08 Hours**
Module-5 **Natural hazards and Safety** Introduction, Earthquake, (general characteristics, Physics of earthquake, Richter scale of measurement and earth quake resistant measures), Tsunami (causes for tsunami, characteristics, adverse effects, risk reduction measures, engineering structures to withstand tsunami), Landslide (causes such as excess rain fall, geological structure, human excavation etc., types of land slide, adverse effects, engineering solution for landslides). Forest Fires and detection using remote sensing. Fire hazards and fire protection, fire-proofing materials, fire safety regulations and firefighting equipment-Prevention and safety measures. Numerical Problems. **Pre requisite: Oscillations. Self-learning: Richter scale.**	**08 Hours**

Course outcome (Course Skill Set)

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

- CO1 **Elucidate** the concepts in oscillations, waves, elasticity and material failures
- CO2 **Summarize** concepts of acoustics in buildings and explain the concepts in radiation and photometry
- CO3 **Discuss** the principles photonic devices and their application relevant to civil engineering.
- CO4 **Describe** the various natural hazards and safety precautions.
- CO5 **Practice** working in groups to conduct experiments in physics and **perform** precise and honest measurements.

Laboratory Component:
Any Ten Experiments have to be completed from the list of experiments
Note: The experiments have to be classified into

(a) Exercise
(b) Demonstration
(c) Structured Inquiry
(d) Open Ended

Based on the convenience classify the following experiments into above categories. Select at least one simulation/spreadsheet activity.

List of Experiments

1. Determination of Young's modulus of the material of the given bar Uniform Bending.
2. Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
3. Study of Forced Mechanical Oscillations and Resonance.
4. Study of the frequency response of Series & Parallel LCR circuits.
5. Determination of Fermi Energy of the given Conductor.
6. Determination of Resistivity by Four Probe Method.
7. Determination of effective spring constant of the given springs in series and parallel combinations.
8. Determination of Young's modlus of the material of the given bar Single Cantilever.
9. Determination of the the Moment of Inertia of the given irregular body using torsional pendulum.
10. Determination of Wavelength of Laser using Diffraction Grating.
11. Determination of Acceptance angle and Numerical Aperture of the given Optical Fiber.
12. Determination of the Radius of Curvature of the given Plano Convex Lens by setting Newton's Rings.
13. Step Interactive Physical Simulations.
14. Study of motion using spread Sheets
15. Application of Statistics using Spread Sheets.
16. PHET Interactive Simulations :
17. Fly wheel
18. Interference of air wedge

(https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

ENGINEERING MECHANICS

Course Code	22CIV13/23	CIE Marks	50
Credits	03	SEE Marks	50
Course Type	Theory		
Contact Hours/Week (L-T-P)	2-2-0-0	Total Marks	100
Contact Hours of Pedagogy	42 hours Theory	Exam Hours	03

Prerequisite: Physics and Mathematics

Course Learning Objectives:

To enable the student to acquire the knowledge in the following topics

1) Understanding and solving the problems involving forces, loads and reactions, Moments and its applications of concurrent force system.
2) Solving the problems of couples and equilibrium of bodies.
3) To determine support reactions and friction of rigid bodies on horizontal and inclined planes.
4) To determine the center of gravity and moment of inertia of planar sections.
5) To study the concept of work, power &energy.

MODULES	Teaching Hours
Module-I Introduction to Engineering Mechanics, force Systems, Basic concepts, Particle equilibrium; Rigid Body equilibrium; System of Forces; Coplanar Concurrent Forces, Composition and resolution of force systems, Resultant force, Moment of Forces and its Application; law of transmissibility of forces, Application based numerical examples	**10 Hours**
Module-II Varignon's theorem of moments Couple system, equivalent force couple system, composition of coplanar non concurrent force system, Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and conditions of equilibrium law of superposition of forces. Application based Numerical examples	**10 Hours**
Module-III Types of supports, types of loads, concept of statically determinate and indeterminate beams, support reactions for statically determinate beams. Friction, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Impending motion on horizontal and inclined planes, wedge friction, ladder friction. Application based Numerical examples	**10 Hours**

Module-IV Centroid of plane figures, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; locating the centroid of triangle, semicircle, quadrant of a circle and sector of a circle, centroid of the simple built sections & composite sections, Moment of inertia concept, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections. Numerical examples	**10 Hours**
Module-V Work, Power & Energy, Introduction, Work of a force, Energy of a particle, principle of work & energy for a system of particles, Potential energy and conservative forces, principles of conservation of energy, Power. Application based Numerical example	**10 Hours**

Text book:

Text Books:

1. S.S.Bhavikatti,"Elementsofcivilengineering",Vikaspublishinghouse Pvt. Ltd., New Delhi.
2. Jagadeesh T.R. and Jayaram, "Elements of civil engineering", Sapna Book House,Bangalore.
3. A.K. Tayal, "Engineering mechanics (Statics & Dynamics)", Ninth edition, Umesh publications, New Delhi.

Reference books:

1. Timoshenko and Young,Engineering Mechanics",McGraw Book Company, New Delhi.
2. Ferdinand P. Beer and E. Russel Johnston Jr., "Mechanics for Engineers: Statics" McGraw Book Company, NewDelhi.
3. K.L. Kumar, "Engineering Mechanics", Tata-McGraw-Hill Publishing company, New Delhi

Course outcome (Course Skill Set)

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

CO1	Determine the resultant of coplanar concurrent force system
CO2	Determine the resultant of non-concurrent force system and analyze the equilibrium of forces
CO3	Determine support reactions and apply of laws of friction for solving engineering problems
CO4	Determine the center of gravity and moment of inertia of plane figures
CO5	Solve the numerical on work, power and energy

INTRODUCTION TO ELECTRICAL ENGINEERING

Course Code	22ESC142/242	CIE Marks	50
Credits	03	SEE Marks	50
Course Type	Theory		
Contact Hours/Week (L-T-P)	3-0-0-0	Total Marks	100
Contact Hours of Pedagogy	42 hours Theory	Exam Hours	03

Prerequisite: Students should have the knowledge of

1. Ohms Law, Kirchhoff's Current and Voltage Law.
2. Fundamentals of AC and DC Circuits.
3. Basics of Magnetism.

Course Objectives

1. Understanding the concept and analysis of Single phase and Three phase AC circuits.
2. Study of construction and performance analysis of single phase transformer.
3. Study of construction and working principle of DC machines
4. Study of construction and working principle of Three phase AC Machines.
5. Study of Power Generation stations, Tariff, measuring instruments and electric safety measures.

MODULES	Hours
Module-I **Introduction:** Conventional and non-conventional energy resources; **Power Generation:** Hydel, Nuclear, Solar & wind power generation (Block Diagram approach). **Electromagnetism:** Faraday Laws of Electromagnetic Induction, Fleming's rules, Lenz's law, types of EMF and numerical.	**8 hrs**
Module-II **A.C. Fundamentals:** Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (only definitions) Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, Active power, reactive power and apparent power. Concept of power factor. (Simple Numerical). **Three Phase Circuits:** Advantages, three phase connections (Star & Delta) (Excluding Derivations).	**8 hrs**
Module-III **DC Machines:** **DC Generator**: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple numerical. **DC Motor:** Principle of operation, back emf and its significance. Torque equation, types of motors, Applications of DC motors. Simple numerical. 3-point starter.	**8 hrs**

Module-IV **Transformers:** Necessity of transformer, principle of operation, Types and construction of singlephase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and simple numerical. Three-phase induction **Motors:** Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical.	**8 hrs**
Module-V **Domestic Wiring:** Requirements, Types of wiring: casing, capping. Two way and three way control of load. **Electricity Bill**: Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock.	**8 hrs**

Question paper pattern: Total ten questions will be asked,two from each module. The student has to answer five questions, selecting at least one from each module.

Reference books:

1. J P Tiwari," Basic Electrical Engineering", New age Publications, 2nd edition, 2011.
2. Rajendra Prasad "Fundamentals of Electrical Engineering", PHI 3rd edition, 2014.
3. B L Theraja& A K Theraja" Electrical Technology", Vol 1 , 2nd edition.
4. B L Theraja& A K Theraja" ABC of Electrical Engineering", 2nd edition.
5. D.P. Kothari and Nagrath "Theory and Problems in electrical Engineering", PHI edition 2011.
6. V. N. Mittal and Arvind Mittal;, " Basic Electrical Engineering" McGraw Hill.
7. R.V. Srinivasa Murthy "Basic Electrical Engineering" Sanguine Technical Publisher2004.

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO's	Course Outcome (CO)
22ESC142/242	CO1	Understand the concepts of various energy sources and Electric circuits.
	CO2	Apply the basic Electrical laws to solve circuits.
	CO3	Discuss the construction and operation of various Electrical Machines.
	CO4	Identify suitable Electrical machine for practical implementation.
	CO5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.

PROFESSIONAL WRITING SKILLS IN ENGLISH

Course Code	**22 PWS 26**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	1:0:0:0	Exam Hours	1:30Min
Total Hours of Pedagogy	15 Hours Theory	Credits	01

Prerquisite: NIL

Course objectives:

The course Communicative English (22PWS26) will enable the students
1. To Identify the Common Errors in Writing and Speaking of English.
2. To Learn effective writing.
3. To read Technical proposals properly and make them to write good technical reports.
4. To Acquire Employment communication skills.
5. To Acquire communication skills at Workplace

MODULES	Teaching Hours
Module-I **Identifying Common Errors in Writing and Speaking English:** Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.	**03 Hours**
Module-II **Effective Writing:** Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Better writing using personal Experiences – Describing a person, situation, memorable events etc…. Sentence arrangements and Corrections activities. Misplaced modifiers, Collocations, Word Order.	**03 Hours**
Module-III **Technical Reading and Writing Practices**: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing - Types of Technical Proposals, Characteristics of Technical Proposals and basic principles of technical writing. Grammar – Cloze Test and Theme Detection Exercises	**03 Hours**
Module-IV **Professional Communication for Employment:** Writing different types of letters – writing for employment, joining letter, complaints & follows up, Enquiries, representation etc. Writing Curriculum Vitae(CV), Official Communication – E-mail & Social Media	**03 Hours**

MODULES	Teaching Hours
Module-V **Professional Communication at Workplace:** Group Discussion – Do and Don't in Group discussion. Debate – Do and Don't in Debate. Group Communication- Meetings, Notice, Planning Meetings, objectives, leading meetings, Minutes of meeting, press conference. Interview – candidates preparation, grooming and Just A Minute (JAM). Speaking for better communication – Speaking about yourself.	**03 Hours**

Text Books:

1."Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022. 2)
2."Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].
3.Murphy – Effective Business Communication – Mc Graw Hill.
4.Nageshwar Rao and Rajendra Das – Business Skills – HPH.
5.Advance Business Communcation – Penrose, Rasberry, Myers, 5/e, cengage learning 2004.
6.Prasad P. Communication Skills, S.K. Kataria & Sons.

Reference Books:

1.English for Engineers by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
2.Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
3.Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4. High School English Grammar & Composition by Wren and Martin, S Chandh & Company Ltd – 2015.
5.Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private
6.Mc Grath – Basic Mangerial Skills – New Delhi – Prentic Hall India learning pvt ltd.
7.Business Communcation – K.K. Sinha – Galgotio Publishing Company, New Delhi.
8.Sen, leena Communication Skills, Prentice Hall of India, New Delhi.

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	To understand and identify the Common Errors in Writing and Speaking.
CO2	To learn effective writing.
CO3	To read Technical proposals properly and make them to Write good technical reports.
CO4	Acquire Employment and Workplace communication skills.
CO5	Acquire communication skills at workplace

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಕನ್ನಡ ಬಲ್ಲ ಮತ್ತು ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ

Subject Code	Subject	Stream	Th– Tut-Pr	Credits
22KSK17 / 27	**SAMSKRUTHIKA KANNADA**	**Humanities and Social Sciences (H.S.S)**	**1 - 0 - 0**	**01**

CIE : 50 **SEE : 50** **SEE : 1 hours 30 Minutes** **Total : 15 Hours**

Course objectives : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

The course (22KSK17/27) will enable the students,

1. ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸಿವುದು.
3. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
4. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
5. ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಘಟಕ -1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು (03 hours of pedagogy)

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಘಟಕ - 2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ (03 hours of pedagogy)

1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ.
2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸರು
   ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು
3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ

ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ (03 hours of pedagogy)

1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ದು ಕೆಲವು ಭಾಗಗಳು
2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ
3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ (03 hours of pedagogy)

1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ (03 hours of pedagogy)

1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

Course outcome (Course Skill Set)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ (22KSK17/27) ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ :

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

CO1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.
CO2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ.
CO3	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO4	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO5	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

University Prescribed Textbook :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.

2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಪದ್ಯ & ಗದ್ಯ ಭಾಗ ಹಾಗೂ ಇತರ ಲೇಖನಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

==========

3. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.

4. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments.

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)

ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)

Subject Code	Subject	Stream	Th– Tut-Pr	Credits
22KBK17 / 27	**BALAKE KANNADA**	**Humanities and Social Sciences (H.S.S)**	**1 - 0 - 0**	**01**

Course objectives : ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

The course (22K**B**K17/27) will enable the students,

1. To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
2. To enable learners to Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To train the learners for correct and polite conservation.
5. To know about Karnataka state and its language, literature and General information about this state.

Course outcome (Course Skill Set)

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:

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

CO1	To understand the necessity of learning of local language for comfortable life.
CO2	To speak, read and write Kannada language as per requirement.
CO3	To communicate (converse) in Kannada language in their daily life with kannada speakers.
CO4	To Listen and understand the Kannada language properly.
CO5	To speak in polite conservation.

Module - 1 (03 hours of pedagogy)

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities, Key to Transcription
3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words

Module - 2 (03 hours of pedagogy)

1. **ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - Possessive forms of nouns, dubitive question and Relative nouns**
2. **ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals**
3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು –ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ – (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) –**Predictive Forms, Locative Case**

Module - 3 (03 hours of pedagogy)

1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - **Dative Cases, and Numerals**
2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು **-Ordinal numerals and Plural markers**
3. ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು & ವರ್ಣ ಗುಣವಾಚಕಗಳು –**Defective/Negative Verbs & Colour Adjectives**

Module- 4 (03 hours of pedagogy)

1. **ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and Urging words (Imperative words and sentences)**
2. **ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative Cases and Potential Forms used in General Communication**
3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs
4. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words

Module - 5 (03 hours of pedagogy)

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು -Different types of Tense, Time and Verbs
2. ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms
3. **Kannada Vocabulary List :ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು -Kannada Words in Conversation**

University Prescribed Textbook :

ಬಳಕೆ ಕನ್ನಡ

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ಸೂಚನೆ :

ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.

2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಭಾಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

==========

3. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.

4. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

Pattern of question paper

1. SEE Paper shall be set for 50 questions, each carrying 1 mark. The pattern of the question paper is MCQ

INNOVATION AND DESIGN THINKING

Course Code	**22 IDT 18/28**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	1:0:0:0	Exam Hours	1:30Min
Total Hours of Pedagogy	15 Hours Theory	Credits	01

Prerquisite: NIL

Course objectives:

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
- To discuss the methods of implementing design thinking in the real world.

MODULES		Hours
Module-I **PROCESS OF DESIGN** **Understanding Design thinking** Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping		**03 Hours**
Teaching-Learning Process	Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos	
Module-II **Tools for Design Thinking** Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design		**03 Hours**
Teaching-Learning Process	Case studies on design thinking for real-time interaction and analysis Simulation exercises for collaborated enabled design thinking Live examples on the success of collaborated design thinking	
Module-III **Design Thinking in IT** Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping		**03 Hours**
Teaching-Learning Process	Case studies on design thinking and business acceptance of the design Simulation on the role of virtual eco-system for collaborated prototyping	
Module-IV **DT For strategic innovations** Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.		**03 Hours**
Teaching-Learning Process	Business model examples of successful designs Presentation by the students on the success of design Live project on design thinking in a group of 4 students	

Module-V Design thinking workshop Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test		03 Hours
Teaching-Learning Process	8 hours design thinking workshop from the expect and then presentation by the students on the learning from the workshop	

Text book:

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengage learning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

Reference books:

1. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", CengageLearning, Second Edition, 2011.
2. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

Course outcome (Course Skill Set)

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

CO1	Appreciate various design process procedure
CO2	Generate and develop design ideas through different technique
CO3	Identify the significance of reverse Engineering to Understand products
CO4	Draw technical drawing for design ideas

INTRODUCTION TO WEB PROGRAMMING

Course Code	**22PLC15A/25A**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	INTEGRATED	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours	Credits	03

Prerequisite: Nil

Course objectives:

- To use the syntax and semantics of HTML and XHTML l
- To develop different parts of a web page
- To understand how CSS can enhance the design of a webpage.
- To create and apply CSS styling to a webpage
- To get familiarity with the JavaScript language and understand Document Object Model handling of Java Script

MODULES	Teaching Hours
Module-I **Traditional HTML and XHTML :** First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths?	**08 Hours**
Module-II **HTML5:** Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications	**08 Hours**
Module-III **Cascading Style Sheets (CSS) :** Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case Study: Description of a Small City's Core Area.	**09 Hours**
Module-IV **Tables and CSS, Links and Images:** Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo- Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element.	**08 Hours**

MODULES	Teaching Hours
Module - V **Introduction to JavaScript: Functions, DOM, Forms, and Event Handlers :** History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Accessing a Form's Control Values, reset and focus Methods	**09 Hours**

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	Explain the historical context and justification for HTML over XHTML
CO2	Develop HTML5 documents and adding various semantic markup tags
CO3	Analyse various attributes, values and types of CSS
CO4	Implement core constructs and event handling mechanisms of JavaScript.

List of Programs – 22ESC145/245Programming Assignments:

1. Create an XHTML page using tags to accomplish the following:
   (i) A paragraph containing text "All that glitters is not gold". Bold face and italicize this text
   (ii) Create equation:

$$x = 1/3(y_1^2 + z_1^2$$

   (iii) Put a background image to a page and demonstrate all attributes of background imageCreate unordered list of 5 fruits and ordered list of 3 flowers2.

2. Create following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary

Department	**Sem1**	***Subject A***
		Subject B
		Subject C
	Sem2	***Subject E***
		Subject F
		Subject G
	Sem3	***Subject H***
		Subject I
		Subject J

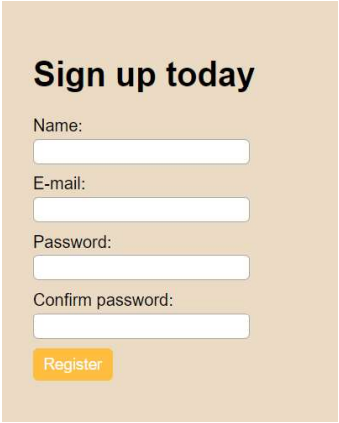
3. Use HTML5 for performing following tasks:
(i) Draw a square using HTML5 SVG , fill the square with green color and make 6px brown stroke width
(ii) Write the following mathematical expression by using HTML5 MathML. d=x2-y2
(iii) Redirecting current page to another page after 5 seconds using HTML5 meta tag

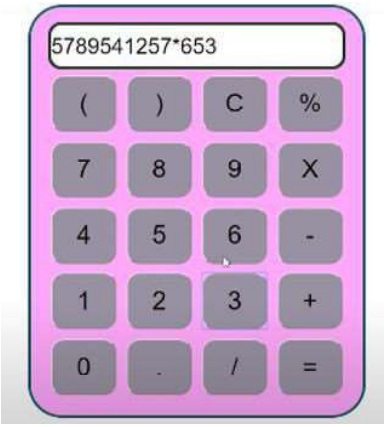
4. Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience.5.

5. Create a class called **income**, and make it a background color of #0ff. Create a class called **expenses**, and make it a background color of #f0f. Create a class called **profit**, and make it a background color of #f00.Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text. Further create following line of text in the same document:~~The current price is 50¹~~ and new price is 40¹~~-~~6.

6. Change the tag **li** to have the following properties:·
A display status of inline·
A medium, double-lined, black border·
No list style typeAdd the following properties to the style for **li**

Margin of 5px
Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px to the leftAlso demonstrate list style type with user defined image logos
7.Create following web page using HTML and CSS with tabular layout**.**





8.Create following calculator interface with HTML and CSSWrite a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay
9.Create a webpage containing 3 overlapping images using HTML, CSS and JS. Further when the mouse is over any image, it should be on the top and fully displayed.

Suggested Learning Resources:
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

TextBook-1: HTML & CSS: The Complete Reference Thomas A. Powell, , Fifth Edition, Tata McGraw Hill,
TextBook-2: WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

INTRODUCTION TO PYTHON PROGRAMMING

Course Code	**22PLC15B/25B**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	INTEGRATED	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours	Credits	03

Prerequisite: Nil

Course objectives:

- Learn the syntax and semantics of the Python programming language.
- Illustrate the process of structuring the data using lists, tuples
- Appraise the need for working with various documents like Excel, PDF, Word and Others.
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object Oriented Programming concepts in Python.

MODULES	Teaching Hours
Module-I **Python Basics**: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, **Flow control:** Boolean Values, Comparison Operators, Boolean Operators,Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules,Ending a Program Early with sys.exit(), **Functions:** def Statements with Parameters, Return Values and return Statements,The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number	**08 Hours**
Module-II **Lists:** The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References, **Dictionaries and Structuring Data:** The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things,	**08 Hours**
Module-III **Manipulating Strings:** Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup **Reading and Writing Files:** Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the print.format() Function, Project: Generating Random Quiz Files, Project: Multiclipboard,	**09 Hours**
Module-IV **Organizing Files:** The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates, Project: Backing Up a Folder into a ZIP File, **Debugging:** Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE s Debugger.	**08 Hours**

Module - V	
Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying, **Classes and functions:** Time, Pure functions, Modifiers, Prototyping versus planning, **Classes and methods:** Object-oriented features, Printing objects, Another example, A more complicated example, Theinit method, The_str_ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation,.	**09 Hours**

Course outcome (Course Skill Set)

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

CO1	Demonstrate proficiency in handling loops and creation of functions.
CO2	Identify the methods to create and manipulate lists, tuples and dictionaries.
CO3	Develop programs for string processing and file organization
CO4	Develop programs for exception handling
CO5	Demonstrate the concepts of Object-Oriented Programming in Python.

List of Programs – 22PLC15B/25B

Programming Exercises:1.

1. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.2.

2. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).3.

3. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.4.

4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.5.

5. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items6.

6. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].7.

7. Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.8.

8. Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.9.

9. Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.10.

10. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use init () method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.

Suggested Learning Resources:
Text Books

1. Al Sweigart, **"Automate the Boring Stuff with Python",** 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)
(Chapters 1 to 18, except 12) for lambda functions use this link: https://www.learnbyexample.org/python-lambda-function/
2. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf
(Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	Demonstrate proficiency in handling loops and creation of functions.
CO2	Identify the methods to create and manipulate lists, tuples and dictionaries.
CO3	Develop programs for string processing and file organization
CO4	Interpret the concepts of Object-Oriented Programming as used in Python.

INTRODUCTION TO C++ PROGRAMMING

Course Code	**22PLC15C/25C**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	INTEGRATED	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours	Credits	03

Course objectives.

- Understanding about object oriented programming and Gain knowledge about the capability to store information together in an object.
- Understand the capability of a class to rely upon another class and functions.
- Understand about constructors which are special type of functions.
- Create and process data in files using file I/O functions
- Use the generic programming features of C++ including Exception handling

MODULES	Teaching Hours
Module-I Introduction to Object Oriented Programming: Computer programming background-C++ overview. First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.	**09 Hours**
Module-II Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading	**08 Hours**
Module-III Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance- Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.	**08 Hours**
Module-IV I/O Streams: C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling during file operations.	**08 Hours**
Module - V Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch block Throw statement- Pre-defined exceptions in C++	**09 Hours**

Suggested Learning Resources:
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)
Textbooks
1. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.

Course outcome (Course Skill Set)

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

CO1	Able to understand and design the solution to a problem using object-oriented programming concepts.
CO2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
CO4	Implement the features of C++ including file stream and file handling
CO5	Demonstrate exception handling in C++

List of Programs – 22PLC15D/22PLC25D

Programming Assignments:

1. Write a C++ program to sort the elements in ascending and descending order.
2. Write a C++ program to find the sum of all the natural numbers from 1 to n.
3. Write a C++ program to swap 2 values by writing a function that uses call by reference technique.
4. Write a C++ program to demonstrate function overloading for the following prototypes.

add(int a, int b) add(double a, double b)

5. Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle".Now, try calling the function by the object of each of these classes.
6. Suppose we have three classes Vehicle, FourWheeler, and Car. The class Vehicle is the base class, the class FourWheeler is derived from it and the class Car is derived from the class FourWheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class FourWheeler has a method 'fourWheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods.So, if we invoke the methods in this order, car(), fourWheeler(), and vehicle(), then the output will be I am a carI have four wheels I am a vehicleWrite a C++ program to demonstrate multilevel inheritance using this.
7. Write a C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.
8. Write a C++ program to write and read time in/from binary file using fstream
9. Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.
10. Write a C++ program function which handles array of bounds exception using C++.

C AND UNIX PROGRAMMING

Course Code	**22PLC15D/25D**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	INTEGRATED	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours	Credits	03

Prerequisite: Nil

Course objectives:

- To learn advanced concepts in pointers to functions, arrays, strings and structures.
- To learn Unix operating system and shell programming

MODULES	Teaching Hours
Module-I Introduction to pointers: The & and * operator, Pointer expressions, Jargon of Pointers, passing addresses to functions, Functions returning pointers, problems. Pointers and arrays: Passing array elements to a function, Pointers and arrays, passing an entire array to a function, Pointers and 2-D arrays, pointer to an array, passing 2D array to a function. problems., File pointers, pointers to functions, argc and argv-Arguments to main( ), pointers and variable number of arguments.	**09 Hours**
Module-II Array of pointers, Dynamic Memory allocation, problems, Pointers and Strings: pointers and strings, const qualifier, 2D array of characters, array of pointers to strings, Limitation of array of pointers to strings. Problems. Pointers and Structures: Array of structures, structure pointers, offsets of Structure Elements. problems.	**08 Hours**
Module-III Architecture of Unix, Features of Unix, Unix Commands - PATH, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, ls-l, ls-d, file ownership, file permissions, chmod, Directory permissions, changing file ownership.	**08 Hours**
Module-IV Process basics, ps, process creation and killing, at , batch and cron commands, File Systems and Inodes, Hard link, symbolic links and ln, The Directory, umask, find, Filters- cut, paste, sort, uniq, tr, grep. System administration, administrators privileges, maintaining security, user management, startup and shutdown, managing Disk space ,Device files, cpio, tar, partitions and file systems, standard file systems and types, creating partitions and file systems, mounting and unmounting file systems.	**09 Hours**

Module - V Shell programming: shell's interpretive cycle, pattern matching, Escaping and Quoting, Redirection, pipes, tee, command substitution, shell variables. shell scripts-simple shell programs using read, if, test, case, expr, while ,for, set, shift.	**09 Hours**

Text Books:

1. Understanding Pointers in C, Yashwant Kanetkar, 3rd Edition, BPB Publisher
2. Unix concepts and applications, Sumitabha Das, 4th edition, Mcgraw Hill Education

Reference Books:

1. The C Companion – Prentice-Hall, INC. Englewood Cliffs, New Jersey 07632 , Allen I. Holub- 1987
2. C Programming – A Modern Approach, K. N. King, 2nd Edition, Mcgraw Hill Education
3. Unix and Shell programming, Dehrouza A Forouzan, Richard F Gilberg, Cengage Learning India 1st Edition

List of Programs

1. Write a C program to convert a number from given base b to decimal.
2. Write a C program to find largest/smallest element using pointers and dynamic memory allocation.
3. Write a C program to implement following built-in string functions using pointers : strcat( ) , strcmp( ) , strlen( ), strcpy( )
4. Write a C program to find substring of a string using function and pointers.
5. Write a C program to sort dynamic 2D-array of strings.
6. Write a C program to find whether a given matrix is symmetric or not using pointers.
7. Write a C program to create structure called course with structure members subject name and marks & display the same using dynamic memory allocation..
8. Write a C program to find distance between two coordinates x & y using pointers to structures as function arguments.
9. Write a C program to demonstrate command line arguments argc( ) and argv( ), such that the input given as argv[1] is converted to int , argv[2] is converted to float and open a file whose path is given as argv[3].

Open-Ended-Program:

10. Write a C program to declare and call a function using function pointers.

Part-B

1. Practice all basic shell commands.
2. Write a Shell Script to display multiplication table using different looping statements .
3. Write a script to find whether a given number is odd or even.
4. Write a shell script to execute various shell commands using case statement.
5. Write a shell script to find sum of all digits from a given number.
6. Write a script to find greatest of three numbers.
7. Write a shell script to backup the files with **.bak** extension and display the completion message after every file is copied.

8. Write a shell script to check whether a given number is Armstrong or not.
9.Write a shell script to reverse a string and check whether a given string is palindrome or not.
10.Write a shell script to count the number of lines, words and characters of an input file.
11.Write a shell script to accept system time and display the message Good Morning / Good afternoon /Good Evening.
12. Write a shell script to find the factorial of a given number.
13. Write a shell script to remove duplicate lines from Files.

Open-Ended-Programs:

14. a) Write a shell script to display the appropriate message when no arguments are input, runs **grep** if two arguments are entered and displays an error massage otherwise.

14b) Write shell script to check user input for null string values, when run without arguments it should turn interactive and takes two inputs from user. It then runs 14a. script with supplied inputs as arguments.

15) Write an interactive shell script that accepts input from the user and looks up a code list of the departments. Accept and validate a department code, display department name and employee-id on the terminal.

Course outcome (Course Skill Set)

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

CO1	Apply pointers in expressions, functions and arrays.
CO2	Illustrate dynamic memory allocation, array of pointers , pointers to strings and structures.
CO3	Demonstrate architecture of unix, unix commands related to files and directories
CO4	Demonstrate lifecycle of Process, system administration and related commands.
CO5	Develop simple shell scripts and demonstrate pattern matching.

BASICS OF JAVA PROGRAMMING

Course Code	**22PLC15E/25E**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	INTEGRATED	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	42 Hours	Credits	03

Prerequisite: Nil

Course objectives:

- Learn fundamental features of object oriented language and JAVA
- Set up Java JDK environment to create, debug and run simple Java programs.
- Learn object oriented concepts using programming examples.
- Study the concepts of importing of packages and exception handling mechanism

MODULES	Teaching Hours
Module-I An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings	**09 Hours**
Module-II Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java s Selection Statements, Iteration Statements, Jump Statements	**08 Hours**
Module-III Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited	**08 Hours**
Module-IV Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class.	**09 Hours**

Module - V Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java s Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions.	**09 Hours**

LIST OF PROGRAMS

Programming Assignments

1. Write a JAVA program that prints all real solutions to the quadratic equation ax2+bx+c=0. Read ina, b, c and use the quadratic formula.
2. Write a JAVA program for multiplication of two arrays.
3.Demonstrate the following operations and sign extension with Java programs (i) << (ii) >> (iii) >>>
4. Write a JAVA program to sort list of elements in ascending and descending order
5. Create a JAVA class called Student with the following details as variables within it.

USN
NAME
BRANCH
PHONE
PERCENTAGE

Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.

6.Write a JAVA program demonstrating Method overloading and Constructor overloading.

7. Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a JAVA program to read and display at least 3 staff objects of all three categories.

8.Demonstrate dynamic dispatch using abstract class in JAVA.

9.Create two packages P1 and P2. In package P1, create class A, class B inherited from A, class C . In package P2, create class D inherited from class A in package P1 and class E. Demonstrate working of access modifiers (private, public, protected, default) in all these classes using JAVA.

10. Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of ArrayIndex Out Of BoundException

Course outcome (Course Skill Set)

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

CO1	To illustrate basics of JAVA programming
CO2	To demonstrate working of operators in JAVA
CO3	To create classes and objects for applications
CO4	To develop simple programs based on polymorphism and inheritance
CO5	To describe the concepts of importing packages and exception handling mechanism

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

CURRICULUM

FOR B.E.III SEMESTER AND IV SEMESTER

FOR THE ACADEMIC YEAR 2023-24

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr.Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart class rooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958 with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35 research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

Hyderabad Karnataka Education Society's

P. D. A COLLEGE OF ENGINEERING, KALABURAGI

B.E in Civil Engineering

Scheme of Teaching and Examination 2022

Outcome Based Education (OBE) and Choice-Based Credit System (CBCS)

Effective from the Academic Year 2023-24

III Semester

Sl. No	Course	Course Code	Couse Title	Teaching Department and Question paper Setting Board	Teaching Hours/Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	BSE	22MATC31	Mathematics for Civil Engg Stream-III	Mathematics	2	2	0	3	50	50	100	3
2	IPCC	22CV32	Strength of Materials	Civil Engg Dept	3	0	2	3	50	50	100	4
3	IPCC	22CV33	Building Planning & Drawing	Civil Engg Dept	3	0	2	4	50	50	100	4
4	PCC	22CV34	Surveying	Civil Engg Dept	2	2	0	3	50	50	100	3
5	PCCL	22CVL35	Surveying Lab	Civil Engg Dept	0	0	2	3	50	50	100	1
6	ESC	22CV36x	Engg Science Course	Civil Engg Dept	3	0	0	1	50	50	100	3
7	UHV	22UHV37	Social Connect and Responsibility	Any Department	0	0	2	1	50	50	100	1
8	AEC	22CVAE38x	AEC/SEC-III	Civil Engg Dept	0	0	2	2	50	50	100	1
9	MC	22xx39	Mandatory Course	NSS/Physical Education/Yoga	0	0	2	--	50	--	50	0
					13	4	12	Total	450	400	850	20

Engineering Science Course (ESC/ETC/PLC)	
22CV36A	**Building materials.**
22CV36B	Rural, Urban Planning and Architecture
22CV36C	Sustainable Design Concept for Building Services
22CV36D	Environmental Protection and Management

Ability Enhancement Course – III	
22CVAE381	Microsoft Excel and Visual Basic Applications (Lab)
22CVAE382	Smart Urban Infrastructure
22CVAE383	**Digital Drafting for Civil Engineers (Lab)**
22CVAE384	Personality Development for Civil Engineers

Hyderabad Karnataka Education Society's

P. D. A COLLEGE OF ENGINEERING, KALABURAGI

B.E in Civil Engineering

Scheme of Teaching and Examination 2022

Outcome Based Education (OBE) and Choice-Based Credit System (CBCS)

Effective from the Academic Year 2022-23

IV Semester

Sl. No	Course	Course Code	Couse Title	Teaching Department	Teaching Hours/Week			Examination				
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
1	PCC	22CV41	Structural Analysis	Civil Engg Dept	2	2	0	3	50	50	100	3
2	IPCC	22CV42	Fluid mechanics	Civil Engg Dept	3	0	2	3	50	50	100	4
3	IPCC	22CV43	Building Construction and Geology	Civil Engg Dept	3	0	2	3	50	50	100	4
4	PCCL	22CVL44	Concrete Technology Lab	Civil Engg Dept	0	0	2	3	50	50	100	1
5	ESC	22CV45x	Engg Science Course	Civil Engg Dept	3	0	0	3	50	50	100	3
6	BSC	22BSC46	Biology for Engineers		3	0	0	3	50	50	100	3
7	UHV	22UHV47	Universal Human Values	Any Department	1	0	0	1	50	50	100	1
8	AEC	22CVAE48x	AEC/SEC-IV	Civil Engg Dept	0	0	2	2	50	50	100	1
9	MC	22XX49	Mandatory Course	NSS/Physical Education/Yoga	0	0	2		50	--	50	0
					15	2	8	Total	450	400	850	20

Engineering Science Course (ESC/ETC/PLC)	
22CV45A	Building Information Modelling in Architecture, Engineering and Construction (BIM)
22CV45B	Construction Equipment, Plants and Machinery
22CV45C	**Concrete Technology**
22CV45D	Hydrology

Ability Enhancement Course / Skill Enhancement Course - IV	
22CVAE481	Finance for Professionals
22CVAE482	**Total station application in Civil Engineering (Lab)**
22CVAE483	Electronic Waste Management - Issues and Challenges
22CVAE484	Components of a Smart City

Engineering Mathematics for Civil Engineering Stream-III
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2022-23)

Course Code	22MATC31	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course Learning Objectives: To enable the students to obtain the knowledge of Engineering Mathematics in the following topics

1. Fourier Series and its application in engineering fields
2. Probability distribution of discrete and continuous random variables
3. Analyze the sample data using Large sample test, t-distribution and chi- distribution

Module-I **9hours**

Statistical methods:

Curve fitting by the method of least squares: Straight line, second degree parabola and the curves of the form $y = ab^x$, $y = ax^b$ *and* $y = ae^{bx}$.

Correlation and lines of regression, angle between two regression lines and rank correlation

RBT Levels: L1, L2 & L3

Module-II **8 hours**

Probability distributions:

Random variable (Discrete and continuous) probability density function, cumulative density function.

Binomial distribution, Poisson distributions, Normal distribution and problems.

RBT Levels: L1, L2 & L3

Module-III **9 hours**

Joint probability distributions:

Concept of joint probability distribution, discrete and continuous random variables independent random variables .problems on expectation and variance

RBT Levels: L1, L2 & L3

Module –IV **8 hours**

Sampling theory -I

Sampling, sampling distribution, standard error, null and alternative hypothesis, Type-I and Type- II errors, Confidence limits. Test of significance for Large sample: Test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations

RBT Levels: L1, L2 & L3

Module –V **8 hours**

Sampling theory -II

Test of significance Small samples student's t-distribution: Test for single mean, difference of means, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes and problems

RBT Levels: L1, L2 & L3

Text books:

1 Higher Engineering Mathematics by B.S.Grewal, Khanna publishers; 40th Edition.2007
2 Engineering Mathematics by N. P. Bali and Manish Goyal. Laxmi publications, latest edition

Reference books:

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & sons 8th Edn.
2. A short course in differential equations – Rainvile E.D.9th Edition.
3. Advanced Engineering Mathematics by R.K.Jain & S.R.K Iyengar; Narosa publishing House.
4. Introductory methods of numerical analysis by S.S.Sastry
5. Statistical Methods Authored By Gupta S.P. Publisher: Sultan Chand & Sons. Publishing Year: 2021
6. Fundamentals of Mathematical Statistics Authored By Gupta S.C.& Kapoor V.K. Publisher:Sultan Chand & Sons.Publishing Year: 2020

Course Outcomes: On completion of this course, students are able to:

CO1: Apply the method of least square to estimate the parameters in regression model CO2:

Solve problems using theoretical probability distributions

CO3: Apply the concepts of joint probability, to find covariance, correlation, independent variables

CO4: Analyze the sample data using Large sample tests

CO5: Analyze the sample data using t-distribution and chi- distribution

Course Title: STRENGTH OF MATERIALS		
Course Code	22CV32	CREDIT: 03
Lecture Hours/Week	3 Hrs. (Theory)+2 hrs. (Practical)	SEE: 50
Total Lecture Hours: 70	CIE: 50 Marks (25m Theory + 25m Practical.)	SEE: 03 Hours

Prerequisite: Elements of Civil Engineering and Engineering mechanics.

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. To understand the behavior of materials under stress and strain.
2. To Analyse an element subjected to compound stress to assess the various stresses in thin and thick cylinders.
3. To understand the concept of shear force and bending moments for beams subjected to various system.
4. To evaluate the bending and shear stress in beam to understand the behavior and design of columns.
5. Strength evaluation and design of circular shaft subjected to torsion and to evaluate the deflection of beams.

Modules	Teaching Hours
Module I **SIMPLE STRESSES AND STRAINS**: Introduction to various strengths of material, concept and definition of stress and strain, types of stresses and strains, Assumptions in strength of materials, stress-strain diagrams for mil for mild steel, ferrous and non-ferrous materials, St Venant's Principle, Hook's Law, Modulus of Elasticity, Poission's ratio, Deformation of bars of uniform cross section, varying cross section. Elongation due to self-weight. Compound bars, Temperature stresses. Elastic constants and their relationship, volumetric strain, application problems.	14 hours

Module II **COMPOUND STRESSES:** Determination of stresses on oblique/inclined plane due to uniaxial, biaxial and general 2D stresses, (Analytical method), Determination of Principal Planes and Principal Stresses, Maximum Shear Stress and their plane (Analytical method) **THIN AND THICK CYLINDERS:** THIN CYLINDERS: Determination of Longitudinal and Circumferential/Hoop's stress, change in dimensions and volume THICK CYINDERS: Assumptions, Lami's equation derivation and problems, radial pressure and hoop stress distribution diagrams.	14 hours
Module III **SHEAR FORCE AND BENDING MOMENT IN BEAMS:** Introduction to types of loads, beams and support with reaction. Definition of Shear force and bending moment, sign conventions. Relationship between load intensity, bending moment and shear force. Shear force diagram (SFD) and Bending moment diagram (BMD) for simply supported beams (both without overhang and with overhangs) and cantilever beams, beams subjected to point loads, UDL, UVL, Couples and their combinations.	14 hours
Module IV **BENDING STRESSES AND SHEAR STRESSES IN BEAMS.** BENDINF STRESSES: Assumptions, Bernoulli's theory of Pure Bending, relationship between bending moment, bending stress and radius of curvature, Moment of Resistance, Section Modulus, flexural rigidity, Modulus of rupture. Bending stress diagram for rectangular, circular, 'I', 'T' and 'L' sections (simple problems), Bending test on Wood under two-point loading. SHEAR STRESS: Expression for transverse shear stressing beams, Shear stress diagram for rectangular, circular, 'I', 'T' and 'L' sections. Bending test on Wood under two-point loading. **TORSION OF CIRCULAR SHAFTS:** Equation for theory of pure Torsion, Assumptions, Torsion equation for circular shaft, Strength and stiffness, torsional rigidity, polar modulus, strengths of solid and hollow shafts, power transmitted by solid and hollow shafts.	14 hours
Module V **ELASTIC STABILITY OF COLUMNS AND STRUTS.** Introduction to short and long columns. Definition of effective length, slenderness ratio, radius	

of gyration, buckling/critical load. Assumption and derivation of Euler's Buckling load for different end conditions. Problems and limitations of "Euler's theory. Rankine's theory, numerical problems. Compression test of Wood **DEFLECTION OF BEAMS:** Definition of stiffness, elastic curve, deflection in simple bending, relation between curvature, Slope and deflection. Double Integration method for cantilever and simply supported beams for point load, UDL, UVL and couple, Macaulay's method, numerical problems.	

STRENGTH OF MATERIALS LAB

Course objectives:

To enable the student to acquire the knowledge in the following topics

- Determine tensile, compressive, torsional, shear and Impact strength of steel samples and interpret the results.
- Determine compressive strength and bending strength of wood samples and interpret the results
- Determine strength properties of brick and tile and interpret the results.

	Teaching Hours
1. Tension test on Mild Steel.	2 Hrs
2. Tension test on HYSD bar	2 Hrs
3. Torsion test on Mild Steel circular sections.	2 Hrs
4. Bending test on Wood under two-point loading.	2 Hrs
5. Compression test of Mild Steel, Cast iron and Wood.	2 Hrs
6. Impact test on Mild steel (Charpy & Izod)	2 Hrs
7. Hardness test on metals-Brinell's Test	2 Hrs
8. Test on Bricks: Compressive strength, Water absorption and Efflorescence.	2 Hrs
9. Demonstration of Strain gauges and Strain indicators.	2 Hrs
10. Demonstration of loading frame	2 Hrs

Course outcomes:

CO1	Demonstrate the concepts of SOM theory course through series of experiments.
CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.
CO3	Perform the experiments and determination of Tension test, Compression test, Torsion test, Bending test, Shear Test, Impact test on Mild steel (Charpy & Izod), Hardness test, Test on Bricks: Compressive strength, Water absorption and Efflorescence, Demonstration of Strain gauges and Strain indicators parameters.
CO4	Analyze the data and interpret the results

CO5	Prepare a well-organized laboratory report.

Question paper pattern:
Two questions to be set from each Module by intermixing the syllabus of respective module. Students have to answer any five full questions by selecting one question from each module. CIE for laboratory is to be conducted with one external examiner from within department.

Text books:

1. S.S.Bhavikatti "Strength of Materials", New age Publications
2. B.S. Basavarajaiah, P Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition (2010)
3. Shesha Prakash MN and Suresh GS, Mechanics of Materials, Prentice Hall, New Delhi,2011
4. R.Subramanian "Strength of Materials" Oxford University Press. 3rdEdition (2016)

Reference Books:

1. D.H. Young, S.P. Timoshenko "Elements of Strength of Materials "East West Press Pvt. Ltd., 5th Edition (Reprint 2014)
2. S.S. Rattan "Strength of Materials" McGraw Hill Education (India)Pvt. Ltd., 2nd Edition (Sixth reprint 2013).

E books and online course materials:

www.civilenggebooks.com

COURSE TITLE: BUILDING PLANNING AND DRAWING		
Course code	22CV33	Credit: 4
Hours/Week	3 Hours (Lectures) 2 Hours (practical)	SEE:50 Marks
Total hours: 42	CIE: 50 Marks (25m Theory + 25m Practical.)	SEE:4 hours

Prerequisite:

Course objectives:
To enable the student to acquire the knowledge in the following topics.

Modules	Teaching Hours
Module I **Principles of Planning:** Aspect, prospect, grouping, space requirement, normal dimensions as per IS 962 orientation of building, building Standards, rules and bye laws of sanctioning Authority. Plot area, built up area, super build up area, carpet area and floor area ratio	7hours
Module II Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Drawing of single storied Residential building (2BHK) with stair case, ii) Drawing Two storied framed building.	12hours
Module-III Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building i) Primary health centre ii) Primary school building iii) College canteen **iv)** Office building **v)** Hostel Building **vi)** Bus Terminal	10hours
Module -IV To prepare working drawing of component of buildings 1. Stepped wall footing. 2. Fully paneled and flush doors 3. Half paneled and half-glazed window 4. Dog legged Staircase and Open well staircase.	8hours
Module – V Preparation of water supply, sanitary and electrical layouts for a given plan.	5hours

Course Outcomes: On completion of this course, students are able to:

CO	

CO1:	Understand the concepts of Principles of Planning.
CO2:	To prepare drawing of plan, elevation, section of Residential building.
CO3:	To prepare bubble diagram and line diagram of public buildings.
CO4	To prepare working drawing of component of buildings of buildings .
CO5	Prepare the Layout of water supply, sanitary and electrical works.

Question paper pattern:
i) Answer **Question No. 3** which is compulsory (40marks) .
ii) Answer any **three-question** selecting one question from remaining modules (20+20+20=60)

BUILDING PLANNING AND DRAWING LAB

	Teaching Hours
1. Lettering and Numerals with specific dimension	
2. Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building:	**2Hrs**
i) Residential building ii) Primary health center, iii) Primary school building	**2Hrs**
3. Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Drawing of single storied Residential building (2BHK) with stair case, ii) Drawing Two storied framed Building.	**4Hrs**
4. To prepare working drawing of component of buildings i. Stepped wall footing. ii. Fully paneled and flush doors, iii. Half paneled and half-glazed window. **iv.** Dog legged Staircase and Open well staircase.	**3Hrs**

Reference books:

1. Shah M.H and Kale C.M "Building Drawing", Tata Mc Graw HillPublishing co. Ltd., New Delhi.
2. Gurucharan Singh "Building Construction", Standard Publishers& distributors, New Delhi.
3. National Building Code, BIS, New Delhi

E books and online course materials:
www.civilenggebooks.com

SURVEYING		
Subject Code	22CV34	Credit 03
Number of Lecture Hours/Week	3Hours (Theory)	SEE: 50
Total Hours: 42	CIE: 50	SEE Hours: 03

Prerequisite: Mathematics.

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Understand the concept of surveying and leveling.
2. Identify the components of surveying and leveling.
3. Interpret the different measurement techniques for various applications.
4. Apply principles of surveying for solving relevant engineering problems.

Modules	Teaching Hours
Module-1 **INTRODUCTION:** Surveying, Objectives and importance of surveying. Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy. Topographic maps. **CHAIN SURVEY-** Fundamental terms, chain types & Tape types, booking of chain survey work, Field book, entries, Conventional symbols, Obstacles in chain survey. **MEASUREMENT OF DIRECTIONS:** Compass survey: Basic definitions; Types of meridians, bearings and their types, magnetic and true bearings. Prismatic and surveyor's compasses, temporary adjustments, declination and Dip. Quadrantal bearing system, whole circle bearing system, local attraction and numerical problems, latitudes and departures-consecutive coordinate method.	9 Hours
Module-2 **LEVELING:** Principles of levelling, Fundamental axes and parts of a dumpy level, temporary adjustments and permeant adjustments i.e., two peg test only and objectives, Types of leveling - Simple leveling, Profile leveling and Cross sectioning, fly leveling. Computation of levels using Rise and fall method and Height of instrument method - comparison, Arithmetic checks. Numerical problems.	9 Hours
Module-3 **CONTOUR SURVEY:** Contours and their characteristics, Methods of contouring - direct	8 Hours

and indirect methods (squares and cross section methods), contour interpolation, Uses of contours. **AREAS AND VOLUMES:** Computation of area and volume by trapezoidal, Simpson rules and prismoidal formulae. Planimeter- Principle, working and uses, Digital Planimeter.	
Module-4 **THEODOLITE SURVEY:** Theodolite and types, Fundamental axes and their relationship, parts of Vernier transit theodolite, uses of theodolite, Temporary adjustments, measurement of horizontal angles (Repetition and Reiteration methods) and vertical angles. **TRIGONOMETRIC LEVELLING:** Determination of Heights and Distances of an accessible and Inaccessible object by single plane and double plane methods, Numerical problems.	8 Hours
Module-5 **CURVES:** **SIMPLE CURVES**: Types, Elements, Designation of curves, setting out of simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine's deflection angle method (No derivation), Numerical problems. **COMPOUND CURVES:** Elements, Design of compound curves, Setting out of compound curves, numerical problems (Case - 1 only). **REVERSE CURVE:** Between two Parallel straights (numerical problems on Equal radius and unequal radius).	8 Hours

Reference Books:

1. Surveying Vol I and Vol II, Punmia B.C, 16" Edition, 2016, Laxmi Publications, (P) Ltd, New Delhi ISBN- 10: 9788170088530 ISBN-10; 817008883
2. Plane surveying, Chandra A.M, 2'd Edition, 2015, New age International (P) Ltd., ISBN- 10: 8122438806
3. Surveying Vol I& Il, Duggal S.K, g' Edition, 2017, Tata Mc Craw Hill Publishing Co, ISBN- 10: 9781259028991 ISBN-10: 978125902899
4. Surveying, Vol I& I, Arora K.R, 2016, Standard Book House, ISBN-10: 8189401246 ISBN- 10: 8189401238
5. Surveying vol. I and II S.K. Duggal, 4th Edition, Tata McGraw Hill – Publishing Co. Ltd., New Delhi.

E books and online course materials: www.civilenggebooks.com			
Course outcomes: **On completion of the course, the student will have the ability to:**			
Course Code	**CO**	**Course Outcome (CO)**	**Bloom Level**
22CV34	**CO1**	Possess the knowledge of principles of surveying, methodologies and the techniques of measurement.	**C2**
	CO2	Understand use of leveling instruments and techniques of leveling operations and its applications.	**C3**
	CO3	Acquire Knowledge about contouring and calculate the areas and volumes.	**C3**
	C04	Use of Theodolite in execution of different civil engineering problems determination of Height of inaccessible object using Trigonometric Levelling.	**C3**
	CO5	To set out the simple, compound and reverse curves.	**C3**

SURVEYING LAB		
Course Code	22CVL35	CREDIT: 01
Number of Lecture Hours/Week	2 hrs (Practical)	SEE: 50 Marks
Total Number of Lecture Hours: 28	CIE: 50Marks	SEE: 03 Hours
Prerequisite: Mathematics		
Course objectives: **To enable the student to acquire the knowledge in the following topics**		

Experiments	**Teaching Hours**
1.a) To Measure distance between two points by direct Ranging	02 Hours
1.b) To Set out perpendiculars at various points on a given line by linear methods.	02 Hours
2. Setting out of rectangle, pentagon and hexagon by compass and Chain	02 Hours
3. Closed traverse of a small area using chain and compass & adjustment of closing error by Bowditch's rule	02 Hours
4. Determination of reduced level of points using dumpylevel/auto level (simple leveling)	02 Hours
5. Determination of reduced level of points using dumpylevel/auto level (differential leveling and inverted leveling)	02 Hours
6. Determination of reduced level of points using dumpylevel/auto level (differential leveling and inverted leveling)	02 Hours
7. To determine the difference in elevation between two pointsusing Reciprocal leveling and to determine the collimation error.	02 Hours
8. To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block contour on graph paper to scale.	02 Hours
9. To Determine the difference in elevation between two points by conducting Fly Levelling Also Carryout Fly Back Levelling calculate the RL of Points by RISE and FALL method	02 Hours
10. Measurements of horizontal angles by Reiteration method using transit theodolite.	02 hours
11. Measurement of vertical angle using transit Theodolite.	02hours
12. To Determine Distance and elevation of an inaccessible object using single plane	02hours

method.	
13.To Determine the Distance and Elevation of an object using double plane method when the base of an object is inaccessible.	02hours
14. To Setout simple circular curve using Rankine's deflection angle method	02 Hours
15. Demonstration of Digital Planimeter.	02 Hours

Question paper pattern:

Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Text books:

1. B.C. Punmia, "Surveying Vol.1 & 2", Laxmi Publications pvt. Ltd., New Delhi –2009.
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I & II, Pune VidyarthiGrihaPrakashan,1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. NewDelhi.2009.
2. K.R. Arora, "Surveying Vol. 1 & 2" Standard Book House, New Delhi. –2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford UniversityPress, New Delhi

A. Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., New Delhi

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
22CVL35	**CO1**	Demonstrate the concepts of Surveying through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the various experiments on surveying and leveling.	C3
	CO4	Analyse the data and interpret the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

BUILDING MATERIALS		
Course code	22CV36A	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42Hrs	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1 Understand the behaviour and properties of Engineering materials
2 Recognize various types of engineering materials used in construction industry
3 Compare behaviour of various engineering materials in construction industry
4 Describe properties of Smart engineering materials and fibres in civil engineering

Modules	Teaching Hours
Module I **Stones:** Engineering Rock Classification, Physical properties of minerals, major rock forming minerals, occurrence and use of minerals. Introduction to major rock types (Igneous, sedimentary and metamorphic rocks); their genesis, classification and structures; Engineering properties of rocks, advantages and disadvantages of different rock types at constructions sites. Common building stones in India and its uses as per IS codal recommendations **Brick** : Classification and composition of bricks, qualities of good bricks, tests on bricks.	6 Hrs
Module II **Timber:** Classification of timber, qualities of good timber, common timbers used for building work, Types of plywood, Ply board, properties and applications. Bamboo as building material Glass: Types of glass and its engineering properties for use in construction	6 Hr
Module-III **Metals:** Types and properties of Iron and Steel – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminium and application. HYSD and TMT bars Materials **Clay products:** ceramics –Refractories Fibre Textiles – Geosynthetics for Civil Engineering applications, Polymers in Civil Engineering.	7 Hr
Module -IV **Smart Construction Materials:** Introduction, Shape cemory alloys, Magnetostrictive Materials, Piezoelectric materials, Electro rheological and electrochromic materials-applications in civil engineering. **Fibres:** Carbon fibres, CFRP, Polyfibres, Pre-Preg Carbon fibres, reinforced polymers and polyesters	8 Hrs

Module – V	6 Hrs
Miscellaneous Materials: Adhesives, Asbestos, Thermopolis, Fibers, Heat insulating materials, Sound insulating materials, Geosynthetics **Construction and demolition waste:** Waste disposal, categories of waste, properties of C&D waste, waste utilization criteria, Recyclable and non-recyclable C&D waste, BIS codal provisions	

Course Outcomes: On completion of this course, students are able to:

CO	
CO1:	Explain the properties of engineering materials
CO2:	Select suitable various types of engineering materials to be used in construction industry and utilization of construction and demolition waste.
CO3:	Examine the behaviour of various engineering materials in construction industry
CO4	Illustrate the properties of Smart engineering materials and fibres in civil engineering
CO5	Select suitable engineering materials for insulation,

Question paper pattern:

iii) Two questions are to be set from each module.

iv)Total five questions are to be answered by selecting minimum one question from each module

Text book:

1.Engineering and General Geology ,Parbin Singh, Edition 2013, S.K. Kataria & Sons, ISBN 10: 9350142678

2. Engineering Materials 1, An Introduction to Properties, Applications and Design , D.R.H. Jones , Michael F. Ashby , Butterworth-Heinemann, 5th Edition, 2018, ISBN-10: 0081020511

3. Engineering Materials , Rangawala, 43rd Edition,2007, Publisher: Charotar Publishing House Pvt. Ltd, ISBN-10: 9385039172

4. Basic Civil Engineering, Sateesg Gopi , 2009, Pearson publication, ISBN 9788131729885

Reference books:

1. Mohan rai and M. P. Jai Singh “Advanced Building Materials and Construction” CBRI Publication Roorkee.

2. Parbin Sing “Civil Engineering Materials “, S. K. Kataria and Sons Publications, New Delhi.

3. K. S. Manjunath “Materials of Construction”, Sanguine Technical Publishers, Bangalore.

COURSE TITLE: RURAL, URBAN PLANNING AND ARCHITECTRE		
Course code	22CV36B	Credit:03
Hours/Week	3 hours (Theory)	SEE:50Marks
Totalhours:42	CIE:50Marks	SEE:3hours

Prerequisite: None

Course objectives:

1. To make the student understand about the past and present architecture of different parts of the world
2. Rural and urban planning and growth and circulation of patterns and effect of increase in urbanization
3. The basic planning required for urban and rural centres with respect to physical and social aspects
4. Student s to visit the different place of architecture monuments to understand the concept
5. To understand different types of architecture and planning

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. The architecture of India has to be understood and few exercises must be given.
2. Student has to visit different cities to understand architecture and planning concepts
3. Online courses to understand the basics
4. YouTube videos
5. Power point presentations

Modules	Teaching Hours
ModuleI Introduction: Aim and importance of Architecture, Architecture as a fine art. Role of an architect and anengineer. Essential principles and qualities of architecture with examples Factors of architecture: Mass, Form, Colour, Solids, and Voids, Uniformity, Balance and Symmetry, Paintingwith examples.	9hours
Module II Architectural influence of the following: Association, Tradition, Climate, Materials, Topography, Religion social customs and aspiration of time. Architectural characteristics of the following architecture with examples. 1. Egyptian, 2. Greek, 3. Roman, 4. Buddhist, 5. Hindu, 6. Jain, 7. Chalukyan, 8. Modern architecture Factors that have influence present day Modern Architecture, Aesthetic difference between the past and present Architecture. Students are advised for a technical tour related Architecture and town planning to gain additional knowledge in this subject	8hours

Module-III Human settlements, Rural and urban pattern of growth, Factors that promote growth anddevelopment of Rural and urban areas Ancient Town Planning in India: Principles of town planning and circulation pattern withexamples	9hours
Module-IV Industrialization: Impact on town planning, Urbanization causes, its effect on town and cities,remedial measures both in urban and rural planning Circulation pattern in cities: Urban roads and streets, their functional classification, traffic survey data and its use in town planning	8hours
Module - V Contemporary objectives and methods of planning of town: Development plans for cities, objectives and stages involved in their preparation and implementation, space standards for planning.	8hours

Course Outcomes: On completion of this course, students are able to:

CO	
CO1:	Understand importance of architecture in rural and urban planning
CO2:	Understand Influence of architecture
CO3:	Design infrastructure for rural and urban region
CO4	Plan and design rural and urban roads
CO5	To know Scope and Importance of architecture, Architecture education, Important architectural structures

Question paper pattern:

1. Two questions are to be set from each module.
2. Total five questions are to be answered by selecting minimum one question from each module

Books

1. History of Architecture – Fletcher
2. Urban pattern – Galliaon
3. Indian architecture – Vol. I & II – Perey Brown
4. Principle of town and country planning – Lewis Keeble
5. Urbanization and Urban Syatems in India, Ramachandran R, Oxford University Press, New Delhi.
6. Town planning – Rangwala, Charothar Publication

COURSE TITLE: Sustainable Design Concept for Building Services		
Course code	22CV36C	Credit:03
Hours/Week	3 hours (Theory)	SEE:50Marks
Totalhours:42	CIE:50Marks	SEE:3hours

Prerequisite: None

Course objectives:

1. To facilitate learners to understand sustainable building designs and its parameters such as energy and water efficiency, Comfort in buildings, and waste management.
2. To expose the learners to shading systems, thermal and visual comfort.
3. To impart fundamental knowledge on Life cycle assessment and Green ratings and certifications.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Videos to teach, providing activities and assignments.
2. Power Point presentation during online expert sessions.
3. Hands-on software exercises through virtual classrooms.

Modules	Teaching Hours
Module I **Introduction to Sustainability and Climatology:** Overview of Sustainability – Global energyscenario, carbon footprint and climate action, Net zero in carbon offsetting, Water neutral, Sustainable construction and resource management. Green buildings - Selection of site –preservation and planning, Influence of climate on buildings, Basics of climatology, Earth – Sun relationship, Solar angles and sun path diagram, Design of shading systems.	9hours
Module II **Comfort in Buildings:** Thermal comfort – Basics of Thermodynamics, Convection/radiation heat transfer, Heat gain through various elements of a building, Thermal comfort models and case studies Acoustics – Building acoustics, measures, defects and prevention of sound transmission Indoor Air Quality – Effects, design consideration and integrated approach for IAQ management Visual comfort – Enhancement strategies for Daylighting and Artificial	8hours
Module-III **Energy, water efficiency and waste management in buildings:** Energy efficiency – Energy efficiency in building envelope and energy efficient HVAC and Lighting as per Energy conservation building code (ECBC) 2017, Energy simulation, Energy management system – Renewable energy and Energy Audit. Water Efficiency – Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment andreuse and Water efficient landscape system. Waste management – Types of waste and its treatment methods, Construction and	9hours

demolition waste management, Waste management in residential, commercial buildings, healthcare facilities.	
Module-IV **Life Cycle Assessment of Buildings and Green project management:** Materials – Green product certifications, features of sustainable building materials and sustainable alternatives for structural, envelope and finishing materials. Low carbon cement, Zero emission bricks and lean construction practices. Life cycle assessment and its types – Modelling and Analysis Greenhouse gas emission. Different phases of Green building project management.	8hours
Module - V **Sustainable rating systems:** Green building rating systems- LEED, BREEAM and others,Indian Green building rating systems – IGBC & GRIHA. IGBC criteria for certification -site selection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction credits.	8hours

Course Outcomes: On completion of this course, students are able to:

CO	
CO1:	Comprehend sustainable design, climatology, shading system and analyze heat transfer mechanism in buildings
CO2:	Assess the design considerations and parameters for thermal comfort, visual comfort, indoorair quality and acoustics
CO3:	Develop solutions for energy efficiency, water efficiency and waste management in buildings
CO4	Adopt green project management methodology and evaluate building life cycle assessment
CO5	Implement green practices during construction and operation phase of the buildings forachieving green rating

Question paper pattern:

1. Two questions are to be set from each module.
2. Total five questions are to be answered by selecting minimum one question from each module

Books

1. HarharaIyer G, Green Building Fundamentals, Notion Press
2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices
3. IGBC Green new building rating system - version 3.0 - Abridged reference guide
4. The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019
5. National Building Code – 2016, Volume 1&2, Bureau of Indian Standards
6. Energy Conservation Building Code – 2017 (with amendments up to 2020), Bureau ofEnergy Efficiency

COURSE TITLE: ENVIRONMENTAL PROTECTION AND MANAGEMENT		
Course code	22CV36D	Credit:03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE:50Marks	SEE:3hours

Prerequisite:

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. Environmental management standards, sustainable production and consumption
2. Environmental quality objectives, zero discharge technologies
3. Environmental policy, legal and other requirements objectives and targets of Environmental management systems.
4. Environmental audit , waste audits and waste minimization planning
5. Hazardous waste characters , classification ,treatment and disposal methods

Modules	Teaching Hours
ModuleI Environmental Management Standards: Unique Characteristics of Environmental Problems-Systems approach to Corporate environmental management-Classification of Environmental Impact Reduction Efforts -Business Charter for Sustainable Production and Consumption-Tools, Business strategy drivers and Barriers -Evolution of Environmental Stewardship. Environmental Management Principles-National policies on environment, abatement of pollution and conservation of resources-Charter on Corporate responsibility for Environmental protection.	8hours
Module II Environmental Management Objectives: Environmental quality objectives-Rationale of Environmental standards: Concentration and Mass standards, Effluent and stream standards, Emission and ambient standards, Minimum national standards, environmental performance evaluation: Indicators, benchmarking. Pollution control Vs Pollution Prevention-Opportunities and Barriers-Cleaner production and Clean technology, closing the loops, zero discharge technologies	9hours
Module-III Environmental Management System: EMAS, ISO 14000 - EMS as per ISO 14001– benefits and barriers of EMS – Concept of continual improvement and pollution prevention - environmental policy – initial environmental review – environmental aspect and impact analysis – legal and other requirements- objectives and targets – environmental management programs – structure and responsibility – training awareness and competence- communication – documentation and document control – operational control – monitoring and measurement – management review.	9hours
Module-IV Environmental Audit: Environmental management system audits as per ISO 19011– Roles and qualifications of auditors-Environmental performance indicators and their evaluation-Non conformance-Corrective and preventive actions -compliance audits-waste audits and waste minimization planning-Environmental statement (form V)-Due diligence audit.	8hours

Module – V Applications: Applications of EMS, Waste Audits and Pollution Prevention Control: Textile, Sugar, Pulp & Paper, Electroplating, , Tanning industry. Hazardous Wastes-Classification, characteristics Treatment and Disposal Methods, Transboundary movement, disposal.	8hours

Course Outcomes: On completion of this course, students are able to:

CO	
CO1:	Understand the elements of Corporate Environmental Management systems complying to international environmental management system standards.
CO2:	Effluent and emission standards and clean technology
CO3:	legal and other requirements objectives targets of Environmental management systems.
CO4	Develop, Implement, maintain and Audit Environmental Management systems for Organizations
CO5	Pollution Prevention Control: Textile, Sugar, Pulp & Paper, Electroplating, , Tanning industry and Hazardous waste characters , classification ,treatment and disposal methods

Question paper pattern:

1. Two questions are to be set from each module.
2. Total five questions are to be answered by selecting minimum one question from each module

Reference books:

1. Christopher Sheldon and Mark Yoxon, Installing Environmental management Systems-a step by step guide Earthscan Publications Ltd, London, 1999.
2. ISO 14001/14004: Environmental management systems-Requirements and Guidelines-International Organisation for Standardisation, 2004
3. ISO 19011: 2002, Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002
4. Paul L Bishop Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000.
5. Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001.

SOCIAL CONNECT AND RESPONSIBILITY			
Course Code	22UHV37	Credits	1
Course Type	Theory	CIE Marks	50
Lecture Hours(L:T:P)	0:0:2	SEE Marks	-
Total Hours	28 Hours	SEE Hours	-

Course Objectives:

- To familiarize the students with the basic biological concepts and their engineering applications.
- To enable the students with an understanding of bio design principles to create novel devices and structures.
- To provide the students an appreciation of how biological systems can be re- designed as substitute products for natural systems.
- To motivate the students to develop interdisciplinary vision of biological engineering.

Modules-1	Teaching Hours
Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of B.Tech. students. They will also make an excerpt either as documentary or a photoblog describing the origin its usage in daily life, and its appearance in folklore and literature. origin, its usage in daily life, and its appearance in folklore and literature Objectives, Visit, case study, report,outcomes.	**6**
Modules-2	
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms. Objectives, Visit, case study, report,outcomes.	**6**
Modules-3	
Organic farming and waste management: usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus. Objectives, Visit, case study, report, outcomes**.**	**6**
Modules-4	
Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. Objectives, Visit, case study, report, outcomes.	**5**
Modules-5	
Food walk city's culinary practices, food lore and indigenous materials of the region used in cooking Objectives, Visit, case study, report, outcomes	**5**

Activities: Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY: The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS: The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.
Duration : A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E.

/B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic ,and poetry) Faculty mentors has to design the evaluation system as per VTU guidelines of scheme & syllabus.

Guideline for Assessment Process:
Continuous Internal Evaluation (CIE): After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below
Excellent: 80 to 100
Good: 60 to 79
Satisfactory: 40 to 59 Unsatisfactory and fail : <39

Course Code	**CO #**	**Course Outcome (CO)**
22UHV37	**CO1**	Communicate and connect to the surrounding. CO2: Create a responsible connection with the society
	CO2	Involve in the community in general in which they work.
	CO3	Notice the needs and problems of the community and involve them in problem solving.
	CO4	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
	CO5	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Teaching-Learning Process(General Instructions)
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.
1. Explanation via real life problem, situation modeling, and deliberation of solutions, hands- on sessions, reflective and questioning /inquiry-based teaching.
2. Instructions with interactions in classroom lectures (physical/hybrid).
3. Use of ICT tools, including YouTube videos, related MOOCs, AR/VR/MR tools.
4. Flipped classroom sessions (~10% of the classes).
5. Industrial visits, Guests talks and competitions for learning beyond the syllabus. -video based content creation for the syllabus (asassignments).
7. Use of gamification tools (in both physical/hybrid classes) for creative learning outcomes.

Pedagogy-Guidelines
It may differ depending on local resources available for study as well as environment and climatic differences, location and time of execution.

s.no	Topic	Group Size	Location	Activity Execution	Reporting	Evaluation of the topic
1.	Plantation	May be	Farmers land,	Site selection/proper	Report	Evaluatio
	and	individua	parks,villages,road	consultation/continuo	should be	n as per
	adoption of	l or team	side, community	us monitoring	submitte	the
	a tree		area/college campus	information board	d by the	rubrics of

			etc		individua	the	
					l to the	scheme	
					concerne	and	
					d	syllabus	
					evaluatio	by	
					n	Faculty	
					authority		
2	Heritage	May be	Temples / monumental	Site selection /proper	Report	Evaluatio	
	Walk and	individua	places / Villages/ City	consultation/Contin	should be	n as per	
	crafts corner	l or team	Areas / Grama	uous monitoring/	submitte	the	
			panchayat/ public	Information board	d by	rubrics	
			associations/Governme		individua	Of	
			nt Schemes officers/		l to the	scheme	
			campus etc…,,		concerne	and	
					d	syllabus	
					evaluatio	by	
					n	Faculty	
					authority		
3	Organic	May be	Farmers land / parks /	Group selection /	Report	Evaluatio	
	farming and	individua	Villages visits /	proper consultation /	should be	n as per	
	waste	l or team	roadside/ community	Continuous	submitte	the	
	managemen		area / College campus	monitoring /	d by	rubrics	
	t:		etc…,,	Information board	individua	Of	
					l to the	scheme	
					concerne	and	
					d	syllabus	
					evaluatio	by	
					n	Faculty	
					authority		
4	Water	May be	Villages/ City Areas /	site selection / proper	Report	Evaluatio	
	conservatio	individua	Grama panchayat/	consultation/Contin	should be	n as per	
	n: &	l or team	public	uous monitoring/	submitte	the	
	conservatio		associations/Governme	Information board	d by	rubrics	
	n techniques		nt Schemes officers /		individua	Of	
			campus etc…		l to the	scheme	
					concerne	and	
					d	syllabus	
					evaluation	by	
					authority	Faculty	
5	Food walk:	May be	Villages/ City Areas /	Group selection /	Report	Evaluatio	

	Practices in	individua	Grama panchayat/	proper consultation /	should be	n as per	
	society	l or team	public	Continuous	submitte	the	
			associations/Governme	monitoring /	d by	rubrics	
			nt Schemes officers/	Information board	individua	Of	
			Campuses etc		l to the	scheme	
					concerned	and	
						syllabus	
					evaluation	by	
					authority	Faculty	

Plan Of Action (Execution of Activities)

Each student should do activities according to the scheme and syllabus.
At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
At last consolidated report of all activities from 1st to 5th , compiled report should be submitted as per the instructions and scheme.

Assessment Details for CIE

Weightage	CIE 100%	
Field Visit, Plan, Discussion	10 Marks	Implementation strategies of the project (NSS work). The last report should be signed by NSS Officer, the HOD and principal. At last report should be evaluated by the NSS officer of the institute.
Commencement of activities and its progress	20 marks	
Case study based Assessment Individual performance with report	20 marks	
Sector wise study & its consolidation 5*5 = 25	25 marks	
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 marks	
Total marks for the course in each semester	100 marks	Finally the consolidated marks sheet should be sent to the university and also to be made available at LIC visit

For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.

Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.

COURSE TITLE: MICROSOFT EXCEL AND VISUAL BASICS APPLICATION LAB		
Course code	22CVAE381	Credit:1
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28 hours	CIE: Marks: 50	SEE:03 hours

Prerequisite: Basic Computer knowledge

Modules	Teaching Hours
Module I Introduction to Worksheet and MS Excel – Getting Started with Excel – Editing Cells and using Commands and Functions – Excel Functions – Range – Moving and Copying, Inserting and Deleting Rows and Columns – Formatting a Worksheet – Formatting Numbers.	9 hours
Module II Creating Charts – Resizing and Moving the Chart – Changing the Chart Type – Controlling the Appearance of a Chart – Updating, Modifying and Deleting a Chart – Previewing and Printing Charts – Using Date and Time in a Worksheet – Naming Ranges and Using Statistical, Math functions.	9 hours
Module-III Introduction to Visual Basic, Integrated development environment features – Forums – Controls – Events – Methods – Properties - Uses of Property Window – Code Window (Code Behind File) – Variable declaration.	8 hours
Module-IV Scope of Variables – Constant – Array – Loops in Visual Basic: For ... Next, While, Do...While - Select statements: if...end if - if...else if...end if - Select...Case End Case -	8 hours
Module - V Standard Controls: Form - Text Box – Command Button – Label Box – Check Box – Frame Control – Combo Box – List Box – Radio Button - Image Control - Picture Box – Timer.	8 hours

Question paper pattern:

1. Two questions are to be set from each module.
2. Total five questions are to be answered by selecting minimum one question from each module

Textbook:

1. Mastering Visual Basic 6 – BPB Publications, New Delhi.

2. Mohammed Azam, Programming with Visual basic 6.0 – Vikas Publishing House.

3. Test Your Vb.Net Skills: Language Elements Part 1 Paperback – 1 Dec 2000 by Yashavant P. Kanetkar (Author), Asang Dani, BPB Publications, New Delhi.

COURSE TITLE: SMART URBAN INFRASTRUCTURE		
Course code	22CVAE382	Credit:1
Hours/Week	2 hours. (Theory)	SEE: 50 Marks
Total hours: 28 hours	CIE: Marks: 50	SEE:03 hours

Prerequisite: None

Course objectives:

1. Knowing about Urban Infrastructure Systems & their Management
2. Knowing about Smart Cities Key Concepts
3. Understand the Transport and Energy Smart Urban Infrastructure and Services
4. Developing Feasibility Studies for Smart City Services
5. Understand the Global Context of Smart Cities

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. You Tube videos and online study material
2. PPT.
3. Assignments and quiz to explore more on smart cities

Modules	Teaching Hours
Module I Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to smart city, Basic concept of developing smart city, Global standards to create smart city. Different conceptual approaches to Smart Cities and discussing the pros and cons of each approach. Smart urban Infrastructure: List of infrastructure facilities, advantages and disadvantages.	9 hours
Module II Smart Urban Energy Systems: Introduction to Smart Energy Systems, Government policy and technology. Energy sector to explore some of the most important managerial considerations in the transition phase and operation of Smart Urban Energy Systems	9 hours
Module-III Smart Transportation Technologies: Introduction to smart transportation system, Mode of transport systems for smart city, data collection to arrive at best transport facility. Significant opportunities and threads for legacy urban transportation systems. Managerial considerations to facilitate the transition phase, and operation of Smart Urban Transportation Systems	8 hours
Module-IV Towards Smart Cities: Important factors in the transition phase of legacy cities to Smart citiesand their managerial implications	8 hours

Module - V	
Towards Smart Cities: Management of Smart Cities calls for different approaches from conventional urban management approaches. The role of city government in the network of actors who play an important role in management of Smart Cities..	8 hours

Course outcome (Course Skill Set)

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

1. Understand the concept of smart city
2. Play the role of a civil engineer in providing smart infrastructure
3. Design efficient energy system for smart city

Analyse and design efficient transport system

Question paper pattern:

1. Two questions are to be set from each module.
2. Total five questions are to be answered by selecting minimum one question from each module

Suggested Learning Resources:

Books

1. Infrastructure for Smart Cities, Dr. R P Rathaliya, Shree Hari Publications, 2021
2. Building Smart Cities, ISBN-13 978-1032340128, by Carol L. Stimmel, 2022
3. Smart Cities for Sustainable Development, Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna, Springer, ISBN-13 978-9811674099, 2022

DIGITAL DRAFTING FOR CIVIL ENGINEERS LAB		
Course Code	22CVAE383	Credit:01
Number of Practical Hours/Week	2 Hrs. Practical	SEE: 50 marks
Total Number of Practical Hours: 28	CIE: 50 marks	SEE Hours: 03

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Understand the concept of AutoCAD and application.
2. Create various types of building plans, Elevations etc.
3. Create centre line diagrams for various types of building plans.
4. Create Line diagram for various services in a building.

Modules	Teaching Hours
Module 1 Introduction to AutoCad, Usage of AutoCAD tool commands like Line, circle, rectangle, polyline, trim, extend, copy, mirror, rotate, erase, offset, move, array, scale, fillet, explode, text, layers, coordinate system, import and exporting of data from various software and its compatibility	**02hours**
Module III Development of plan, elevation and section elevation for 1. One storey residential building 2. Two storeyed residential building	**06 hours**
Module III Centre line diagram for Primary school building, Primary health centre and foundation center line diagram for load bearing and RCC structures in AutoCAD software	**04 hours**
Module IV Line diagram for preparation of water supply, sanitary, electrical layouts and rain water harvesting	**02 hours**

Text Book: AutoCAD User Manual			
Course outcomes: **On completion of the course, the student will have the ability to:**			
Course Code	**CO#**	**Course Outcomes**	**Blooms Level**
22CVAE383	**CO1**	Understand the concept of AutoCAD and application.	
	CO2	Create various types of building plans, Elevations etc.	
	CO3	Create centre line diagrams for various types of building plans.	
	C04	Create Elevations for various types of building plans.	
	CO5	Create Line diagram for various services in a building.	

COURSE TITLE: PERSONALITY DEVELOPMENT FOR CIVIL ENGINEERS		
Course code	22CVAE384	Credit: 01
Hours/Week:2 Hrs	2 hours. (Theory)	SEE: 50 Marks
Total hours: 28 hrs.	CIE: 50 Marks	SEE: 03 hours
Prerequisite: None		

COURSE OBJECTIVE:

TO ENABLE THE STUDENT TO AQUIRE THE KNOWELDGE IN THE FOLLOWING TOPICS.

Develop skills to embrace change,

Handle setbacks, and thrive in dynamic work environment

Improve both verbal and non-verbal communication abilities,

Build self-confidence, overcome self-doubt,

Able to assert oneself in professional settings.

Modules	Teaching Hours
Module I Define Personality, Determinants of Personality Development, Perception – Definition, Perceptual Process. Factors of Association – Relationship, Personality Traits, Developing Effective Habits, Emotional Intelligence.	3 hours
Module II Motivation, Introspection, Self-Assessment, Self-Appraisal & Self-development, Ego & Super Ego. Self Esteem, Mind Mapping, Competency Mapping Types of Personalities – Introvert, Extrovert & Ambivert person, Effective Communication & Its key aspects.	4 hours
Module-III Assertiveness, Decision-making skills, Conflict: Process & Resolution, Leadership & Qualities of Successful Leader. Interpersonal Relationship, Good manners & Etiquties, Effective Speech, Understanding Body language, projective positive body language.	3 hours
Module -IV Attitude – Concept -Significance -Factors affecting attitudes – Positive attitude–Advantages –Negative attitude-Disadvantages -Ways to develop a positive attitude	2 hours

Module – V	
Stress Management: Introduction, Causes, stress management techniques, Time management: Importance of time management, Techniques of time management, Time management styles.	2 hours

Course Outcomes: On completion of this course, students are able to:

CO	
CO1:	Personality, Determinants of Personality Development, & Factors of Association
CO2:	Motivation, Introspection, Self-Assessment, Self-Appraisal, Mind Mapping, Types of Personalities
CO3:	Decision-making skills, Conflict: Process & Resolution, Leadership & Qualities, Interpersonal Relationship, positive body language
CO4	Attitude – Concept -Significance attitudes – Positive attitude &Negative attitude
CO5	Stress Management, techniques, Importance of time management

Question paper pattern:

v)Two questions are to be set from each module.

vi)Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Personality Development Course BY SURYA SINHA

PUBLISHER: DIAMOND POCKET BOOKS PVT LTD.

2. Personality Development and Soft Skills BY BARUN K MITRA

OXFORD PUBLICATION.

3. Personality Development. – by Rajiv K. Mishra

Reference books:

1.Practical Personal Development: The Most Popular Personal Development Concepts BY Jim Stephens RWG Publishing

IV Semester

Course Title **STRUCTURAL ANALYSIS**		
Course Code	22CV41	Credit: 04
Number of Lecture Hours/Week	3 Hours (Theory)	SEE: 50 Marks
Total Number of Lecture :42 Hrs	CIE: 50 Marks	SEE: 03 Hours
Prerequisite: Engineering Mechanics, Strength of material		

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Determine the degree of freedom and degree of redundancy of structures and analyse the trusses
2. Analysis beams, frames& trusses for displacements using strain energy methods.
3. Analysis arches, cables and analysis of beams by slope deflection method
4. Analysis of beams and frames by moment distribution method
5. Analysis of beams and frames by Kani's method.

Modules	**Teaching Hours**
Module I **Structural systems:** Forms of structures. Determinate and indeterminate structures. Static and Kinematic Indeterminacy of structures. principle of superposition. linear and non-linear structures. **Plane trusses:** Introduction, analysis of trusses by method of joints and by method of sections.	8 hours
Module-II **Strain energy:** Strain energy and complimentary strain energy. Strain energy due to axial load, bending and shear, theorem of minimum potential energy, Law of conservation of energy, Clarke -Maxwell`s theorem of reciprocal deflection & Castigliano's theorems. Numerical examples on beams & frames. **Arches and cables:** Analysis of three hinged parabolic arches and circular arches. (Support at same levels and different levels). Analysis of cables under point loads and UDL, length of cables (support at same levels only) Numerical problems	8 hours

Module -III **Slope & deflection method:** Analysis of continuous beams with & without sinking of supports by Slope deflection method Analysis of rigid Frames by Slope deflection method (Sway and Non-Sway).	8 hours
Module IV **Moment distribution method:** Analysis of continuous beams with & without sinking of supports Analysis of rigid frames (sway& Non sway) by moment distribution method	9 hours
Module -V **Rotation contribution method (Kani.s method):** Analysis of continuous beams by Kani's method. Analysis of rigid frames by Kani's method (Non sway frames only)	9 hours

Question paper pattern:

Two questions to be set from each module by inter-mixing the syllabus of respective module. Students have to answer any five full questions by selecting minimum one question from each module.

Text books:

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.
3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.
4. S Ramamrutham R Narayan .Dhanpath Rai Publishing company(P) Ltd New Delhi

Reference Books:

1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.
2. Devadas Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CV41	**CO1**	Describe different types of structural systems and analyze plane trusses
	CO2	Analyze the beams, trusses and frames using energy principles and Analyze the arches and cables
	CO3	Analyze frames and beams by slope deflection method
	CO4	Analyze beams & frames by moment distribution method
	CO5	Analyze beams & frames by Kani's method. Analyze beams subjected to rolling loads

FLUID MECHANICS		
Course Code	22CV42	CREDIT:04
Lecture Hours/Week	3hrs(Theory) + 2 hrs (Practical)	SEE: 50 Marks
Total Lecture Hours: 70	CIE: 50 Marks (40 M Thry + 10M Prct.)	SEE:03Hours + 02 Hrs

Prerequisite: Engineering Mathematics, Engineering Mechanics.

Course objectives:
To enable the student to acquire the knowledge in the following topics

1. Distinction between solid, fluid, liquid and gas. Classify the fluids and measurements of pressure by various types of manometers. Flow measurements through notches.
2. Hydrostatic forces on vertical, inclined and curved surfaces. Dynamics of fluid flow, Flow measurement over weirs
3. Types of flows in pipes and head loss in pipe due to friction and bends. Impact of Jets. Flow through pipes and flumes
4. Measurement of flow through orifice, notches and weirs. Pumps. Flow through Orifices and Mouth pieces.
5. Analyse Open Channel flow, Dimensions & Model studies. Pumps, Turbines.

Modules	Teaching Hours
Module I **Scope and importance of the subject.** Definition of fluid, distinction between a solid and a fluid, distinction between a liquid and a gas, Fluid continuum. Fluid properties and classification of Fluids: Mass density, specific volume, specific weight, relative density, viscosity, Newton's Law, compressibility, surface tension and capillarity and their units (SI systems) Pressure at a point in a static fluid – Pascal's law – Hydrostatic Pressure law, Atmospheric pressure, Absolute, gauge, and vacuum pressure, Simple U-tube manometer, U-tube Differential manometers, inverted U-tube monometer. Calibration of rectangular notch, triangular notch, Cipolletti notch.	14 hours
Module II **Hydrostatics:** Hydrostatics Forces on vertical & inclined plane surfaces, Hydrostatic forces on curved surfaces and center of pressure, pressure diagrams. Applications of total pressure and center of pressure on Dams, Roller gates, Tainter gates, sector gates, Sluice gates and pressure diagrams. Calibration of broad crested weir, ogee weir, plug sluice **Dynamics of Fluid Flow**: Euler's equation of motion in one dimension – Integration of Euler's equation, Bernoulli's equation, Limitations and modifications of Bernoulli's equation – Applications of Bernoulli's equation, Pitot tubes, Venturi meter,	14 hours

Module III **Flow Through pipes:** Types of flows in pipes, Reynolds's experiments – Reynold's number Laminar & turbulent flows, fluid friction in pipes - Head loss due to friction (Darcy Weisbach equation) Friction factors for commercial pipes, Minor losses in pipes, pipes in series,equivalent pipe and pipes in parallel, Introduction to Impulse – momentum equation and its application on pipe bend. Water hammer analysis and Surge tanks Definition of pump, difference between pump & turbine, classification, Description & general principle of working, priming & methods. Work done & efficiencies of a centrifugal pump. Determination of constants of Parshall flume, minor losses through pipes, hydraulic coefficient of small circular orifice.	14 hours
Module IV **Flow measurements:** Flow through a small orifice. Hydraulic coefficients and experimental methods of determination. Flow through large rectangular orifices, submerged orifices. Flow through mouth pieces, external cylindrical mouth piece, hydraulic co-efficient, flow through internal or re-entrant Borda's mouth piece. Classification of Notches & weirs, Flow over rectangular Notch, Triangular Notch or weir Trapezoidal Notch, stepped Notch, Velocity of approach, Francis formula Flow, Cipolletti weir or Notch, Broad crested, ogee weir, submerged weir, effect on discharge over a rectangular weir due to end contraction and velocity approach, error in the measurement of head. Determination of friction loss through pipes, hydraulic coefficients of external cylindrical mouth piece. coefficient of discharge of venturi meter.	14 hours
Module V **Open channel flow**: Introduction to open channels, classification, difference between pipe flow & open channel flow, types of flow, geometric properties of open channels, Uniform flow in open channels, Chezy's and Manning's formulae, Problems on uniform flow, Most economical section of open channel flow, Derivation of conditions for most economical rectangular, triangular and trapezoidal sections. Problems on most economical sections. Most economical circular channels derivations and problems, **Dimensional analysis & model similitude**: Introduction to Dimensional Analysis unit & dimensions, Table of Dimensions, Dimensional Homogeneity, Methods of Analysis, Rayleigh's & Buckingham's method. Problems on Rayleigh's & Buckingham's methods, Model Studies, Introduction, Similitude, Dimensionless parameters. Types of models. Froude's models theory & problems. Reynolds models, Problems, Scale effects. Study of performance of centrifugal pump, Francis turbine, Pelton wheel turbine.	14 hours

Question paper pattern:

Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module. In each module 10% weightage shall be given to questions related to Laboratory experiments.

Text books:

P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi

R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi

S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi

Reference Books:

1. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed).

K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd.

3. K Subramanya, "Fluid Mechanics and Hydraulic Machines-problems and solutions", Tata McGraw Hill Publishing Co. Ltd.

J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, "Fluid Mechanics", Pearson, Fifth Edition.

Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press.

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
22CV42	**CO1**	Identify basic properties of Fluids, measurement of fluid pressure	C2
	CO2	Analyze fluid pressure forces and design sluice gates, roller gates etc. Apply Bernoulli' s equation & its application on fluid flow problems	C4
	CO3	Analyze fluid flow through pipes, impact of jets on fluid machines.	C3
	CO4	Apply fluid flow phenomenon in flow measurement through orifices, mouth piece, notches and weirs	C2
	CO5	Identify basic principles of flow through open channels and organize the design parameters based on model studies.	C3

BUILDING CONSTRUCTION AND GEOLOGY		
Course code	22CV43.	Credit: 04
Hours/Week	hours. (3+1) (Theory/Practical)	SEE: 50 Marks
Total hours: 42Hrs	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. Preparing job layout, Properties of bricks and bonds in brickwork
2. Types of stone masonry, materials and methods of damp proofing courses.
3. Types of stairs and design of doglegged stair.
4. Roof, insulating materials and types of plastering.
5. Types of doors, windows, flooring and paints

Modules	Teaching Hours
Module I **Construction of substructure and super structure**: Job Layout; site clearance, preparing job layout, layout for load bearing and framed structure by center line method and face line method, precautions	3 Hrs
Foundation: Introduction, Requirements of good foundation, types of foundation	6 Hrs
Brick Masonry: Brick Masonry: Definition of terms used in masonry, bonds in brick work, English bond, Flemish bond, Reinforced brick work.	
Module II **Stone Masonry**: Rubble Masonry, Coursed and Un-coursed rubble masonry, Ashlar masonry, Shoring, Under Pinning and Scaffolding.	6 Hr
Damp Proof Course: Materials used for damp proof course, D.P.C Treatment in building methods of treatment to foundations, treatment to floors, walls and slabs, Concrete paver blocks.	3Hrs
Module-III **Stairs**: Types (classifications) and technical terms in stairs, requirements of a good stair, geometric design of R.C.C dog legged and open well stairs (Plan and Sectional elevation of stairs).	4Hs
Types of flooring: (Materials and method of laying), Granolithic, Mosaic Ceramic, Marble, Polished Granite types and applications, Industrial flooring	5 Hr

Module -IV **Doors**: Types, Paneled doors, glazed doors, flush doors. Windows: Types, Paneled Window, glazed Window. **Plastering**: Purpose of plastering, materials of plastering, lime mortar, cement mortar, masonry mortar, methods of plastering, Stucco plastering, Lath plastering **Painting:** Purpose of painting, types of paints, application of paints to new and old surfaces, distemper, plastic emulsion, enamel, polishing of wood surface.	4 Hrs 5 Hrs
Module – V **Roofs& Miscellaneous Materials:** Sloped roof (R.C.C and tile roof), Requirements of good roofs. **Green Buildings:** Concepts and requirements. Energy conservation in buildings. Rating of buildings, Site selection, design concepts, materials and different certifications programs (IGBC AND LEED) Safety in construction Necessity and types of Personal protective equipment. Safety in construction Necessity and types of Personal protective equipment.	4 Hrs 2 Hrs
GEOLOGY LAB	
1. Physical properties of minerals: Identification of I. ROCK FORMING MINERALS - Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Asbestos, Calcite, Gypsum, etc II. ORE FORMING MINERALS- Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc 2. Engineering Properties of Rocks: Identification of I. IGNEOUS ROCKS- Types of Granites, Dolerite, Granite Porphyry, Basalt, Pumice etc II. SEDIMENTARY ROCKS- Sandstone, Lime stone, Shale, Laterite, Breccia etc III. METAMORPHIC ROCKS- Gneiss, Slate, Schist, Marble, Quartzite etc 3.. Dip and Strike problems. Determination of Apparent dip and True dip.	2 Hrs 2 Hrs 2 Hrs 2 Hrs 2 Hrs 1 Hrs 2 Hrs 1 Hrs

5. Calculation of Vertical, True thickness and width of the outcrops. 6. Three-point borehole problems. 7. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc. 8. Interpretation and drawing the GEOLOGICAL SECTION MAPS. 9. Field work– To identify Minerals, Rocks, Geomorphology and Structural features with related to the Civil Engineering projects.	

Course Outcomes: On completion of this course, students are able to:

CO	
CO1:	Explain the ingredients of brick, different tests on brick and brick masonry.
CO2:	Compare different types of stone masonry and explain different types of DPC.
CO3:	Design the R.C.C dog legged stair case and explain roofing materials, miscellaneous materials.
CO4	Explain doors, windows, floors, and paints.
CO5	Expalin about Roofs & Miscellaneous materials and green buildings

Question paper pattern:

vii) Two questions are to be set from each module.

viii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. B.C. PUNMIA "Building Construction", Lakshmi Publications, New Delhi.
2. SUSHIL KUMAR "Building Construction", Standard Publication and Distributors, New Delhi.
3. S.C. RANGWALA" Building Construction", Charter Publishing House, Anand, India.
4. Sushil Kumar "Engineering Materials", Standard Publication and Distributors, New Delhi.
5. S. C. Rangwala" Engineering Materials", Charter Publishing House, Anand, India.
6. P. G. Verghese" A Text Book of Building Materials", prentice-Hall of India Pvt Ltd, Publication.
7. R. K. rajpal" Engineering Materials", S.Chand and Company, New Delhi.

Reference books:

1. Mohan rai and M. P. Jai Singh "Advanced Building Materials and Construction" CBRI Publication Roorkee.
2. Parbin Sing "Civil Engineering Materials ", S. K. Kataria and Sons Publications, New Delhi.
3. K. S. Manjunath "Materials of Construction", Sanguine Technical Publishers, Bangalore.

CONCRETE TECHNOLOGY LAB		
Subject code	22CVL44	Credit: 01
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Concrete Technology

Course objectives:
To enable students to acquire the knowledge in the following topics:

Modules	Teaching Hours
I Testing of cement	
Cement:	
Normal Consistency,	1 Hours
Setting time (Initial and Final)	1 Hours
Soundness by autoclave method,	1 Hours
Compression strength test	2 Hours
Fineness of cement.	1 Hours
Specific gravity of cement	1 Hours
II Testing of aggregate	
Water absorption and moisture content of aggregate.	1 Hours
Specific gravity and bulk density of coarse and fine aggregates	2 Hours
Fineness modulus of fine and coarse aggregate (sieve analysis).	1 Hours
Flakiness index and elongation index of coarse aggregate.	2 Hours
Impact value and crushing value of aggregate.	1 Hours
Tests on Concrete	
Workability tests- Slump cone test.	2 Hours
Compression factor test.	2 Hours
Vee Bee consistometer test.	2 Hours
strength tests Concrete:	
Compression Strength	2 Hours

Split tensile tests	2 Hours
Permeability of concrete	2 Hours
NDT Tests (Rebound Hammer Test and Ultra-pulse velocity Test) only Demonstration.	2 Hours

Course Outcomes: On completion of this course, students are able to:

CO	Course Outcomes	BL
CO1:	Demonstrate the concepts of CT theory course through series of experiments.	C2
CO2:	Sharetheresponsibilitiesinsmallteamsof4-5membersforconductingtheexperiments	C3
CO3:	Perform the experiments and determination of specific gravity, Setting time of cement, soundness and Tests on Hardened concrete.	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:

Any one of the above experiments is to be conducted in the examination by the student.

Reference books:

1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand &Co. Ltd, New Delhi.
3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi
4. Relevant codes.

Nptel Link: https://youtu.be/cx5gPKp9QEc

COURSE TITLE BUILDING INFORMATION MODELLING IN ARCHITECTURE, ENGINEERING AND CONSTRUCTION		
Coursecode	22CV45A	Credit:01
Hours/Week	2 hours. (Theory/Practical)	SEE:50 Marks
Total hours: 28	CIE:50 Marks	SEE:03 hours

Prerequisite:

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. Develop building and infrastructure vocabulary to be able to describe a building, its components, and its systems, including the architectural, MEP (mechanical, electrical, plumbing), and structural components.
2. Describe evolution and development of BIM from it origination to today. Be able to compare, including advantages and disadvantages of BIM vs. 2D and 3D CAD.
3. Explain the challenges and roadblocks still facing the use of BIM.
4. Demonstrate proficiency of commonly used BIM software (Autodesk Revit), including project document development and professional presentation of a BIM model.
5. Understand applications of BIM, such as cost estimation, architectural renderings, interference checking, and modeling of energy consumption

Modules	Teaching Hours
Module I Introduction to/Review of Buildings & Systems □ Building components and systems (architectural, MEP, structural) □ Building vocabulary □ Building drawings, specifications □ Building design process and roles of owners, managers, designers, engineers and contractors/subcontractors	3 hours
Module II Introduction to BIM and BIM Concepts □ What is BIM? □ How can BIM be a part of the building design process? □ BIM vs. 3D CAD □ Evolution and development of BIM & object-based parametric modeling □ BIM platforms	3 hours
Module-III Autodesk Revit □ Mass and concept modeling □ Detailed modeling □ Creating, importing and modifying families of objects and elements □ Architecture, MEP and Structural applications □ Creating plans, sections, details, schedules, cover page	3 hours
Module-IV Future of BIM	3 hours

Module - V Miscellaneous Applications of BIM □ Cost Estimating □ Energy Modeling □ Conflicts/Interference checking	2 hours

Course Title: CONSTRUCTION EQUIPMENT, PLANTS AND MACHINERY		
Course Code	22CV45B	CIE: 50
Number of Lecture Hours/Week	3HRS. (THEORY)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03

Prerequisite: **None**

Course objectives:

This course enables students to

- Various type of equipments used in constructions advantage & limitations of theseequipment.
- Manufacturing of natural aggregate & recycled aggregate through mechanization.
- Mechanization in rebar fabrication, concrete production, placement, types of form work & scaffolding and materials used.
- Construction of bridge/flyover by segmented construction and box pushing technologyfor tunneling &pile driving equipment.
- Construction methods of drilling blasting, tunneling &various equipments used in thisconstruction.

MODULES	TEACHING HOURS
MODULE I Introduction to mechanization: Definition, advantages and limitations of mechanization, Indian scenario and Global scenario. Mechanization through construction equipment: Equipment cost,Machine power, production cycle-Dozers, scrapers, Excavators, finishing equipment, Trucks and Hauling equipment, Hoistingequipment, Draglines and Clamshells.	**10Hrs.**
MODULE II Mechanization in aggregate manufacturing: Natural aggregatesand recycled aggregates	**8Hrs.**
MODULE III Mechanization in rebar fabrication Mechanization in concrete production and placement Mechanization through construction: Formwork and scaffolding types, materials and design principals.	**8Hrs.**
MODULE IV Mechanization through construction methods/technologies: Segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology. Pile driving equipment: Pile hammers, selecting a pile hammer, loss of energy due to impact, energy losses due to causes other than impact.	8Hrs.

MODULE V Mechanization through construction methods of drilling, Blasting and Tunneling Equipment: Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills, piston drills, blast hole drills,shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment, selecting drilling pattern. Selecting andEnvironmental issues in mechanization.	8Hrs.

Question paper pattern:
i) **Two** questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text books:
1)construction equipments by , S.C.Sharma , Dr.S.Seetharaman

REFERENCES:

1. "Construction Equipment and its Planning and Applications", Mahesh Varma, Metropolitan Book Co.(P) Ltd.,New Delhi. India.
2. "Construction Machinery and Equipment in India". (A compilation of articles Published in Civil Engineering and
3. "Construction Review" Published by Civil Engineering and Construction Review,New Delhi, 1991.
4. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, Delhi, 1988
5. Peurifoy R L, "Construction Planning, Equipment and Methods", Mc Graw Hill
6. James F Russell, "Construction Equipment", Prentice Hall
7. "Current Literature"

E books and online course materials: www.civilenggbooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Title **CONCRETE TECHNOLOGY**		
Course Code	22CV45C	Credit: 01
Number of Lecture/weeks	2 Hrs (Theory)	SEE:50 Marks
Total Number of LectureHours: 28	CIE:50 Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Hydration of cement and physical properties of cement and types of cement.
2. Physical properties of course and fine aggregate.
3. Design of concrete mix.
4. Fresh and hardened state property of concrete.
5. Testing of concrete.

Modules	**Teaching Hours**
Module I **Cement:** Manufacture of cement (OPC) by dry and wet process (Flow charts only). chemical composition and their importance, bogue's compounds, hydration of cement, heat of hydration. Tests on cement- Fineness by sieve test and Blaine's air permeability test, normal consistency, setting time, soundness, compressive strength of cement specific gravity of cement.	5 hours
Module-II **Aggregate:** Coarse aggregate, importance of size, shape, texture, grading of aggregates, sieve analysis Flakiness and Elongation, Specific Gravity, Moisture Content, Crushing, Impact, Abrasion tests.Fine Aggregate, Bulking of fine aggregate, Bulk Density, Ten percent Fineness Value, Sieve Analysis Specific Gravity. Deleterious Material and Introduction of M sand and recycled aggregates.	5 hours
Module -III **Fresh Concrete:** Workability-factors affecting, measurement of Workability-Slump, Compaction Factor, Vee-bee Consistometer, Flowtests. Segregation and Bleeding, Mixing, Placing and Compaction. Curing methods, Accelerated curing. **Admixtures**-plasticizer, superplasticizer, accelerators, retarders and airentraining agents. Mineral admixtures-fly ash and silica fume	6 hours

Module IV **Hardened Concrete:** Factors affecting strength- w/c, degree of compaction, age, aggregate/cement ratio, aggregate properties, maturity concept. Elasticity, factors affecting modulus of elasticity, relation between modulus of elasticity and Poisson's ratio, Introduction to RMC. **Testing:** Destructive testing-compressive strength, flexural strength, split tensile strength NDT by Schmidt rebound hammer test and ultra-Pulse velocity . Relation between tensile strength and compressive strength	6 hours
Module V **Shrinkage**- types of shrinkage, factors affecting shrinkage. Creep- factorsaffecting creep, effect of creep. Durability-importance, permeability, sulphate attack, chloride attack, carbonation, freezing and thawing. **Concrete Mix Design**: Factors to be considered in Mix Design, Mix Design by BIS method.	6 hours
Question paper pattern: Two questions to be set from each Module by intermixing (in total 10). Studentshave to answer any five full questions by selecting one question from each module.	
Textbooks**:** 1. Neville A.M. "Properties of Concrete"-4th Ed., Longman. 2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S.Chand and Company, New Delhi. 3. Kumar Mehta. P and Paulo J.M. Monteiro "Concrete-Microstructure, Propertyand Materials", 4th Edition, McGraw Hill Education, 2014 4. A.R. Santha Kumar, "Concrete Technology", Oxford University Press, NewDelhi (New Edition).	
Reference Books: 1. M L Gambir, "Concrete Technology", McGraw Hill Education,2014. 2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN:978-81-8487-186-9 3. Job Thomas, "Concrete Technology", CENGAGE Learning,2015. 4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement andConcrete] Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete BMTPC.	
E books and online course materials: www.civilenggebooks.com	
Course outcomes: **On completion of the course, the student will have the ability to:**	

Course	CO #	Course Outcome (CO)

Code		
22CV45C	**CO1**	Explain manufacturing of cement and the significance of physical properties of cement.
	CO2	Describe and identify the requirements of goodquality fine aggregate and coarse Aggregate.
	CO3	Design a concrete mix and explain the fresh stateproperty requirements of concrete
	CO4	Evaluate the influence of different parameters onthe properties of hardened concrete
	CO5	Analyze the quality of hardened concrete using the results of types of test

Course Title: **HYDROLOGY**		
Course Code	22CV45D	Credits: 03 CIE: 50
Number of Lecture Hours/Week	3 hrs	SEE: 50
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03

Prerequisite: The students should have knowledge of Engg. Mechanics & water resourcesengineering

Course objectives: The students will be able to acquire knowledge in the following topics

1. Hydrological cycle & Measurement rainfall over a catchment.
2. Engineering Analysis of Rainfall data.
3. Rainfall-Runoff relationship & Analysis of stream flow data.
4. Hydrograph theory & Application to predict floods.
5. Ground water hydrology & Estimation of yield of well.

Modules	**Teaching Hours**
Module I **INTRODUCTION:** Introduction and practical application of Hydrology and water Resources. Hydrologic cycle (Hortion's Qualitative Representation) . Concept of Catchment and Water budget equation.	4 hours
PRECIPITATION: Definition and forms of precipitation Types of precipitation – seasons in India Measurement of precipitation – Non recording and recording type rain gauges. Computation of average depth of precipitation over an area. Statistical method. Estimation of mission precipitation record.	4 hours
ModuleII **ANALYSIS OF RAINFALL DATA**: Mass curve and consistency of rainfall data Rain gauge networks – optimum number of rain gauges, Hyetograph, Average & Maximum intensity curves, Depth area durationcurves. Problems on dependable rain, frequency analysis.	8 hours
Module III **RUNOFF & STREAM FLOW MEASUREMENT:** Components. Factorsaffecting runoff. Basin yield. Rainfall – Runoff relationship using simple regression analysis. Computation of maximum flood discharge by rational formula, Empirical equations, frequency analysis. Stream flow measurement,Stage of a river, area-velocity method. Slope area method, Dilution method, Units of stream flow, flow duration curve, flow mass curve.	9 hours
Module IV **HYDROGRAPH THEORY:** Components of hydrograph. Separation of	
base flow. Unit hydrograph theory. Derivation and application of unit hydrograph. Computation of unit hydrographs ordinates of different durations . S-Curve and its use. Computation of Run off Hydrograph using unit hydrograph. Unit hydrograph for complex storms.	9 hours

Module V **GROUND WATER HYDROLOGY AND WELL HYDRAULICS:** Scope and importance of ground water hydrology. Occurrence of ground water. Definitions: Aquifers, aquitard, aquifuge, aquiclude, perched aquifer. Aquifer parameters. Darcy's law and its validity. Steady radial flow into a well in confined and unconfined aquifers. Safe yield, yield of an open well Pumping test and recuperation test. problems	8 hours

Question paper pattern:
Two questions is to be set from each module by intermixing the topic in the same module. Totalfive questions to be answered by selecting minimum one question from each module.

Text books:

1. Subramanya K. Engineering Hydrology, Tata McGraw Hill, New Delhi.
2. R.K. Sharma and Sharma – Hydrology and Water Resource Engineering
3. Linsley, Kohler and Paulhus: Applied Hydrology, McGraw Hill, New Delhi
4. Jayarami Reddy P: A textbook of Hydrology, Lakshmi Publications, New Delhi

Reference Books:

1. Mutreja. K.M. Engineering Hydrology
2. H.M. Raghunath: Hydrology, Wiley Eastern Publications
3. Ven Tee Chow Handbook of applied hydrology
4. Garg. S.K: Hydrology and Water resources engineering, Khanna Publications
5. nic@karnic.in
6. Water resources systems and management B.L.Gupta & Amit Gupta StandardPublishers distributers Dheeli

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CV45D	**CO1**	Students will be in a position to analyze the rainfall dataand apply the principles to the real problems.
	CO2	Students in a position to understand runoff computationsand apply the principles.
	CO3	Students acquire the knowledge of hydrographs and itscomponents also students can apply the principles of various hydrographs to solve field problems.
	CO4	Students gain knowledge in ground water source andapply the principles to different problems.
	CO5	Students will acquire the skills to interpret the hydrological data pertaining to surface and ground water.

Course Title: **Universal Human Values**		
Subject Code: 22UHV47	**Credit : 1**	**CIE: 50**
Number of Lecture Hours/Week (L:T:P:S)	**0:2:0 Hrs**	**SEE: 50**
Total Number of Lecture Hours	**30 Hrs**	**SEE Hours: 01**

Course objectives:

This course is intended to:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
- This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied skills.
3. State the need for UHV activities and its present relevance in the society and Provide real-life examples.
4. Support and guide the students for self-study activities.
5. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
6. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
7. Encourage the students for group work to improve their creative and analytical skills.

Modules	**Teaching Hours**
Module-I **Introduction to Value Education:** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations	**06 Hrs**

Module-II **Harmony in the Human Being :** Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	**06 Hrs**
Module-III **Harmony in the Family and Society :** Harmony in the Family – the Basic Unit of Human Interaction. 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to- Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.	**06 Hrs**
Module-IV **Harmony in the Nature/Existence :** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	**06 Hrs**
Module-V **Implications of the Holistic Understanding – a Look at Professional Ethics :** Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical. Case Studies, Strategies for Transition towards Value-based Life and Profession	**06 Hrs**

Course outcome (Course Skill Set)

At the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature);

- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Expected to positively impact common graduate attributes like:

1. Ethical human conduct
2. Socially responsible behaviour
3. Holistic vision of life
4. Environmentally responsible work
5. Having Competence and Capabilities for Maintaining Health and Hygiene
6. Appreciation and aspiration for excellence (merit) and gratitude for all

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.

The first test will be administered after 40-50% of the syllabus has been covered, and the secondtest will be administered after 85-90% of the syllabus has been covered

Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.

For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to50 marks

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions,** each of the 01 marks. **The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Web links and Video Lectures (e-Resources):

- Value Education websites,
- https://www.uhv.org.in/uhv-ii,
- http://uhv.ac.in,
- http://www.uptu.ac.in
- Story of Stuff,
- http://www.storyofstuff.com
- Al Gore, An Inconvenient Truth, Paramount Classics, USA
- Charlie Chaplin, Modern Times, United Artists, USA
- IIT Delhi, Modern Technology – the Untold Story
- Gandhi A., Right Here Right Now, Cyclewala Productions
- https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
- https://fdp-si.aicte-india.org/8dayUHV_download.php
- https://www.youtube.com/watch?v=8ovkLRYXIjE
- https://www.youtube.com/watch?v=OgdNx0X923I
- https://www.youtube.com/watch?v=nGRcbRpvGoU
- https://www.youtube.com/watch?v=sDxGXOgYEKM

Finance for professionals		
COURSE CODE:	22CVAE481	Credit: 01
Hours/ week	(theory /practical): 14 / 0	SEE MARKS:50
TOTAL HOURS:14	CIE MARKS:50	SEE HOURS:
PREREQUISITE:		

COURSE OBJECTIVES:

TO ENABLE THE STUDENT TO AQUIRE THE KNOWELDGE IN THE FOLLOWING TOPICS.

1.How to manage finance and risk analysis
2.firm values and Cash Flow comparative Analysis.
3. Financial Statement Analysis
4. Foreign Exchange Markets, Financing Foreign Operations
5. Documents in International Trade, Financial Management in Sick Units

MODULE-I

Introduction: Evolution of Financial Management, Goals, Forms of Business.
Risk and Required Return: Risk and return relationship, Business risk, financial risk, and risk in expected rate of return, Capital asset pricing model. Capital Budgeting: Risk analysis in Capital Budgeting, HOURS: 03

MODULE-II

Capital Structure and Firm Value: Assumption, Definition and approaches, Capital Structure decisions – EBIT, EPS analysis, ROI, REI analysis and Cash Flow comparative Analysis. Working Capital Management: Factors influencing working capital requirement, HOURS: 03

MODULE-III

Securities and Portfolio Analysis: Derivatives, Futures Trading, Financial Statement Analysis: Ratio analysis, time series analysis, Du pont analysis, funds flow analysis. HOURS: 02

MODULE-IV

International Financial Management: World Monitoring system, Foreign Exchange Markets, International Parity Relationships, International Capital budgeting, Financing Foreign Operations, HOURS: 03

MODULE-V

Raising Foreign Currency Finance, Financing Exports, Documents in International Trade. Financial Management in Sick Units: Definition of sickness, Causes of sickness, Symptoms of sickness, Prediction of sickness. HOURS: 03

Course Outcomes:

CO1: Financial Management, Risk and return relationship,& Risk analysis

CO2: Firm Value,Capital Structure decisions Factors influencing working capital requirement,

CO3: Futures Trading, Financial Statement Analysis:

CO4: International Financial Management, Financing Foreign Operations,

CO5: International Trade., Financial Management in Sick Units
Text Books: 1.Financial Management Theory and practice – Prasanna Chandra 2.Financial accounting – B.S. Raman – United publication – VoI II **Reference Books:** 1. Financial Management Text & Problems – Khan & Jain – TMH – ISBN 007-460208-X. 2. Financial management – IM Pandey – Vikas Pub. House – ISBN 0- 7069-5435-1.

TOTAL STATIONAPPLICATION IN CIVIL ENGINEERING		
Course Code	22CVAE482	CREDIT:2
Number of Lecture Hours/Week	2hrs(Practical)	SEE:50Marks
Total Number of LectureHours:28	CIE:50Marks	SEE:03Hours

Prerequisite: Basic Surveying, AutoCAD

Course objectives:
To enable the student to acquire the knowledge in the following topics

Experiments	Teaching Hours
1. Setting up, levelling up, centering and creation of file in Total Station.	02Hours
2. Taking out basic measurements RDM, REM & SHV using Total Station	02Hours
3. Determination of Area measurement using Total Station	02Hours
4. Establishment of new station using free stationing technique	02Hours
5. Traversing using total station to prepare topographic map of Area.	04Hours
6.Contour surveying using Total station.	04Hours
7. Plotting of topographic details within contours.	04Hours
8. Downloading total station data and map completion.	04Hours
9. Stake-out application using Total Station	04Hours
10.Determination of area of a polygon and capacity of contour using digital Planimeter.	

Question paper pattern:
Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. A. Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., New Delhi

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)	Blooms Level
21CVAE46B	**CO1**	Understand the concepts of Surveying theory course through series of experiments.	C2

	CO2	Sharetheresponsibilitiesinsmallteamsof4-5members for conducting the experiments.	C3
	CO3	Perform the various experiments on total station survey	C3
	CO4	Analyze the data and interpret the results.	C3
	CO5	Prepare a well-organized laboratory report.	C3

COURSE TITLE: ELECTRONIC WASTE MANAGEMENT- ISSUES AND CHALLENGES		
Course code	22CVAE483	Credit:01
Hours/Week	0/2hours.(Theory/Practical)	SEE:50Marks
Total hours: 14	CIE:50Marks	SEE:2hours

Prerequisite: Environmental studies, waste management, impact analysis

Course objectives:
To enable the student to acquire the knowledge in the following topics.
1. Understand the environmental impacts of e-waste.
2. Apply concepts of e-waste management hierarchy
3. Distinguish the role of various national and internal act and laws applicable for e-waste management and handling
4. Analyze the e – waste management measures proposed under national and global legislations.
5. The international legislations on e-waste control

Modules	Teaching Hours
ModuleI Introduction. E- waste; composition and generation. Global context in e- waste; E-waste pollutants, E waste hazardous properties, Effects of pollutant (E- waste) on human health and surrounding environment, domestic e-waste disposal, Basic principles of E waste management, Component of E waste management	3hours
Module II E-waste hazardous on Global trade Essential factors in global waste trade economy, Waste trading as a quint essential part of electronic recycling, . Important hazardous e-waste in India; India,. recycling of e-waste in metro cities of india	3hours
Module-III E-waste control measures Need for stringent health safeguards and environmental protection laws in India, , Reduction of waste at source. Restrictions of Hazardous Substances (RoHS) Directive	3hours
Module-IV E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016 - Salient Features and its likely implication. Government assistance for TSDFs.	2hours
Module - V The international legislation: The Basel Convention; The Bamako Convention. The Rotterdam Convention. Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union,	3hours

CourseOutcomes: Oncompletion ofthiscourse,students areableto:

CO	
CO1:	Understand the environmental impacts of e-waste
CO2:	Apply concepts of e-waste management hierarchy
CO3:	Distinguish the role of various national and internal act and laws applicable for e-waste management and handling
CO4	Analyze the e – waste management measures proposed under national and global legislations.

CO5	To know the international legislation on e-waste control

Question paper pattern:

ix) Two questions aretobesetfrom eachmodule.

x) Totalfivequestionsaretobeansweredbyselectingminimumonequestionfromeachmodule

Textbook:

1. Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi 2. Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009

Reference books:

1. Fowler B, Electronic Waste – 1 st Edition (Toxicology and Public Health Issues), 2017Elsevier E-Resources 1. https://news.mit.edu/2013/ewaste-mi

COMPONENTS OF SMART CITY		
Subject code	22CVAE484	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. To Understand the necessity of infrastructural development for smart cities.
2. To Identify components of infrastructure and Prepare infrastructure plan for smart city.
3. To Understand smart transport system for smart cities and its application
4. To Study of water resources systems for smart city and its application.
5. To Understand National and Global policies to implement for smart city development.

Modules	Teaching Hours
Module I **Fundamental of smart city & Infrastructure:** Introduction of Smart City, Concept of smart city, Objective for smart cities, History of Smart city world and India. Need to develop smart city, Challenges of managing infrastructure in India and world, various types of Infrastructure systems, Infrastructures need assessment.	09 hours
Module II **Planning and development of Smart city Infrastructure:** Energy and ecology, solar energy for smart city, Housing, sustainable green building, safety, security, disaster management, economy, cyber security, Project management.	09 hours
Module-III **Intelligent transport systems** Smart vehicles and fuels, GIS- uses- applications -components- use cases, GPS uses- applications -components- use cases, Navigation system, traffic safety management, mobility services, E-ticketing Definition-airline ticket-checking in with e tickets - limitations.	08 Hours
Module -IV **Management of water resources and related infrastructure** Storage and conveyance system of water, sustainable water and sanitation, sewerage system, flood management, conservation system. Monitoring aging infrastructure -public health water quality and environmental protection -extreme weather and climatic conditions .mobile operator capabilities for smart water management.	08 Hours
Module - V **Infrastructure Management system & Policy for Smart city** Integrated infrastructure management systems for smart city- solving urban infrastructure problems using smart city technologies, Infrastructure management - IoT-based monitoring for smart community. Policy for Smart city- Introduction- vision-objective-coverage-strategy-administrative structure-financing- Convergence with Other Government Schemes- Countries Supporting India's Smart Cities Mission- Budget Allocation.	08 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Understand the necessity of infrastructural development for smart cities.	C3

CO2:	Identify components of infrastructure and Prepare infrastructure plan for smart city.	C4
CO3:	Understand smart transport system for smart cities and its application	C4
CO4	Study of water resources systems for smart city and its application.	C4
CO5	Understand National and Global policies to implement for smart city development.	C4

Question paper pattern:

xi) Two questions are to be set from each module.

xii) Total five questions are to be answered by selecting minimum one question fromeach module

Text book:

1. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li
2. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos
3. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend
4. Grig N.S., Infrastructure engineering and management, Wiley-Interseience, 1988
5. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 1997
6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
7. Mission statement &guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf

Reference books:

1. Smart city government of India. http://smartcities.gov.in
2. Reconceptualising Smart Cities: A Reference Framework for India https://www.niti.gov.in/writereaddata/files/document_publication/CSTEP%20Report%20Smart%20Cities%20Framework.pdf
3. Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development -martcitiesoftomorrow.com/wp-content/uploads/2014/09/CONCEPT_NOTE_ 3.12.2014__REVISED_AND_LATEST_.pdf

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

CURRICULUM

FOR B.E.V SEMESTER AND VI SEMESTER

FOR THE ACADEMIC YEAR 2024-25

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr.Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart class rooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958 with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35 research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

Hyderabad Karnataka Education Society's

P. D. A COLLEGE OF ENGINEERING, KALABURAGI

B.E in Civil Engineering

Scheme of Teaching and Examination 2022

Outcome Based Education (OBE) and Choice-Based Credit System (CBCS)

Effective from the Academic Year 2022-23

V Semester

Sl. No	Course	Course Code	Couse Title	Teaching Department	Teaching Hours/Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	22CV51	Construction Management, and Economics	Civil Engg Dept	3	0	0	03	50	50	100	3
2	IPCC	22CV52	Environmental Engineering	Civil Engg Dept	2	2	2	03	50	50	100	4
3	PCC	22CV53	Geotechnical Engineering	Civil Engg Dept	4	0	0	03	50	50	100	4
4	PCCL	22CVL54	Geotechnical Engineering Lab	Civil Engg Dept	0	0	2	03	50	50	100	1
5	PEC	22CV55x	Professional Elective-I	Civil Engg Dept	3	0	0	03	50	50	100	3
6	PCCL	22CVL56	CAD Lab	Civil Engg Dept	0	0	2	03	50	50	100	1
7	AEC	22RMI57	Research Methodology and IPR	Any Department	2	2	0	03	50	50	100	3
8	BSC	22ES58	Environmental Studies	Civil Engg Dept	2	0	0	03	50	50	100	2
9	MC	22XX59	Mandatory Course	NSS/Physical Education/Yoga	0	0	2		50		50	
								Total	450	400	850	21

Professional Elective Course -I	
22CV55A	**Water Resource Engineering**
22CV55B	Matrix method of Structural Analysis.
22CV55C	Rural Water Supply and Sanitation
22CV55D	Numerical methods in Engineering

Mandatory Course	
22NS59	NSS
22PE59	Physical Education
22YO59	Yoga

Hyderabad Karnataka Education Society's

P. D. A COLLEGE OF ENGINEERING, KALABURAGI

B.E in Civil Engineering

Scheme of Teaching and Examination 2022

Outcome Based Education (OBE) and Choice-Based Credit System (CBCS)

Effective from the Academic Year 2022-23

VI Semester

Sl. No	Course	Course Code	Couse Title	Teaching Department	Teaching Hours/Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	IPCC	22CV61	Transportation Engineering	Civil Engg Dept	2	2	2	03	50	50	100	4
2	PCC	22CV62	Design of reinforced Concrete structures	Civil Engg Dept	3	2	0	03	50	50	100	4
3	PEC	22CV63x	Professional Elective-II	Civil Engg Dept	3	0	0	03	50	50	100	3
4	OEC	22CVOE64x	Open Elective-I	Civil Engg Dept	3	0	0	03	50	50	100	3
5	PROJ	22CV65	Major Project Phase-I	Civil Engg Dept	0	0	4	03	50	-	50	2
6	PROJ	22CVMP66	Extensive Survey Project	Civil Engg Dept	0	0	4	03	50	50	100	2
7	AEC	22CVAE67x	AEC/SEC-V	Civil Engg Dept	0	0	2	03	50	50	100	1
8	MC	22XX68	Mandatory Course	NSS/Physical Education/Yoga	0	0	2		50	-	50	0
								Total	400	300	700	**19**

Professional Elective Course -II	
22CV63A	**Design of Masonry Structures**
22CV63B	Structural Dynamics
22CV63C	Advanced Surveying
22CV63D	Theory of Elasticity

Open Elective- I	
22CVOE641	**Ecology and Environment**
22CVOE642	Remote Sensing and GIS
22CVOE643	Numerical Methods in Engineering

Ability Enhancement Course / Skill Enhancement Course - V	
22CVAE671	Software Based Lab
22CVAE672	Smart City Command Centre
22CVAE673	Applications of DRONE
22CVAE674	AI and Analytics for Structural Health Monitoring
22CVAE675	Structural Health Monitoring using Sensors
22CVAE676	**Indian Knowledge System**

Mandatory Course	
22NS68	NSS
22PE68	Physical Education
22YO68	Yoga

Course Title: CONSTRUCTION MANAGEMENT ECONOMICS AND EQUIPMENTS		
Course Code	22CV51	Credits:03 CIE:50
Number of Lecture Hours/Week	03Hrs	SEE:50
Total Number of Lecture Hours	42Hrs	SEE Hours: 03
Prerequisite: Building material and construction, Building planning and drawing, Estimation		

Course objectives:
To enable the student to acquire the knowledge in the following topics: -
1. Planning, scheduling, and controlling, bar chart, milestone charts, elements of network for project.
2. Network analysis and Probability of meeting the scheduled time of project using CPM and PERT network.
3. Cost time relation and Resource allocation of project.
4. To apply economics in design material selection, Interest and interest formulae. Compare the alternatives in civil engineering problem, breakeven and minimum cost analysis and benefit cost analysis.
5. Construction equipment and equipment economics.

Modules	Teaching Hours
Module I	
Construction planning: Introduction, planning scheduling, controlling, bar charts and milestone charts. Elements of network- event, activity, dummy activity, network rules, numbering of events, problems.	4hours
Construction industry and management: Introduction value engineering time management, labor and material management, professional practice, definition rights and responsibilities of owner contract and contractor organization and administration.	3hours
Module II	
Net Work Analysis: CPM and PERT network analysis, Activity time estimates, start and finish times of activity, float, critical path, Basic rules for CPM network, drawing a network, advantages of CPM	5hours
PERT network, uncertainties in PERT network, timeestimates, earliest expected time (TE) latest allowable occurrence time (T_L), slack, critical path, Probability of meeting the scheduled time for PERT network difference between CPM and PERT	5hours
Module III	
Cost time Relation: construction cost direct cost, indirect cost, total cost, optimum cost, optimum duration of project problems.	5hours
Resource Allocation: Histogram, Resource smoothing and resource levelling and related problems, Introduction to Management software package "Primavera	3 hours

Module IV **Engineering Economics**: introduction basic concepts of economics analysis, time value of money, cash flow diagram, equivalence single payment in the future (P/F, F/P), present payment compared to uniform series payments (P/A,A/P) future payment compared to uniform series payments (F/A,A/F)working capital management ,construction accounting **Basis for Comparison of Alternatives:** interest formula Present worth amount, annual equivalent amount, future worth amount, rate of return. Evaluating replacement alternatives, break even and minimum cost analysis, benefit cost analysis. Numerical.	5hours 4hours
Module V **Construction Equipment**: Introduction, various earth moving equipment, hoisting equipment, concrete mixer and plants, conveyors and rollers, trenching machines, equipment for highway construction, factor for selecting equipment, special equipment **Equipment economics**: Economic life of equipment. Equipment costs, Ownership and operating costs, Buy/Rent/Lease options. Replacement analysis.	4hours 4hours

Question paper pattern:
Two questions are to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.

Textbooks: Construction management – k. Subramium Anuradha publishers.

Reference Books:

1) CPM and PERT by "Punmia" Lakshmi Publications
2) CPM and PERT by "L.S.Srinath"
3) Engineering Economics by "Theusen"
4) Construction equipment by S.C.Sharma, Khanna publication
5) Construction planning and management- Mahesh Varma, Metropolitan Book Co. Delhi 1982

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome (CO)	Bloom levels
22CV51	CO1	Prepare the Bar charts and milestone chart for projects. Allocation of Resource in Construction Management.	C3
	CO2	Analyze CPM and PERT network for determining Completion scheduled time for a project.	C4
	CO3	Analyse Cost time relation and Application of Primavera (P6) software in Civil Engineering Project.	C3
	CO4	Evaluate the concept of Economics and identify the alternatives for a minimal cost analysis.	C2
	CO5	Applications of Equipment and operating cost in construction organization.	C2

ENVIRONMENTAL ENGINEERING		
Subject code	22CV52	Credit: 04
Hours/Week	6 hours. 2L+ 2T+2P	SEE: 3 hours
Total hours: 56+ 28=84	CIE: 50 Marks	SEE: 50 Marks

Prerequisite: Fluid Mechanics, Water Resources engineering

Course objectives:

To enable the students to acquire the knowledge in the following topics.

1. Fundamentals of water and wastewater engineering.
2. Various components of water supply and wastewater collection systems.
3. Quantitative and qualitative assessment of water and wastewater.
4. Design water and wastewater system using hydraulic principles.
5. Operation of water and wastewater treatment systems.

Modules	Teaching Hours
MODULE-I **Introduction**: Need for protected water supply. **Demand of water:** Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits and demerits- variations in demand of water. Fire demand – estimation by Kuching's formula, Freeman formula and national board of fire underwriters' formula, peak factors, design periods and factors governing the design periods. **Quality of water:** Objectives of water quality management. Concept of safe water wholesomeness, palatability and potable. Water borne diseases. **Sources:** Surface and subsurface sources – suitability with regard to quality and quantity.	10 Hours
MODULE-II **INTRODUCTION**: Wastewater disposal - Necessity for sanitation. Methods of sewage disposal. **Materials of Sewers**: Sewer materials, Shapes or sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewers. . **Examination of water and wastewater:** objectives – Physical chemical and Microbiological Examinations, (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water standards BIS and WHO standards. Health significance of Fluoride, Nitrates and heavy metals like Mercury and Cadmium. Sampling of water for examination. Types of sewerage systems and their suitability **Analysis of wastewater**: Physical. Chemical and biological characteristics concepts of aerobic and anaerobic activity, more emphasis on BOD and COD. Sampling, significance, techniques and frequency. **Quantity of Sewage**: Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design	10 Hours

flow, estimation of storm flow, rational method and empirical formulae of design of storm water drain; Time of concentration. **Sewer Appurtenances**: Catch basins, manholes, flushing tanks, oil and grease traps, drainage traps, basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage	
MODULE-III **Collection and conveyance of water**: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms, Pipe appurtenances. **Design of Sewers**: Hydraulic formulae for velocity, effects of flow variations on velocity, self-cleansing and non-scouring velocities. Design of hydraulic elements for circular sewers flowing full and for partially full. **Disposal of effluents:** By dilution, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, disposal standards on land and water, chlorination of sewage. **Treatment of sewage:** Flow diagram of municipal sewage treatment Plant.	12 Hours
MODULE-IV **Water treatment**: Objectives – Treatment of flow-chart. Aeration- Principles, types of aerators. **Sedimentation:** Theory of settling tanks, types, design. Aided sedimentation –with coagulants, dosages, chemical feeding, flash mixing, and flocculator-design ofall units. **Primary Treatment: screening**, grit chambers, skimming tanks, primary sedimentation tanks – Designs.	12 Hours
MODULE-V **Filtration**: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing filters. **Softening:** Definition, methods of removal of hardness lime soda process and zeolite process. **Disinfections**: Theory of disinfections, methods of disinfections, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. **Secondary Treatment:** Trickling filter – types, theory and operation – Designs. Activated sludge process – principle and flow diagram, methods of aeration, modifications, F/M ratio – Design	12 Hours

Course Outcomes: On completion of this course, students are able to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Understand water demands and estimate the water demand for a known population considering different influencing Parameters	C3
CO2	Evaluate the quality of water and waste water with reference to physical, chemical and biological parameters	C4
CO3	Describe different types of intake structures, pumps and design the rising main and design of sewers for disposal of effluents	C4
CO4	Explain the steps involved in the water treatment and design of primary treatment systems.	C4
CO5	Describe the water softening techniques, rain water harvesting methods and the concepts. Involved in the design of water distribution systems. Secondary treatment systems.	C4

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text books:

1. Environmental Engineering (Vol I & II) – By S.K. Garg, Khanna Publishers
2. Environmental Engineering – (Vol I & II) By B.C. Punmia and Ashok Jain
3. Water and Wastewater Engineering Vol – II By Fair, Geyer, Okun, Willey Eastern Publishers, New York
4. Waste Water Treatment, Disposal and Reuse - By Metcalf & Eddy Inc... Tata McGraw HillPublications (2003 Edition)
5. Water Technology By Hammer & Hammer

Environmental Engineering By Howard.S. Peavy, Donald. Rowe, George Tchobanoglouse,McGraw Hill International Edition

Reference Books:

1.Manual on Waste Water Treatment – CPHEEO, Ministry of Urban Development, New Delhi

E-Books: www.civilenggebooks.com

ENVIRONMENTAL ENGINEERING LAB

Perquisite: Engineering Chemistry.

Course objectives:

1. **To enable the student to acquire the knowledge in the following topics**
2. **Determination of Solids in Water / Sewage, turbidity, electrical conductivity, optimumalum dosage, Sieve Analysis of Filter Sand.**
3. **Determination of Chlorides. Alkalinity, Acidity, Total Hardness, COD, BOD, percentageof chlorine,**
4. **Determination of pH. Sulphate, Fluoride. Iron. Nitrate.**
5. **Determination of Total Count Test, Most Probable Number (MPN).**

Modules	TeachingHours
I Analysis of Physical Parameters:	
1. Determination of Solids in Water / Sewage – Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.	2 Hours
2. Determination of Turbidity present in water.	2 Hours
3. Determination of Electrical Conductivity of water.	2 Hours
4. Determination of Optimum Alum Dosage.	2 Hours
5. Sieve Analysis of Filter Sand.	2 Hours
II Analysis of Chemical Parameters:	
1. Determination of Chlorides.	2 Hours
2. Determination of Alkalinity, Acidity.	2 Hours
3. Determination of Total Hardness, Calcium Hardness, Magnesium Hardness	2 Hours
4. Determination of Dissolved Oxygen, Biochemical Oxygen Demand(BOD), Chemical Oxygen Demand (COD).	2 Hours
5. Determination of Percentage of Chlorine in Bleaching Powder, Residual Chlorine, Chlorine Demand	2 Hours
III Analysis of Chemical Parameters by Instrumental Methods:	
1. Determination of pH.	2 Hours
2. Determination of Sulphate.	2 Hours
3. Determination of Fluoride	2 Hours
4. Determination of Iron.	2 Hours

GEOTECHNICAL ENGINEERING		
Subject code	22CV53	Credit: 04
Hours/Week	4 hours. (Theory)	SEE: 50 Marks
Total hours: 56	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering geology

Course objectives:
To enable the student to acquire the knowledge in the following topics.
1. Understand basic properties of soil and classify the soil.
2. Determine compaction and permeability of soil
3. Understand the methods of subsurface exploration and determine the consolidation properties of soil.
4. Understand the Shear strength of soil. and determine the Earth pressure of soil
5. familiarize the students with the procedures used for estimation of Bearing capacity and settlements under the foundation.

Modules	Teaching Hours
Module I **Introduction:** Definition, origin and formation of soil, Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships and Density index. **Index properties of soils and their determination**: Index properties of soils- Water content, Specific Gravity, Particle size distribution, Consistency limits and indices, insitu density. particle size distribution (Sieve analysis and Hydrometer analysis only). **Classification of soils**: Particle size Classification by IS Method.	08 hours
Module-II **Flow of water through soils**: Darcy's law- assumptions and validity, coefficient of permeability and its determination (laboratory), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity andcoefficient of percolation, effective stress concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena. **Compaction of soils definition**: Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control-proctor needle.	08 hours
Module-III **Subsurface exploration:** Importance, Exploration program, Methods of exploration: Boring, sounding tests, geophysical methods-Electrical resistivity and Seismic refraction methods. Types of samples- undisturbed, disturbed and representative samples. Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilization of boreholes. Typical boring log. Number and depth of borings for building and dams. Determination of ground water level by Hvorselev method **Consolidation of soils**: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory, assumption and limitations. Normally consolidated, under consolidated and over consolidated soils. Reconsolidation pressure and its determination by Casagrande's method. Laboratory one dimensional consolidation test. Determination of consolidation characteristics of soils-compression index. and coefficient of consolidation,	09 Hours

Module -IV **Shear strength of soil**: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, measurement of shear parameters. Direct shear test, unconfined compression test, Triaxial compression test and vane shear test. Test under different drainage conditions. Conventional and modified failure envelops. Total and effective shear strength parameters, factors affecting shear strength of soils. **Lateral earth pressure:** Types of Earth pressure, Active and Passive earth pressures, Earth pressure coefficient and their range. Earth pressure theories-Rankine's and Coulomb's – assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) –Cullman's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.	09 Hours
Module-V **Bearing capacity:** Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations-assumptions and limitations. Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Plate load test, Standard penetration test, **Foundation settlement:** Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance BIS specifications for total and differential settlements of footings and rafts.	08 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Determine the index properties of soil and classify the soils.	C3
CO2:	Apply the principal of flow of water through the soil and also determine the compaction properties.	C4
CO3:	Explain the methods of subsurface exploration and determine the consolidation properties.	C4
CO4	Analyze the shear strength of soil and determine lateral earth pressure in soils.	C4
CO5	Determine the bearing capacity and settlement of soils	C4

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co., New Delhi.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering, UBS Publishers and Distributors, New Delhi.
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India.
5. Bowles,J.E., "Foundation Analysis and design" 5th edition, McGraw Hill Pub. Co ., New York (1996)

Reference books:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics-, John Wiley & Sons.
2. Donald P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi.
3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-Tata McGraw Hill Publications.
4. Debashis Moitra, "Geotechnical Engineering", Universities Press.,
5. Malcolm D Bolton, "A Guide to soil mechanics", Universities Press.,
6. Dr. C Venkataramaiah, 'Geotechnical engineering" New age Publications.
7. Dr. Alam Singh , Modern Geotechnical engineering.

Nptel Link: **https://youtu.be/afirGWlleSM**	
E-Books: www.civilenggebooks.com	

GEOTECHNICAL ENGINEERING LAB		
Subject code	22CVL54	Credit: 01
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering geology

Course objectives:
To enable the student to acquire the knowledge in the following topics
1. Determination of Specific gravity, moisture content, Grain size analysis, density by core cutter
2. Determination of Consistency limits- Liquid limit, plastic limit and shrinkage limit.
3. Determination of Standard Proctor compaction test and Modified Proctor Compaction test,
4. Determination of Coefficient of permeability, Strength tests, Unconfined compression test, Direct shear test (for small and big particle size), Triaxial compression test

Modules	Teaching Hours
1. Test for determination of specific gravity and moisture content	2 hours
2. Grain size analysis of soil sample (sieve analysis) 3. Insitu density by core cutter and sand replacement methods.	2 hours
4. Consistency limits- Liquid limit (Casagrande and cone penetration methods), plastic limit and shrinkage limit.	2 hours
5. Standard Proctor compaction test and Modified Proctor Compaction test.	2 hours
6. Coefficient of permeability by constant head and variable head methods	2 hours
7. Strength tests	
a) Unconfined compression test	2 hours
b) Direct shear test (for small and big particle size)	2 hours
c) Triaxial compression test	2 hours
8. Consolidation test–determination of compression index and co -efficient of consolidation. (Demonstration).	2 hours
9. Laboratory vane shear test	2 hours
10. Demonstration of equipment's a) Demonstration of miscellaneous equipment's such as Augers, Samplers, Rapid moisture meter, Proctor's needle.	2 hours
b) Demonstration of Hydrometer test.	2 hours
c) Demonstration of free Swell Index test	2 hours
d) Demonstration of determination of relative density	2 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1	Demonstrate the concepts of GT theory course through series of experiments.	C2

CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments	C3
CO3	Perform the experiments and determination of specific gravity, moisture content, Grain size analysis of soil sample, core cutter and sand replacement methods, Liquid limit, plastic limit and shrinkage limit, Standard Proctor compaction test, Modified Proctor Compaction test, compression index, co-efficient of consolidation, Laboratory vane shear test, Hydrometer test, Swell index test, relative density.	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:
Any one of the above experiments is to be conducted in the examination by the student.

Reference books:

1. Soil testing –lab manual & question bank by KVS Appa Rao, VCS Rao, university science press
2. Punmia B C, Soil Mechanics and Foundation Engineering-(2017),16th Edition, Laxmi Publications co., New Delhi.
3. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi.
4. Head K.H., "Manual of Soil Laboratory Testing" Vol. I, II, III, Princeton Press
5. Bowles J. E "Engineering Properties of Soil and Their Measurements", -Mc Graw Hill Book Co. New York.
6. Relevant BIS Codes of Practice: IS-2720 series

Nptel Link: **https://youtu.be/55RwyS0-ySo**

E-Books: www.civilenggebooks.com

WATER RESOURCES ENGINEERING		
Subject code	22CV55A	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Fluid Mechanics, Engineering Mathematics

Course objectives: Introduce importance of water resource engineering.

1. The basics of hydrology & hydrograph.
2. Introduction to canal irrigation and solving problems involved in canal irrigation system.
3. Explaining the concept of gravity dam and spillways,
4. Design of Gravity Dams.
5. Conceptualization of earthen Dams.

Modules	Teaching Hours
Module I **Introduction: W**ater resources engineering disciplines, water management sectors Water wealth of India. Hydrological cycle, water shed hydrology, measurement of precipitation by rain gauges Computation of precipitation, missing rainfall data, rain gauge density, rainfall mass curve & hyetograph - Problems	8 Hours
Module-II **Runoff:** Runoff cycle, factors affecting runoff, computation of average annual runoff, maximum runoff, Concept of Hydrograph & Unit Hydrograph & Flood frequency Studies - problems. **Reservoirs:** Types, site selection, Investigations for reservoirs. Determination of storage capacity of reservoirs using mass curve, analytical method, storage zones of reservoir, economical height of dam.	8 Hours
Module-III **Canal irrigation:** Types of canals, alignment of canals, definition of gross command area, culturable command area, intensity of irrigation, time factor, capacity factor, kharif season, rabi season, types of crops & their duty, delta, base periods determination of canal capacity, frequency of irrigation, field capacity. Crop factor. Consumptive use of water, Blinney-criddle equation problems irrigation efficiency, L-section of canal, balancing depth of canal.	10 Hours
Module –IV **Dams & Spillways:** Rigid dams & non-rigid dams Gravity dams, Forces acting on gravity dams, design of elementary profile of gravity dam, Types of Spillways, Necessity, location, ogee spillway. Design of ogee spillway, Energy dissipation below spillway. Use of hydraulic jump & design of stilling basin	8 Hours
Module-V **Earthen dams:** Types, Necessity, mode of failures of earth dams, Preliminary section, determination of Phreatic line in earthen dams, seepage discharge and problems, Control of seepage in earthen dams. Design criteria of earthen dams, Seepage Analysis & stability Analysis of earthen dams- Fellenious method & Swedish Slip circle method.	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO	Course Outcomes	Blooms Level
CO1:	The students will be able to explain water management sectors and importance of water resource projects.	C2
CO2:	The students will be able to describe hydrological cycles and its various components.	C2
CO3:	The students will be able to assess the requirements of canal irrigation and solve problems related to them.	C3
CO4	The students will be able to attain information about gravity dams, spillways and energy dissipating systems so they can design Gravity dams and spillways.	C4,
CO5	The students will be to insight all the factors involved in analysis of earthen dams.	C4

Question paper pattern:

Scheme of SEE: i) Two questions are to be set from each module. i) Total five questions are to be answered by selecting minimum one question from each module.

Text book:

1. S. K. Garg, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi.

2. Punmia and Pandey Lal, "Irrigation and Water Power Engineering" Lakshmi Publications, New Delhi.

3. K. R. Arora. "Irrigation, Water Power and Water Resources Engineering" Standard Publications, New Delhi.

Reference books:

1. Garg, S.K. "Hydrology & Water Resource Engineering" Khanna publications
2. Modi, P.N. "Irrigation, Water Resources and Water Power Engineering Standard Book 3. R.K. Sharma, "Hydrology & Water resources Engineering House, New Delhi.

3. Punmia and Pandey Lal, Irrigation and Water Power Engineering Lakshmi Publications, New Delhi.

Nptel Link: **https://youtu.be/fx1uUek3Iqg**

E-Books: www.civilenggebooks.com

Course Title: **MATRIX METHODS OF STRUCTURAL ANALYSIS**		
Course Code	22CV55B	Credits: 03
Number of Lecture Hours/Week	3hrs. (Lecture)	CIE: 50 SEE: 50
Total Number of Lecture Hours	42 hrs	SEE Hours: 03

Prerequisite: **Elements of civil engineering, Strength of material, Structural analysis.**

Course objectives:

1. Fundamentals of stiffness and flexibility methods for analyzing indeterminate structures
2. Analysis of trusses, continuous beams, and rigid frames by direct stiffness method
3. Analysis of trusses, continuous beams, and rigid frames by flexibility method

Modules	**Teaching Hours**
MODULE-I Stiffness and flexibility: Development of stiffness and flexibility. Relationship between stiffness and flexibility matrix, member coordinates and global coordinates. Displacement Transformation matrix, force transformation matrix and relationship between them.	04Hrs
Development of total stiffness matrix by using basic element approach. Analysis of continuous beams and frames using stiffness method (by using basic element approach).	04Hrs
MODULE-II Introduction to direct stiffness method, Local and global co-ordinate system, Transformation of variables, rotation transformation matrix, Relationship between member and nodal numbering member, member stiffness matrix in global system and local system, Development Overall stiffness matrix (global stiffness matrix), Development of load vector, Banded matrix snd band width minimization. Computation of internal forces in members and reactions.	05Hrs
Analysis of truss by direct Stiffness method: Development of member stiffness matrix in global system, numerical problems on Analysis of truss method (kinematic indeterminacy<=3) by direct Stiffness	04Hrs
MODULE-III Application of direct Stiffness method in analysis of beams: Development of member stiffness matrix in global system, numerical problems on Analysis of continuous beams(D.O.F<=3).	04Hrs
Application of direct Stiffness method in the analysis of rigid frames: Development of rotation transformation matrix. Development of member stiffness matrix in global system. Analysis of rigid frames by DSM(D_k <=3).	05Hrs
MODULE-IV Introduction to flexibility method, Equilibrium equation, Compatibility condition, Choice of released structure, Equilibrium matrix, Element flexibility matrix. Point of contragredience, Construction of flexibility matrix of the structure, Relationship between nodal forces and displacementt	4Hrs
Application of flexibility method in the analysis of continuous beams, numerical problems (static indeterminacy<=3).	04Hrs

MODULE-V	
Application of flexibility method in the analysis of rigid frames, numerical problems (D_s<=3). Application of flexibility method in the analysis of trusses, numerical problems (D_s<=3).	04Hrs 04Hrs

Question paper pattern:

i) **Two** questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module.

Text books:

i) Mukhopadhyay "Matrix, finite elements, Computer and Structural analysis", Oxford & IBW,1984

ii) W. Weaver J.M. Gere "Matrix Analysis of framed structures", CBS publishers and Disributers,1986

iii) S Rajshekharan. G Sankara Subramanian " Computational structural Mechanics", PHI, 2001

iv) G.S Pandit & S P Gupta " Structural Analysis A Matrix Approach" Tata Mc Graw- Hill,1981

C.S Reddy " Basic structural Analysis", Tata Mc Graw-Hill,1996

Reference Books:

i) L S Negi and R S Jangid "Structural Analysis", Tata Mc Graw-Hill,1997

ii) H C Martin " Introduction to Matrix Methods of Structural analysis ",International text book Company,1996

E books and online course materials: www.civilenggbooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
22CV55B	**CO1**	Understand the basic concepts of method and develop stiffness method	C2
	CO2	Application of direct stiffness method in structural analysis	C2
	CO3	Analyze trusses, continuous beams and rigid frames by flexibility method	C4
	CO4	Understand the concepts of flexibility method and develop flexibility matrix	C2
	CO5	Analyze continuous beams, rigid frames trusses & by flexibility method.	C4

Course Title: **RURAL WATER SUPPLY AND SANITATION**		
Course Code	**22CV55C**	Credits 03
Number of Lecture Hours/Week	**3hrs. (Theory)**	CIE: 50 SEE: 50
Total Number of Lecture Hours	42 hrs	SEE Hours: 03

Prerequisite: **Environmental studies and Environmental engineering.**

Course objectives:

To enable the students to acquire the knowledge in following topics.

1. Characteristics of water quality, sources for rural water supply sources and treatment methods
2. Problems in rural sanitation, different method of collection and disposals of refuse, rainwater harvesting techniques.
3. Milk sanitation and control of insects

Modules	**Teaching Hours**
MODULE-I Need for a protected water supply Investigation & selection of different water sources for rural places, Water borne diseases. Protection of well waters, Drinking water quality Indian standards - Physical, Chemical and bacteriological parameters. Different types of pumps for rural places	8hrs
MODULE-II **Supply systems:** Metered water supply, Piped water supply, Intermittent and continuous water supply system. Water treatment methods- Disinfection of water , Removal of hardness & iron removal methods, Defluorination- different methods and Nalgonda technique Ground water contamination & control.	8hrs
MODULE-III **Rural sanitation** Conservancy, public latrine, Concept of Eco-sanitation, Trenching method of refuse disposal and compositing methods of garbage disposal, Sewage farming techniques for utilization of treated effluent. Two pit latrines for rural places, Aqua privy, Design of Septic tank, Soak.	8hrs
MODULE-IV **DRAINAGE SYSTEMS:** Storm water & sullage disposal systems Methods –Roof top and various rainwater harvesting methods and its uses. **Communicable Diseases:** Terminology, Classification, Methods of communication of communicable diseases, Methods of control of communicable diseases **Refuse Collection & Disposal**: Garbage, ash, rubbish, Collection methods, Transportation. Disposal –salvaging, Dumping, controlled tipping, Incineration, Dung digester, Biogas plant.	**10hrs**
MODULE-V **Milk Sanitation:** Essential of milk sanitation, Test for milk quality, Pasteurization of milk, Quality control, Cattle borne diseases, Planning and design for a sanitary cow shed. INSECT CONTROL: House fly - Life cycle, Diseases, methods of transmission & Control measures Mosquito - Life cycle, Diseases, methods of transmission &	**8hrs**

Control measures.	

Question paper pattern:

i) **Two** questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module.

Text books:

1. Joseph A Solveto, "Environmental sanitation "
2. E-waste," Water supply and sanitary engineering"
3. S.K Garg, "Water supply Engineering" Khanna Publishers

Reference Books:

1. Environmental sanitation by Joseph Salvato , John Wiley and sons INK Chapman & hall ltd.
2. Rural water supply & sanitation by,Sanjay Gupta ,vayu education of india ,SAPNA book house Bangalore.
3. Municipal and rural sanitation by, Victor M Ehlevs and earnest .W, steel ,new York Mc graw hillbook company.

E books and online course materials: www.civilenggbooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
22CV55C	**CO1**	Possess knowledge of drinking water standards, protected water supply and water borne diseases. Understand and demonstrate techniques of identifying sources and selection of water source, well protection and pumps	C2
	CO2	Possess knowledge of various water supply systems. Understand techniques of drinking water treatment methods and ground water contaminations	C2
	CO3	Possess of knowledge of eco-sanitation, public latrine and conservancy. Interpret and demonstrate techniques for treatment and disposal of solid waste and sewage farming.	C2
	CO4	Define concepts of communicable diseases and refuse collection. Understand and interpret techniques for rain water harvesting, storm water and sullage disposal, communication and control of communicable diseases and solid waste disposal.	C2
	CO5	Show knowledge of disease transmission by milk	C2

		and insects Interpret and demonstrate techniques for milk sanitation, life cycle and control of insects	

NUMERICAL METHODS IN CIVIL ENGGINEERING		
Subject code	22CV55D	Credit:3
Hours/Week	42 HRS	SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering Mathematics.

Course objectives:

To enhance the problem-solving skills of engineering students using an extremely powerful problem solving tool namely numerical method.

1. To understand the system of equations, non-linearities and complicated geometries that are not uncommon in engineering practice and that are often impossible to solve analytically.

Modules	Teaching Hours
Module I Linear Algebra: Solution of System of Linear Algebraic equations by triangularizationmethod: Crout's method, Cholesky method, Partitions method, Gauss Jacobi, Gauss- Sidel's method and Power method for eigen values and eigen vectors	8hrs
Module II Roots of equations: Muller method, Graeffe's root squaring method. Numerical solution of ordinary differential equation by Picards method of successive approximation, first order simultaneous equation by Picard and Runge-Kutta method. Second order equation by Picard's method.	8hrs
Module-III Partial Differential Equations: Numerical solution of one-dimensional wave equation, Heat equation, (Schmidt's explicit formula) & Laplace equation (Gauss-Seidel process) by finite difference schemes. Illustrative examples on each method.	8hrs
Module-IV Probability distribution: Random variables, probability mass and probability distribution function, Probability distributions: Binomial, Normal and Gaussian distributions & examples.	9hrs
Module - V Sampling Theory: Testing of hypothesis: t-distribution test, Chi square test and F-test. Analysis of Variance (ANOVA):one way classification, Design of experiments, RBD.	9shrs

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Acquire the idea of significant figures, types of errors during numerical. computation.	C3
CO2:	Learn various numerical methods to solve system of linear deferential equations	C4

CO3:	Analyze and solve PDE's related to wave equation arising in vibration analysis	C4
CO4	Describe the basic notions of discrete and continuous probability distributions	C4
CO5	Understand statistical and probabilistic concepts required to test the hypothesis anddesigning the experiments using RBD.	C4

Question paper pattern:

xi) Two questions are to be set from each module.

xii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Numerical Methods: Problems and Solutions" by M.K. Jain, S. R. K. Iyengar, and R. K. Jain
2. Numerical Methods in Engineering & Science" by B.S. Grewal
3. Numerical Methods" by E. Balagurusamy
4. Numerical Methods: Problems and Solutions" by Raghavan V. and Pawan K. Bhambri
5. Numerical Methods for Engineers" by S.K. Gupta

Reference books:

1.S.S .Shastry, Introductory Methods of Numerical Analysis , PHI, 2005.

2.David C. Lay, "Linear Algebra and its applications", 3rd Edition , Pearson Education,2002.

3.T.Veerarajan "Probability, Statistics and Random Process", 3rd Edition, Tata Mc-Graw HillCo.,2016

4.Kenneth Hoffman and Ray Kunze, "Linear Algebra", 2nd Edition,PHI, 2011

5.B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers,44Th Ed,20176.E.Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley,2015.

CAD LAB		
Subject code	22CVL56	Credit: 01
Hours/week	2 practical's	See: 50 marks
Total hours:28 hours	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Basic Knowledge of computers

Course objectives:
This course will enable students to
1. Use industry standard software in a professional set up.
2. Understand the elements of finite element modeling, specification of loads and boundary condition, performing analysis and interpretation of results for final design.
3. Develop customized excel spread sheets.

Modules	Teaching Hours
Module I Use of civil engineering software STAAD PRO for: 1. Analysis of plane trusses, 2. Analysis of continuous beams. 3. Analysis of 2D frame 4. 3D analysis of multistoried frame Building(G+2).	12 hours
Module-II Use of EXCEL spread sheets. 1. To Design of Septic Tank 2. To Design of Trickling Filter 3. To Design of Grid Chamber 4. To Design of Sedimentation Tank 5. To Create profile levelling and Cross Section levelling 6. To adjust closing error by Bowditch rule in Traverse.	12 hours
Module-III GIS applications using open-source software: 1. To create shape files for point, line and polygon features with a map as reference.	4 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Analyze and Design beams and trusses using software	C2
CO2:	3D analysis of multistoried frame structures using Software.	C3
CO3:	Apply GIS software to create shape files with a map as reference and to create.Decision maps for specific purpose	C4
CO4	Design of Septic Tank using excel spread sheets	C4
CO5	Design of Grid Chamber using excel spread sheets	C4

Question paper pattern:
Writeup & Viva 15 marks, Excel sheet 20marks, Staad Pro 10 marks, QGIS 5 marks

Reference books:
Training manual sand User manual sand Relevant course reference books

E-Books: www.civilenggebooks.com

RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS			
Course Code	22RMI57	Credits	3
Course Type	RMI	CIE Marks	50
Lecture Hours(L:T:P)	3:0:0	SEE Marks	50
Total Hours	42	SEE Hours	03

Course objectives:

- To understand the knowledge on basics of research and its types.
- To learn the concept of defining research problem and Literature Review, Technical Reading.
- To learn the concept of attributions and citation and research design.
- Concepts, classification, need for protection, International regime of IPRs - WIPO, TRIPS, Patent - Meaning, Types, surrender, revocation, restoration, Infringement, Procedure for obtaining Patent and Patent Agents.
- Meaning, essential requirements, procedure for registration and Infringement of Industrial Designs, Copyright.

Modules	Teaching Hours
Module -1	
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship	9
Module -2	
. Defining the research problem - Selecting the problem. Necessity of defining the problem Techniques involved in defining the problem- Importance of literature review in defining a problem Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.	8
Module -3	
Research design and methods - Research design - Basic principles. Need of research design Features of good design- Important concepts relating to research design - Observation and Facts Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.	9
Module -4	
Basic Concepts of Intellectual Property (IP), Classification of IP, Need for Protection of IP, International regime of IPRs - WIPO , TRIPS. Patents: Meaning of a Patent – Characteristics/ Features. Patentable and Non-Patentable Invention. Procedure for obtaining Patent. Surrender of Patent, revocation &restoration of Patents, Infringement of Patents and related remedies (penalties) . Different prescribed forms used in Patent Act. Patent agents qualifications and disqualifications Case studies on patents - Case study of Neem patent, Curcuma(Turmeric)patent and Basmati rice patent, Apple inc.v Samsung electronics co.Ltd	8

Module -5	
Industrial Design: Introduction to Industrial Designs. Essential requirements of Registration. Designs which are not registrable, who is entitled to seek Registration, Procedure for Registration of Designs Copy Right Meaning of Copy Right. Characteristics of Copyright. Who is Author, various rights of owner of Copyright. Procedure for registration. Term of copyright, Infringement of Copyright and Its remedies. Software Copyright.	8

Question paper pattern:

• The question paper will have ten questions.

• Each full question consists of 20 marks.

• There will be 2 full questions (with a maximum of four sub questions) from each module.

• Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Research Methodology: Methods and Techniques C.R.Kothari, Gaurav Garg New Age International4th Edition,2018
2. Dipankar Deb•RajeebDey,ValentinaE.Balas "EngineeringResearchMethodology",ISSN1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13-2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0.3
3. Dr. M.K. Bhandari"Law relating to Intellectual property" January 2017 (Publisher By Central Law Publications). Dr. R Radha Krishna and Dr. S Balasubramanain "Text book of Intellectual Property Right". First edition, New Delhi 2008. Excel books.

P Narayan "Text book of Intellectual Property Right". 2017 ,Publisher: Eastern Law House

Reference Books:

1. A.V.Oppenheim and R.W.Schafer, Digital Signal Processing, PHI.
2. J.G.Proakis and D.G.Manolakis, Digital Signal Processing- Principals,Algorithms and Applications, PHI.
3. Rabiner and Gold, Theory and Applications of Digital Signal Processing, PHI
4. SanjitK.Mitra, Digital Signal- A computer- Based Approach, TMH.

E books and online course materials:

- NPTEL: INTELLECTUAL PROPERTY by PROF.FEROZ ALI , Department of Humanities andSocial Sciences IIT Madras https://nptel.ac.in/content/syllabus_pdf/109106137.pdf
- www.wipo.intwww.ipindia.nic.in

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22RMI57	CO1	To know them leaning of engineering research.
	CO2	To know the defining of research problem and procedure of Literature Review.
	CO3	To know the Attributions and Citations and research design.
	CO4	Highlights the basic Concepts and types of IPRs and Patents
	CO5	Analyse and verify the procedure for Registration of Industrial Designs &Copyrights

ENVIRONMENTAL STUDIES			
Subject Code	22ES58	Credits:01	CIE:50
Number of Lecture Hours/Week	2 hrs		SEE:50
Total Number of Lecture Hours	28 hrs		SEE Hours:01
Prerequisite: Nil			

Course Objectives:

To creative environmental awareness among the students'

To gain knowledge on different types of pollution in the Environment.

Teaching- Learning process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos and animation films may be adopted so that the delivered lesson can progress the students in theoretical applied and practical skills.
2. Environmental awareness program on off campus
3. Encourage Collaborative (Group learning) learning in the class seminars, surf prize test and quizzes may be arranged for students in respective subjects to develop skills

Modules	Teaching Hours
Module:1 Environment-Definition, components, Ecosystem-Balanced Ecosystem, Structural and functional unit of Ecosystem, Human activities – Economic and Social Security	**5 Hours**
Module:2 Human activities Effects on Environment-Industries, Housing, Agriculture, mining, Transportation, Natural Resources-Water Resources, forest, mineral resources, fluoride problems in Drinking water, water Induced diseases. Deforestation, sustainable mining,	**6 Hours**
Module:3 Material cycles – Nitrogen, Sulphur, carbon cycle Environmental pollution – ground water pollution, noise pollution, soil pollution, Industrial and Municipal sludge. Air pollution, B.O medical waste E-wastes, Automobile pollution	**6 Hours**
Module:4 Global Environmental Concerns-Climate change and global warming effects, urbanization, ozone layer depletion, acid rain, current Environmental issues and important, population growth, Environmental toxicology, Biogas energy, solar energy.	**6 Hours**
Module:5 Objects of Environmental studies, Importance of women's Education, non-government organization (NGO), Green building or water treatment plant, G.I.S and Remote sensing, EIA (Environmental Impact Assessment), Role of Government for protection of Environmental	**5 Hours**

References Textbooks: -

1. Environmental Studies- Benny Joseph –Tata Megrawhill 2005
2. Environmental Studies-D L Manjunath, P M Dotrad, B.S.Raman
3. Environmental Studies-Geeta Naagbhushan

At the end of the course students will be able to :	
CO	Course Outcomes
CO1	Understand the Environmental components balance eco systems
CO2	Develop critical thinking and apply them to the analysis of a problems or question related to Environment
CO3	Demonstrate Ecology knowledge of a complex relationship between biotic and a biotic components
CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers phase when dealing with complex issue
CO5	Understand latest developments in environmental pollution, Mitigation, Tools Concept and applications of G.I.S and Remote sensing.

VI Semester

TRANSPORTATION ENGINEERING		
Subject code	22CV61	Credit: 04
Hours/Week	3 hours. (Theory) + 2Hr Lab	SEE: 50 Marks
Total hours: 56 +28 hrs	CIE: 50 Marks	SEE: 3 hours

Prerequisite: **None**

Course objectives: To enable students to acquire the knowledge in the fallowing topics

1. Understand different modes of transportation systems, highway planning and highway alignment and survey.
2. Design the horizontal and vertical alignments of roads.
3. Understand the different pavement materials and design the thickness of different types of pavements.
4. Understand about pavement construction and highway drainage system.
5. Gain the skills of evaluating the highway economics by different methods and also introduce the students to highway financing and pavement maintenance.

Modules	Teaching Hours
MODULE-I	
Introduction: Importance of Transportation. Different modes of transportation, characteristics and comparison of different modes. Road development in India, Jayakar committee recommendations and implementation. Salient features of 1st, 2nd and 3rd 20-year road development plan and problems on 3rd 20-year road development plan only. Present scenario of road development in India. NHDP, PMGSY, KSHIP and KRDCL projects	03 Hours.
Highway Planning: Road Types and classification, road patterns. Planning surveys or fact-finding surveys, Master plan - saturation system of road planning, phasing road development programmed – problems on best alignment among alternate proposals and phasing.	03 Hours.
Highway Alignment and Surveys: Ideal alignment, factors affecting alignment, engineering surveys for new and realignment projects.	03 Hours
MODULE-II	
Highway Geometric Design: Importance, factors controlling the design of geometric elements. Highway cross section elements – pavement surface characteristics, camber, width of carriageway, shoulder width, formation width, right of way, typical cross section of roads. Design speed – sight distances - Design of horizontal alignment: radius of curve, superelevation, extra widening on curves, transition curves and vertical alignment –Summit and valley curves. Numerical problems on above (No derivation of formulae only brief description)	08 Hours.
MODULE-III	
Pavement Materials: Properties and requirements of subgrade soils, HRB andIS soil classification. Determination of CBR and Modulus of subgrade reaction ofsoil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on	03 Hours.

above. **Pavement Design**: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC: 37 –. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 –excluding design of joints.	06 Hours
MODULE-IV **Pavement Construction:** Specifications, construction steps and quality control tests for Granular subbase course, WBM base course. Brief description on bituminous constructions such as prime coat, tack coat, bituminous binder course (BM and DBM), common types of bituminous surfacing courses such as surface dressing, premixed carpet (PMC) and bituminous concrete. Construction steps for cement concrete pavements. **Surface and Subsurface drainage system** for road pavements, types, functions and basic design principles	04 Hours. 04 Hours.
MODULE-V **Highway Economics and Financing:** Highway user benefits –VOC using charts only – Highway costs – Economic analysis by annual cost method and benefit cost ratio methods. Numerical problems on above. Highway financing – BOT and BOOT concepts. **Pavement Maintenance:** Pavement failures, cases. Maintenance of highways. Principles of pavement evaluation – functional and structural evaluation.	04 Hours. 04 Hours.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Have knowledge about the road development in India, Highway planning & Highway alignment	C2
CO2	Design highway geometries	C5
CO3	Explain the different pavement materials and design the thicknesses of different types of pavements	C2
CO4	Have knowledge about pavement construction and highway drainage system	C2
CO5	Determine the highway economic cost by different methods and understand about highway financing and pavement maintenance	C4

Question paper pattern:
i) Two questions are to be set from each module.
) Total five questions are to be answered by selecting minimum one question from each module

Textbooks:

1. Khanna, S.K. and Justo, C.E.G., "Highway Engineering" Nem Chand and Bros, Roorkee 8th Edition (2009).
2. Kadiyali, L.R., "Highway Engineering" Khanna Publishers, New Delhi.
3. Subramanyam, K.P., "Transportations Engineering –I" Scitech Publications, Chennai.
4. Rao, G.V., "Principles of Transportation and Highway Engineering," McGraw – Hill Publishing Company Limited, New Delhi.

Reference Books:

1. IRC: 37-2018, IRC: 58-2015 and other relevant IRC codes
2. MoRT&H-2015, "Specifications for Roads and Bridges" New Delhi (2015)
3. Partha Chakraborty and Animesh Das, "Principles of Transportation Engineering", Prentice-Hall of India Private Limited, New Delhi (2003)
4. IRC SP 30 2019 Manual on Economic evaluation of Highways in India.

E books and online course materials: **www.civilenggbooks.com**

Nptel Link: **https://youtu.be/5zKC_aq4ypM**

HIGHWAY MATERIAL TESTING LAB

List of Exercises:	**Teaching Hours**
1. Tests on Aggregates	
a. Aggregate Crushing value	2 Hours
b. Los Angeles abrasion test	2 Hours
c. Aggregate impact test	1 Hours
d. Aggregate shape tests (combined index and angularity number)	2 Hours
2. Tests on Bituminous Materials	
a. Penetration test	2 Hours
b. Ductility test	2 Hours
c. Softening point test	2 Hours
d. Specific gravity test	2 Hours
e. Viscosity test by tar viscometer	2 Hours
f. Bituminous Mix Design by Marshal Method	2 Hours
3. Tests on Soil	
a. Wet sieve analysis	2 Hours
b. CBR test	2 Hours
5. Demonstration on a. 5th Wheel bump integrator b. Aggregate polishing Value test c. Benkelman Beam deflection studies d. Merlin for Unevenness study	3 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**

CO1:	Demonstrate the concepts of Highway Engineering theory course through seriesof experiments.	C2
CO2:	Sharetheresponsibilitiesinsmallteamsof4-5membersfor Conducting the experiments.	C3
CO3:	Perform the experiments and determination of strength of aggregates, Bitumen and Tar Properties like Softening point, ductility, and Flash and fire	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:

All are individual experiments

1. Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
2. All exercises are to be included for practical examination.

Reference books:

1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi

DESIGN OF R.C.C STRUCTURES		
Subject code	22CV62	Credit: 04
Hours/Week	3 hours. (Theory) + 2 hours Tutorial	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Strength of Materials, Structural Analysis & Concrete Technology

Course objectives:
To enable the students to acquire the knowledge in the following topics:
1. Basic concepts of RCC design, Working Stress method and Limit state method.
2.Check serviceability requirements as per the IS codes
3. Design of RCC beams using LSM as per IS 456 : 2000
4.Design of slabs, staircases using LSM as per IS 456 : 2000
5. Design of columns, and isolated column footing using LSM

Modules	Teaching Hours
Module I **Introduction:** Basic concepts of reinforced concrete, Load and Load combinations, , Stress- Strain behavior of concrete and steel, Methods and design philosophies in RCC design Working stress method (Elastic theory): Assumptions, concept of Transformed Area , Analysis of singly Reinforced RC section only Philosophy of limit state design, Characteristic loads and design loads, Characteristic. Strength and design strength, Limit State of Collapse- Flexure, Ultimate flexural strength of rectangular sections and flanged sections, Numerical examples for analysis of rectangular, flangedsection in Flexure.	9 Hours
Module-II **Limit State of Collapse in Shear:** Ultimate Shear strength of R.C. Sections - Concepts of development length and anchorage in R.C. Sections, Numerical examples. **Limit State of Collapse in Torsion**, **Limit state of serviceability** for deflection, Computation of short term and long-term deflection for Reinforced section as perI.S.456-2000. **Limit state of serviceability** for cracking, Control of cracking and computation of crack width as per IS 456-2000 for Singly Reinforced sections. Numerical examples on computation of deflection and crack width.	8 Hours
Module-III **Design of beams:** Codal requirements in the design of beams, cover to reinforcement, spacing of Reinforcement, curtailment and splicing of reinforcement, Design of reinforced rectangular beams (singly & doubly) with detailing. (Cantilever & simply supported). Design of flanged beams with detailing (T beam Only).	8 Hours
Module -IV **Design of slabs:** Introduction, General aspects in the design of slabs, Design & detailing of rectangular slabs spanning in one direction (Simply supported and Continuous) as per IS: 456-2000, Design & detailing of rectangular slabs spanning	8 Hours

in two directions (Simply supported and Continuous) as per IS: 456-2000, Design & detailing of Cantilever slab. **Design of staircase:** Introduction, Structural behavior of staircases, Loads and distribution of load on staircases as per IS: 456-2000, Design & detailing of staircases (Dog legged, Open well type),	
Module-V **Design of columns:** Introduction, Limit state of compression, Minimum eccentricity, slenderness limits, Code provisions for reinforcement & detailing, Design & detailing of short axially loaded columns (Square &. Rectangular and circular), Design & detailing of short columns under axial load with uniaxial bending and axial load with biaxial bending using SP-16 (Square & Rectangular sections). **Design of footing**: Introduction, types of footing, Structural behavior of footing, selection of types of footing, footing shapes & size, Reinforcement requirement as per IS: 456: 2000, Design & detailing of Isolated footing of uniform depth & variable depth (Square & Rectangular footing).	9 Hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Analyze rectangular and flanged beams in flexure using working stress method and limit state method	C3
CO2:	Analyze the beams using limit state approach for flexure, shear, torsion. and also analyze the flexural members for limit state of serviceability	C3
CO3:	Design RC rectangular and flanged beams by limit state approach	C4
CO4	Design of one way and two-way slabs and stair case using limit state approach	C4
CO5	Design columns and isolated column footing using limit state approach	C4

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Unnikrishnan Pillai and Devdas Menon, “Reinforced Concrete Design”, McGraw Hill, New Delhi
2. Subramanian, “Design of Concrete Structures”, Oxford university Press
3. H J Shah, “Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)”, Charotar Publishing House Pvt. Ltd.

Reference books: **1.** P C Varghese, "Limit State design of reinforced concrete", PHI, New Delhi. **2.** W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publishers. **3.** Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications. **4.** A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press. **5.** Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.
Nptel Link: https://youtu.be/pIdaC_I6H_M
E-Books: www.civilenggebooks.com

DESIGN OF MASONRY STRUCTURES		
Subject code	22CV63A	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: **Elements of civil engineering and Strength of material**

Course objectives:
This course will enable the students to
1. Understand properties of masonry units, strength and factors affecting strength.
2. Understand design criteria of various types of walls subjected to different load system.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of masonry elements

Modules	Teaching Hours
MODULE-I **Masonry units, materials, types & masonry construction:** Brick, stone and block masonry units –strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks. **Strength and stability:** Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, Compressive strength formulae based on elastic theory and empirical formulae. .	10 Hours
MODULE-II **Permissible stresses**: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile stress and shear stresses. **Design Considerations:** Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars.	7 Hours
MODULE-III **Load considerations and design of Masonry subjected to axial loads:** Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.	9 Hours
MODULE-IV **Design of walls subjected to concentrated axial loads:** Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings. **Design of walls subjected to eccentric loads:** Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, walls with piers.	8 Hours

MODULE-V	
Design of Laterally and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls. Introduction to reinforced brick masonry, lintels and slabs. In-filled frames: Types – modes of failures – design criteria of masonry retaining walls.	8 Hours

CO	Course Outcome (CO)	BL
CO1	Explain different types of masonry construction such as brick, stone, reinforced walls in composite action and identify the loads on masonry walls. Summarize various formulae's for finding compressive strength of masonry units.	C2
CO2	Explain permissible stresses and design criteria as per IS: 1905 and SP-20.	C3
CO3	Consider the loads. and design of walls under udl, solid walls, cavity walls	C4
CO4	Design of Masonry walls subjected to axial loads and eccentric loads	C5
CO5	Design of Laterally and transversely loaded walls	C5

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module.

Text books:

1. Dayaratnam P, "Brick and Reinforced Brick Structures", Scientific International Pvt. Ltd.
2. M. L. Gambhir, "Building and Construction Materials", McGraw Hill education Pvt. Ltd.
3. Structural Masonry- Henry, A.W. Macmillan Education Ltd., 1990.

Reference Books:

1. Henry, A.W., "Structural Masonry", Macmillan Education Ltd.,1990.
2. IS 1905–1987 "Code of practice for structural use o f un-reinforced masonry- (3rd revision) BIS, New Delhi.
3. SP20(S&T)–1991, "Hand book on masonry design and construction(1strevision) BIS, New Delhi.

Nptel Link: https://youtu.be/E-rfU6n2rCw

E books and online course materials: www.civilenggbooks.com

STRUCTURAL DYNAMICS		
Subject code	22CV63B	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Knowledge of basic structural engineering subjects, such as SOM, SA-I,SA-II& Matrix methods of structural analysis.

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. To attain the knowledge of effect of vibrations & earthquake force on the structures.
2. To attain the knowledge of rotating unbalance, Duhamel's integral, DLF, SDOF.
3. To attain the knowledge of free vibration of MDOF, natural frequencies, shear buildings modeled as MDOF.
4. To attain the knowledge of forced vibration of MDOF, response of shear building to base motion, base isolation.
5. To attain the knowledge of continuous systems, dynamic analysis of beams, lumped mass and consistent mass formulation

Modules	Teaching Hours
Module I Introduction to structural dynamics, Brief history of vibration and Earthquakes, Major earthquakes, Earthquakes zones, some basic definitions, Vibration of single degree of freedom system, undamped, damped, free vibrations, logarithmic decrement. Forced vibrations of single degree freedom systems, response of undamped and damped systems subjected to harmonic loading.	8 hours
Module-II Rotation unbalance, reciprocating unbalance. Duhamel's integral, response due to two loading cases system of loading, dynamic load factor, response spectrum, response of SDOF subjected to harmonic base excitation, vibration isolation.	9 hours
Module-III Free vibration of multi degree of freedom systems, natural frequencies, normal modes, orthogonality property of normal modes, eigen values. Shear buildings modeled as multi degree of freedom systems, free vibrations, natural frequencies.	9 hours
Module -IV Forced vibration motion of shear buildings, modal superposition method, and response of shear buildings to base motion, harmonic forced excitation. Damped motion of shear buildings, equations for damped shear buildings, uncoupled damped equations, conditions for damping uncoupling	11 hours
Module-V Dynamic analysis of beams stiffness matrices lumped mass and consistent mass formulation equations of motion. Numerical Examples	5 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL

CO1:	Explain the terminology associated with earthquake And the basic concepts of SDOF System and its response to harmonic loads.	C2
CO2:	Explain Duhamel's integral vibration isolation and analyze SDOF subjected to general system of load, harmonic base excitation	C2
CO3:	Analyze MDOF system subjected to free vibration,	C3
CO4	Determine the response of shear building to forced vibration, base motion and Harmonic forced excitation.	C4
CO5	Analyze beams by dynamic approach using technique of lumped mass and consistent mass formulation.	C4

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:
1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.
3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.

Reference Books:
1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.
2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

Nptel Link: https://youtu.be/0KiYC8QQOiM

E-Books: www.civilenggebooks.com

ADVANCED SURVEYING		
Subject code	22CV63C	Credit:03
Hours/Week	3hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE:50 Marks	SEE: 3 hours

Prerequisite: Survey– land Survey

Course objectives:
To enable the student to acquire the knowledge in the following topics.
1.Field astronomy and determination of meridians, solar time and day
2. Classification of errors and determining precision of surveying applications
3.Basics of modern surveying instrument total station
4. Hydrographic surveying application and setting out of major projects in civil engineering fields.
5.photogrammmetry principles, types & advantages of photogrammetry

Modules	Teaching Hours
Module I	
Field astronomy: Definitions, Co-ordinate's system, the terrestrial latitude and longitude, spherical triangle and spherical trigonometry. Astronomical triangle Napier's rule, relationship between co-ordinates.	5 hours
Time: Sidereal time, day and year – solar time and day – Greenwich mean time – standard time. Meridian and azimuth – their determination -latitude and its determination	3hr
Module-II	
Theory of errors and triangulation adjustment: Errors and classification of errors, Precision and accuracy, Laws of weight and accidental errors **Probability:** Probability distribution function and density function –normal distribution. RMS error-measure of precision. Rejection of observations-principles of least squares-Normal equations	8 hours
Module-III	
Electronic distance measurement (EDM): Introduction, Measurement principal EDM, Different wavelength bands used by EDM, Electro Magnetic (EM) Waves, Phase comparison and modulation. Instruments–Geodimeter – Tellurimeter – Distomat. Introduction to GPS Total Station. Principle, theory of total station,	5 hours
Total Station: Introduction - Parts of a Total Station – Accessories – Advantages - Limitations and Applications, Field procedure for total station survey, data transfer, preparation of maps. Contour surveying using Total station.	4 hours

Module-IV **Hydrographic surveying: s**Methods of sounding .Instruments. Three-point problem. Tidal and Stream discharge measurement. **Setting out works:** Introduction. Setting out of buildings, culverts, bridges, pipeline and sewers, tunnels.	8 hours
Module-V **Photogrammetry:** Principles of Photogrammetry, Types – Terrestrial and Aerial Photogrammetry, Advantages over ground survey methods - geometry of vertical photographs, scales of vertical photograph. Ground coordination- relief displacement, distance measurements in photographs – flight planning	9hrs

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Apply basic concepts of astronomical field survey, solar time and day	C2
CO2:	Describe and interpret classification of errors and determine precision in surveying application	C2
CO3	Demonstrate understanding of modern surveying instruments like total station	C3
CO4	Solve problems in hydrographic surveying and in setting out various engineering infrastructures works on ground Demonstrate understanding of modern surveying Instruments like total station	C3
CO5	Explain principle, types and advantages of photogrammetry	C2

Question paper pattern:
i) Two questions are to beset from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Textbook:
1. Surveying VolI , II& III-B.C. Punmia-Lakshmi Publications, NewDelhi.
2. Surveying VolI & III- Duggal S.K .-TataMcGraw-Hillpublishing Co.,
3. Surveying Levelling II–KanitkarT.P& Kulkarni S.V-Pune Vidhyarthi Gruha Prakashana.
4. Advanced surveying Sateesh Gopi, R Sathkumar and NMadhu2ndedition, Dorling kinderley (India) pvt ltd, Pearson Education.

Referencebooks:
1. Introduction to Surveying-James, Anderson&Edward,M.Mikhail-MC-Graw-HillBook Co., 1985.
2. Analysis and Survey measurements-M. Mikhail and Gracie, G. Van Nostrand Reinhold Co., (NY)-1980.
3. Plane and Geodetic Surveying for Engineers-David Clark – Vol I & II-CBS publishers anddistributors, New Delhi.

NptelLink:https://youtu.be/TqbYlHIzYJs

E-Books:www.civilenggebooks.com

THEORY OF ELASTICITY		
Subject code	22CV63D	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Strength of materials, Structural analysis –I, and Structural analysis–II

Course objectives:

1. Generalized Hooke's law and strain-displacement relations, Equations of equilibrium and compatibility for two dimensional problems in rectangular & polar co ordinates
2. Plane stress and plane strain problems, measurement of surface strains and strain rosettes, stalk polynomial.
3. Analysis of two-dimensional problems in rectangular and polar coordinates

Modules	Teaching Hours
Module I Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, constitutive laws, Generalized Hook's Law, Strain displacement relations.	7 hours
Module-II Differential equations of equilibrium, boundary conditions, compatibility equations, Airy's stress function, problems, Stress polynomials, St. Venant's principle.	8 hours
Module-III Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, analytical method. Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, simply supported beam subjected to UDL.	10 hours
Module -IV Two-dimensional problems in polar coordinates, strain- displacement relations, equations of equilibrium, compatibility equation, stress function.	9 hours
Module-V Stress distribution symmetrical about an axis, Rotating discs, Lame's problem. Effect of circular hole in an infinite plate, stress concentration factors.	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Describe stress and strain at a point, Generalized Hooke's law and strain displacement relations	C2
CO2:	Explain equilibrium and compatibility equation for the two-dimensional rectangular coordinate system &solve problems on stress polynomials	C2
CO3:	Explain surface strain measurement technique using strain rosettes and solve problems on cantilever and section beams.	C3
CO4	Solve two dimensional problems in polar coordinate system using the	C3

	Concepts of equilibrium and compatibility equation	
CO5	Develop the for- s t r e s s distribution for the call of rotator discs and Effect of circular hole in an infinite rate	C4

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:
1. S P Timoshenko and J N Goodier, "Theory of Elasticity", McGraw-Hill International Edition, 1970.
2. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 2012.
3. S Valliappan, "Continuum Mechanics - Fundamentals", Oxford &IBH Pub. Co. Ltd., 1981.
4. L S Srinath, "Advanced Mechanics of Solids", Tata - McGraw-Hill Pub., New Delhi, 2003.

Reference books:
Reference Books:
1. C. T. Wang, "Applied Elasticity", Mc-Graw Hill Book Company, New York,1953.
2. G. W. Housner and T. Vreeland, Jr., "The Analysis of Stress and Deformation", California Institute of Tech.,
CA, 2012. [Downloadasperuserpolicyfromhttp://resolver.caltech.edu/CaltechBOOK:1965.001].
3. A. C. Ugural and Saul K. Fenster, "Advanced Strength and Applied Elasticity", PrenticeHall,2003.
4. Abdel-Rahman Ragab and Salah Eldinin Bayoumi, "Engineering Solid Mechanics: Fundamentals and Applications", CRC Press,1998

Nptel Link: https://youtu.be/eICv1p8WjgI

E-Books: www.civilenggebooks.com

ECOLOGY AND ENVIRONMENT		
Subject code	22CVOE641	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Environmental studies

Course objectives:

To enable the student to acquire knowledge in the following topics:

1. Components of environment and the interactions and subdivisions of ecology.
2. Structural and functional characteristics of an ecosystem, principles related to energy and concepts of productivity.
3. Bio-geochemical cycles and pathways of matter in the biosphere.
4. Fresh water and marine water eco system.
5. Effects of pollution on human health, aquatic and terrestrial ecosystems, and global environmental problems.

Modules	Teaching Hours
Module I	
Introduction: Environment, definition, components of environment and its interaction. Ecology – Definition, Subdivisions of Ecology.	4 hours
Concepts of ecosystem: Structural and functional characteristics of an ecosystem. Balanced ecosystem, biological control, production, and decomposition in nature.	6 hours
Module-II	
Principles and concepts pertaining energy in ecological system: Fundamental principles related to energy, energy environment, laws of thermodynamics, energy system. Pathways of energy in the biosphere; Concept of productivity – its measurement; Food chains/ Food webs – trophic levels, trophic structure	7 hours
Bio geo chemical cycles: Concept of bio-geochemical cycles –significance, pathways of matter in the biosphere, C, N, S & P cycles	7 hours
Module-III	
Fresh water ecology: Fresh water environment types and limiting factors, classification of freshwater organisms, fresh water biota (flora & fauna), zonation in streams, Eutrophication of lakes.	7 hours
Marine ecology: Marine environment, marine biota, zonation in the area (case study), estuarine ecology.	5 hours
Module -IV	
Pollution and environmental health: Types of pollution (Air, Water and Land) effects on human health, effects on aquatic and terrestrial system.	3 hours
Module-V	
Global environment problems: Acid rain, ozone layer depletion, greenhouse effect, Global warming.	3 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Identify the components of environment and the sub-divisions of ecology	C1

CO2:	Describe the characteristics of an ecosystem, energy system and the concepts of bio-geochemical cycles	C1
CO3:	Understand the fresh and marine water ecology,	C2
CO4	Understand effects of pollution on human health, and on ecosystems.	C2
CO5	Understand the global environment problems. And its causes and effect so faci drain, ozone layer depletion, greenhouse effect, global warming.	C1, C2

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Modi, P.N., "Irrigation Water Resources and Water Power Engineering". Standard Book House, New Delhi. 10th Edition, 2019.
2. Raghunath, H.M., "Groundwater",3rd Edition, New Age International Publishers, New Delhi, 2007.
3. Krishnan, M.S., "Geology of India & Burma". CBS publishers, New Delhi, 2017.
4. P. Jaya Rami Reddy, "A Textbook of Hydrology", University Science Press, New Delhi, 2011.
5. M N Rao and H V N Rao, "Air pollution", McGraw Hill Publications, 2017.
6. Krishnamurthy K.V., "An advanced textbook of Biodiversity- Principle &Practices." Oxford and IBH publications, New Delhi. 2004.

Reference books:

1. Odum, E.P., "Fundamentals of Ecology", W.B sounders, Philadelphia, USA, 1971
2. Singh J.S, Singh S.P & Gupta, S.R. "Ecology, environment and resource conservation", Anamaya publications, 2006.
3. Edmond A. Mathez & Jason E. Smerdon, "Climate Change: The science of Global warming and our energy feature", Columbia University Press, 2009.
4. National Council of Applied Economic Research, "Economic Impact of Interlinking of Rivers Program", Revised Final Report, April 2008.
5. http://nwda.gov.in/content.
6. Madhav Gadagil, "Biodiversity and India's degraded lands", Indian Academy of Sciences, Volume 22- No 2/3, http://www.jstor.org/pss/4314063

Nptel Link: https://youtu.be/ZngDF4jfRdw

E-Books: www.civilenggebooks.com

REMOTE SENSING AND GIS		
Subject code	22CVOE642	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Environmental Science

Course objectives:

1. The fundamental concepts of RS and remote sensing sensors including the electromagnetic Spectrum.
2. The concept of Microwave Remote Sensing.
3. Photogrammetry and interpretation of visual image.
4. The fundamentals of GIS and GPS.
5. To attain integrated information about RS and GIS and introduction to Web series.

Modules	Teaching Hours
Module I **Introduction:** Remote Sensing, Historical Development of Remote Sensing, Remote Sensing Components. **Basic Principles**: Energy Source & its characteristics, Electromagnetic Energy and Spectrum, Wave Bands, Interaction of Electromagnetic Energy with Atmosphere and Earth's Surface. **Remote Sensing Platforms and Sensors:** Introduction, Satellite System Parameters, Sensor Parameters, Imaging Sensor System, Earth Resources Satellites, Metrological Satellites.	8 Hours
Module-II **Microwave Remote Sensing:** Introduction, The Radar Principle, Factors Affecting Microwave Measurements**,** Radar Wave Bands, Side Looking Airborne, Radar (SLAR) System, Synthetic Aperture Radar (SAR). Interaction between microwaves and earth's surface, Interpreting SAR images, Geometrical characteristics.	8 Hours
Module –III Visual Image Interpretation: Introduction, Types of pictorial data products, Image interpretation strategy, process of image Interpretation, Basic elements of image interpretation	10 Hours
Module –IV **Fundamentals Of GIS:** Roots of GIS, Overview of Information System, GIS definition and terminology, Application of GIS, The four Ms. Geo-referencing and Projection: Understanding Earth, Coordinate System, Map Projection, Transformation, Geo-referencing. Global Positioning System (GPS): Introduction, functional segments of GPS, Basics **of** GPS	8 Hours

functioning, Applications of GPS.	
Module-V **Integration Of Remote Sensing And GIS:** Introduction. Remote Sensing and GIS Synergy, Raster Data for GIS, Vector Data for GIS, Need of Integration and general view on applications. **Web GIS: Introduction, Web GIS, OGC and Web services.**	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO	Course Outcomes	Blooms Level
CO1:	Understand the principles of RS and its components, Remote Sensing Platforms and Sensors.	C2
CO2:	Understand and familiarize with study and identification of satellite imageries.	C2
CO3:	Understand image processing techniques and its interpretation.	C2
CO4	Understand the soft skills by using GIS technologies.	C5
CO5	To acquire integrated information about RS and GIS and introduction to Web series.	C5

Question paper pattern:

Scheme of SEE: i) Two questions are to be set from each module. i) Total five questions are to be answered by selecting minimum one question from each module.

Text book:

1. M. Anji Reddy, "Remote Sensing and Geographical Information Systems",4th Edition, BS Publications.
2. Kang-Tsung Chang, "Introduction to Geographic Information Systems", McGraw-Hill Book Company.

Reference books:

1. Dr.S.Kumar, "Basics Of Remote Sensing And GIS", University Science Press.

2. Dr.B.C.Panda, "Remote Sensing Principles And Applications", By Viva Books.

NUMERICAL METHODS AND OPTIMIZATION TECHNIQUES		
Subject code	22CVOE643	Credit:03
Hours/Week	42 hours	SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

1 Recognize the difference between analytical and Numerical Methods.
2 Effectively use Numerical Techniques for solving complex Mechanical engineering Problems.
3 Prepare base for understanding engineering analysis software.
4 Build the foundation for engineering research.
5 Optimize the solution for different real-life problems with available constraints.

Modules	Teaching Hours
Module I **Errors and Approximations** Types of Errors: Absolute, Relative, Algorithmic, Truncation, Round off Error, Error Propagation, Concept of convergence-relevance to numerical methods. **Roots of Equation** Bisection Method, False position Method, Newton Raphson method and Successive approximation method.	8hrs
Module II **Simultaneous Equations** Gauss Elimination Method with Partial pivoting, Gauss- Seidal method and Thomas algorithm for Tri-diagonal Matrix..	8hrs
Module-III **Optimization** Introduction to optimization, Classification, Constrained optimization (maximum two constrains): Graphical and Simplex method, One Dimensional unconstrained optimization: Newton's Method. Modern Optimization Techniques: Genetic Algorithm (GA), Simulated Annealing (SA)	8hrs
Module-IV **Ordinary Differential Equations [ODE]** Taylor series method, Euler Method, Runge-Kutta fourth order, Simultaneous equations using RungeKutta2nd order method. Partial Differential Equations [PDE]: Finite Difference methods Introduction to finite difference method, Simple Laplace method, PDEs- Parabolic explicit solution, Elliptic-explicit solution.	9hrs
Module - V **Numerical Integration** (1D only) Trapezoidal rule, Simpson's 1/3rdRule, Simpson's 3/8thRule, Gauss Quadrature 2 point and 3 point method. Double Integration Trapezoidal rule, Simpson's 1/3rdRule.	9hrs

Course Outcomes: On completion of this course, students are able to:		
C01	Use appropriate Numerical Methods to solve complex mechanical engineering problems.	C4
CO2:	Formulate algorithms and programming.	C4
CO3:	Use Mathematical Solver.	C4
CO4	Generate Solutions for real life problem using optimization techniques.	C4
CO5	Analyze the research problem	C4

Question paper pattern:

- Two questions are to be set from each module.
- Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, 4/e, Tata McGraw Hill Editions
2. Dr. B. S. Garewal, Numerical Methods in Engineering and Science, Khanna Publishers,
3. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientist, Tata Mc- Graw Hill Publishing Co-Ltd
4. Rao V. Dukkipati, Applied Numerical Methods using Matlab, New Age International Publishers

Reference books:

1. Gerald and Wheatley, Applied Numerical Analysis, Pearson Education Asia
2. E. Balagurusamy, Numerical Methods, Tata McGraw Hill
3. P. Thangaraj, Computer Oriented Numerical Methods, PHI
4. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI.

MAJOR PROJECT PHASE-I		
Subject code	22CV65	Credit: 02
Hours/Week	4 hrs	SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 03 hrs

Prerequisite:

Course objectives:
To enable the students to conduct literature survey in the field of their interest in latest in civil engg field such as new materials, construction techniques, design tools for structures (software's), environmental and water resource engg.
Prepare a report containing literature review, objective, methodology.

Student shall select the topic of the project work and Guide in the beginning of the VI Sem only and shall complete the literature survey and finalize the objectives of the project work as part of Project phase-I by the end of the VI Sem. The project work will be carried out in batches containing maximum four students.

Project works can be taken up on different specializations of civil engineering preferably on emerging topics. Students have to present their project before expert committee constituted by HOD. Guide shall award the CIE marks based on performance of the students and after completion of literature survey. SEE will be conducted by one internal and external examiner appointed by HOD

Question paper pattern:
Evaluation of CIE marks: 60% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 40% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee.
Evaluation of SEE marks: Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Propose an engineering-based project in a clear and concise manner	C5
CO2	Identify and summarize the literature review and relate them to current project.	C5
CO3	Formulate clearly a work plan and procedures consisting of fore casting of project costs, time lines, quality & ethical issues	C4
CO4	Present the project outlining the literature review, methodology and expected results using good oral and written presentation skills.	C5
CO5	Prepare a well-organized and compiled project report involving literature review, methodology and expected results.	C4

EXTENSIVE SURVEY PROJECT *(MINI PROJECT)		
Subject code	22CVMP66	Credit: 02
Hours/week	1 hours. (Theory)+ 2 hours Practical	See: 50 marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:
To be conducted between 5th& 6th Semester for a period of 2 weeks, Viva voce conducted along with 6th semester exams)
An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The student shall submit a project report consisting of designs and drawings. Preferably the Total Station must be used for the survey work of the projects

General instructions, Reconnaissance of the sites and fly levelling to establish bench marks.
1.new tank projects: The work shall consist of
Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line. Capacity surveys.

2. **Details at Waste weir and sluice points. Canal alignment:**

3. Restoration of an existing tank: The work shall consist of: Alignment of center line of the existing bund, Longitudinal and cross- sections. along the center line.
Capacity surveys, details at sluice and waste weir.

4. Water supply and sanitary project:
Examination of sources of water supply, Calculation of quantity required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks, underground drainage system surveys for laying the sewers

5. Highway project: Preliminary and detailed investigations to align a new road between two terminal stations. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1	Demonstrate the concepts of survey, water resource engineering, environmental engineering and transportation engineering theory course through series of experiments	C2
CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C2

CO3	Perform the experiments and determination of General instructions,	C4
	Reconnaissance new tank projects Alignment of center line of the proposed bund, Longitudinal and cross sections of the centerline. restoration of an existing tank, water supply and sanitary project, Examination of sources of water supply, highway project Preliminary and detailed investigations to align a new road between two terminal stations.	
CO4	Analyze the data and design the projects such highway, w a t e r supply and sanitation, overhead tank and restoration of existing tank project	C3
CO5	Prepare a well-organized drawings and report containing detail design.	C3
Question paper pattern:		
Reference books: Training manuals and User manuals Relevant course reference books		
Nptel Link: https://youtu.be/HgKYf6TVrNE		
E-Books: www.civilenggebooks.com		

SOFTWARE BASED LAB		
Subject code	22CVAE671	Credit: 01
Hours/week	2 practical	See: 50 marks
Total hours:28 hours	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Basic Knowledge of computers

Course objectives:
This course will enable students to
1. Use industry standard software in a professional set up.
2. Understand the elements of finite element modeling, specification of loads and boundary condition, performing analysis and interpretation of results for final design.
3. Develop customized excel spread sheets.

Modules	Teaching Hours
Module I Use of EXCEL spread sheets: 1. Design of singly reinforced and doubly reinforced rectangular beams, design of oneway and two-way slabs and Axially loaded Column.	10 hours
Module-II Structural Detailing of RCC Structures Using AutoCAD	6 hours
Module-III Design of Multistoried Building using ETABS	**12 hours**

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Design beams using excel spread sheets	C4
CO2:	Design slabs using excel spread sheets	C4
CO3:	Design Columns using excel spread sheets	C4
CO4	Draft structural detailing using Autocad	C3
CO5	Design Building using ETABS	C5

Question paper pattern:
Writeup & Viva 15 marks
Excel sheet 20marks
ETABS 10 marks
QGIS 5 marks

Reference books:
Training manual sand User manual sand Relevant course reference books

E-Books: www.civilenggebooks.com

SMART CITY COMMAND CENTRE		
Course Code	22CVAE672	Credits :01
Total hours:28 hours	2 Hrs	SEE: 03 hrs.

Objectives of introducing this subject at fourth year level in civil branches are:
• To understand the concept of smart city and associated challenges.
• To understand latest technologies used in intelligent building.
• To understand process of planning and drafting a plan for smart city
• To understand the importance of different smart system.

Modules	**Teaching Hours**
Module I Introduction to Smart cities 1.Introduction to city planning 1.2 Concept, Principle stakeholders, key trends in smart cities developments	4hrs
Module II Smart Cities Planning and Development 2.1 Understanding smart cities 2.2 Dimension of smart cities 2.3 Global Standards and performance benchmarks, Practice codes 2.4 Smart city planning and development 2.5 Financing smart cities development 2.6 Governance of smart cities	6 hrs
Module III Project management in Smart Cities 3.1 Phases, Stages of project and work break down Structure 3.2 Project organization structure, Planning, Scheduling and CPM 3.3 Project cost analysis, resource allocation & leveling, Line of balancing technique 3.4 Project monitoring and control, Project risk management	6 hrs
Module IV Green building in smart cities 4.1 Introduction to green buildings, Rating system, Energy saving system	6 hrs

Module V	6 hrs
Command and Control center Implementation of command control and communication centers. Intelligent traffic systems. Solid waste management. E-collection of municipal taxes.	

Reference Books:

1. Jo Beall (1997); "A city for all: valuing differences and working with diversity"; Zed books limited, London (ISBN: 1-85649-477-2)
2. UN-Habitat; "Inclusive and sustainable urban planning: a guide for municipalities"; Volume 3: Urban Development Planning (2007); United Nations Human Settlements Programme (ISBN: 978- 92-1-132024-4) 3. Arup Mitra; "Insights into inclusive growth, employment and wellbeing in India"; Springer (2013), New Delhi (ISBN: 978-81-322-0655-2)
4. William J. V. Neill (2004); "Urban Planning and cultural identity"; Routledge, London (ISBN: 0-415-19747-3)
5. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); "Remaking the city: Social science perspective on urban design"; State University of New York Press, Albany (ISBN: 0-87395-678-8)
6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
7. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CVAE672	**CO1**	Acquaint knowledge on smart cities planning and development
	CO2	Develop work break down structure, scheduling and project management of smart cities
	CO3	Work out the most energy efficient technique
	CO4	After studying this subject student will be able to understand technologies, infrastructure, and concept of planning and latest methodology.
	CO5	After studying this subject student are able to understand smart services or services in a integrated manner.

Application of DRONE		
Subject code	(22CVAE673)	Credit:01
Hours/Week	3hours. (Theory)	SEE: 50 Marks
Total hours: 14 hrs	CIE:50 Marks	SEE: 3 hours

Course learning objects
1.understand the fundamental principles of drone technology and its application in surveying
2.identyfy different types of drones, their components, and their suitability for various surveying tasks
3.explain the principles of data acquisition using drones, including photogrammetry, liDAR scanning, and sensor integration.
4.recognize the legal and regulatory frameworks governing drones operation in surveying contexts

Modules	Teaching Hours
Module I **Introduction to drone surveying:** Overview of drones technology and its applications in surveying, Historical development and evolution of drones in surveying, basic principles of drone operation and flight dynamics, .	2hrs
Module-II Drone Hardware and software: types of drones used in surveying (fixed wing, rotary-wing, VTOL, etc) components of a surveying drone :UAV, sensors ,cameras, GNSS etc Introduction to drone software for flight planning, data collection, and post-processing (e.g, pix4D, drone deploy, Agisoft Metashape).	3hours
Module-III Surveying techniques with drones: basic surveying methodologies(ground contro), ,data acquisition techniques for different surveying applications(topographic mapping, 3D modeling, volume calculations etc)	3 hrs
Module-IV Data processing and Analysis: introduction to photogrammetry and LiDAR data processing workflows, pre-processing of drone-captured data(georeferencing ,image alignment, point cloud generation ,etc) post-processing techniques for creating accurate maps, models, and point cloud, quality assessment and error analysis in drone surveying data	3hours
Module-V Applications of drone surveying: topographic mapping and terrain analysis, asset inspection and monitoring (infrastructure,),urban planning and development, disaster response , case studies and real world examples showcasing diverse applications of drone surveying	3hrs

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Explain the fundamental principles of drone technology and its application in surveying.	C2
CO2:	Identify different types of drones, their components ,and their suitability for various surveying tasks	C2
CO3	explain the principles of data acquisition using drones, including photogrammetry, liDAR scanning, and sensor integration.	C3
CO4	recognize the legal and regulatory frameworks governing drones operation in surveying contexts	C3
CO5	Applications of drone survey in topographic mapping and terrain analysis	C2

Question paper pattern:

iii) Two questions are to beset from each module.

iv)Total five questions are to be answered by selecting minimum one question from each module

Textbook:

1. Surveying VolI , II& III-B.C.Punmia-LakshmiPublications,NewDelhi.
2. Advance methods and techniques in drone surveying by Dr.E.VRaghava Rao and Dr.S A Rahim, Publisher: prashas research consulting pvt.ltd
3. Introduction to modern photogrammetry by Edward M.Mikhail, james S. Bethel, j. chris Mcglone. Publisher : Wiley

Referencebooks:

1.drone technology in architecture, engineering and construction by Tal Daniel andJon Altschulo, publisher: John Wiley &sons lnc

2. photogrammmetry and remote sensing by Matt Weilberg,

NptelLink:https://onlinecourses.nptel.av.in/noc22_ce05/oreview

Structural Health Monitoring USING AI		
Subject code	22CVAE674	Credit: 1
Hours/Week	2 hours. (Theory)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: None

1) **Introduction to SHM and AI**: Provide an overview of structural health monitoring principles and the role of AI in enhancing monitoring capabilities. Understand how AI can improve the efficiency, accuracy, and reliability of SHM systems.
2) **Fundamentals of AI**: Cover the basic concepts of AI, including machine learning algorithms (e.g., regression, classification, clustering), neural networks, deep learning, and their applications in SHM.
3) **Data Acquisition and Pre-processing**: Learn techniques for acquiring sensor data from structures and pre-processing it for AI algorithms. Understand data cleaning, normalization, feature extraction, and selection methods specific to SHM applications.

Modules	Teaching Hours
Module I Overview of SHM, Importance and benefits of SHM, Components of an SHM system, Traditional vs. AI-based. SHM methods Types of sensors used in SHM (strain gauges, accelerometers, fibre optics, etc.), Wireless sensor networks, Data acquisition systems and protocols, Data pre-processing techniques.	6 Hours
Module II Introduction to AI and ML concepts, supervised vs. unsupervised learning, Introduction to deep learning, Tools and frameworks for AI in SHM (TensorFlow, PyTorch, Scikit-learn) Supervised learning algorithms (SVM, decision trees, neural networks), Unsupervised learning algorithms (k-means, PCA, anomaly detection), Feature extraction and selection techniques, Model evaluation and validation	5 Hours
Module-III Basics of vibration analysis, Modal analysis using AI, Frequency domain analysis, Case studies on vibration-based damage detection. Fundamentals of image processing, Visual inspection using drones and cameras, Defect detection using computer vision (CNNs, object detection), Thermal imaging and infrared thermography.	6 Hours
Module-IV Predictive analytics in SHM, Remaining Useful Life (RUL) estimation techniques, Maintenance scheduling optimization using AI, Case studies on predictive maintenance, Data fusion from multiple sensors, Handling large datasets, Cloud-based storage and processing solutions, Introduction to digital twins.	5 Hours

Module – V	
SHM in bridges, buildings, pipelines, and aerospace structures, Success stories and lessons learned, Ethical considerations and safety in AI-based SHM, Regulatory and compliance issues, Advances in AI hardware (edge computing), Emerging technologies (quantum computing, IoT), Collaborative and multi-agent systems, Future research directions.	6 Hours

Question paper pattern:

i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text books:

"Structural Health Monitoring: A Machine Learning Perspective" by Krishna Chetty and Raghvendra V. Cowl Agi - This book explores the application of machine learning techniques, including AI algorithms, to SHM. It covers topics such as anomaly detection, predictive maintenance, and decision-making in monitoring systems.

1. **"Machine Learning and Data Mining in Structural Health Monitoring" edited by Fabio Biondini and Daniele Zonta** - This book provides insights into the use of machine learning and data mining techniques specifically tailored for SHM applications. It includes case studies and applications of AI in monitoring civil structures.
2. **"Artificial Intelligence in Civil Engineering" edited by John Y. K. Cho and Dookie Kim** - While not exclusively focused on SHM, this book covers various applications of AI in civil engineering, including structural monitoring, optimization, and decision-making processes.
3. **"Artificial Intelligence for Construction" edited by F. Javier Zaratiegui and Daniel M. Hall** - This book discusses AI applications in the construction industry, including aspects related to structural health monitoring, automated inspection, and predictive analytics.

Reference books:

1. **"Artificial Intelligence Applications in Structural Engineering" edited by M. Golparvar-Fard** - This book provides insights into various applications of AI in structural engineering, including SHM. It covers topics such as machine learning, neural networks, and expert systems in the context of monitoring and maintenance of civil structures.
2. **"Deep Learning Techniques for Biomedical and Health Informatics" edited by João Manuel R. S. Tavares and R. M. Natal Jorge** - While primarily focused on biomedical applications, this book discusses deep learning techniques that can be applied to SHM, such as convolutional neural networks and recurrent neural networks for analyzing sensor data.
3. **"AI in Structural Engineering: Application of Neural Networks, Genetic Algorithms, and Other Machine Learning Techniques" by T. S. Srinivasan** - This book explores the use of neural networks, genetic algorithms, and other machine learning techniques in structural engineering, including their application in SHM for predicting structural behaviour and assessing health.

Structural Health Monitoring USING SENSORS		
Subject code	22CVAE675	Credit:01
Hours/Week	2 hours.(Theory)	SEE:50Marks
Totalhours:28 hrs	CIE:50Marks	SEE:3hours

Prerequisite: None

Course objectives:

1) **Fundamental Principles**: Understanding the basic principles and concepts of structural health monitoring, including the importance of monitoring structural integrity and performance over time.
2) **Sensor Technologies**: Learning about various types of sensors used in SHM, such as strain gauges, accelerometers, piezoelectric sensors, fibre-optic sensors, and wireless sensor networks (WSNs). This includes understanding their operating principles, advantages, limitations, and appropriate applications.
3) **Data Acquisition and Processing**: Gaining skills in data acquisition systems for sensors, including signal conditioning, data sampling, and processing techniques. This involves learning about data analysis methods such as Fourier analysis, wavelet transforms, and statistical approaches.

Modules	Teaching Hours
Module I Failure of concrete, deterioration of structure drying shrinkage thermal contraction spalling, corrosion etc. Structural health monitoring and its need ensuring integrity and safety, detecting the evolution of damage. The need for SHM, vibration damage detection.	6 Hours
ModuleII Sensors, Strain gauges, Accelerometers, temperature sensors and monitoring, wind measurement sensors, seismic sensors, load cells etc. Data acquisition and transmission and data processing.	6 Hours
Module-III Design of SHM system for bridges, bridge failures and limitations of bridges.	5 Hours
Module-IV Structural Audit, Assessment of health structure-includes components of structure, behaviour under loading cases. Collapse and investigation Management, SHM procedures.	6 Hours

Module–V	
Applications Real time SHM applications on structure behaviour- displacement, acceleration.	5 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Understand the failure criteria, deterioration, its integrity and safety, SHM for vibration damage detection.	
CO2:	Understand the different types of sensors and its application.	
CO3:	Understand the Application of SHM in bridge.	
CO4	Understand the application of SHM in Structural auditing.	
CO5	Understand the application of SHM in structural behavior	

Question paper pattern:

iii) Two questions are to be set from each module.
iv) Total five questions are to be answered by selecting minimum one question from each module

Textbook:

1. "Structural Health Monitoring: A Machine Learning Perspective" by Krishna Chetty and Raghvendra V. Cowlagi - This book explores the application of machine learning techniques to structural health monitoring, which often involves sensor data.
2. "Structural Health Monitoring: A Practical Approach" by Daniel Balageas, et al. - This textbook covers various aspects of structural health monitoring, including sensor technologies and their applications.
3. "Handbook of Modern Sensors: Physics, Designs, and Applications" edited by Jacob Fredon - Although not exclusively focused on structural health monitoring, this handbook provides comprehensive coverage of sensor technologies, which are crucial in SHM systems.
4. "Smart Materials for Structural Health Monitoring" edited by Victor Giurgiu Tiu - This book focuses on smart materials and their applications in structural health monitoring systems, which often involve sensors.
5. "Fundamentals of Structural Health Monitoring" by Fu-Kuo Chang - This textbook provides an introduction to the fundamentals of structural health monitoring, including the role of sensors in monitoring and maintaining structural integrity.

Reference books:

1. **A Review of Structural Health Monitoring Literature: 1996-2001**
   Authors: Fu-Kuo Chang, et al.
   Published in: Shock and Vibration Digest, 2003.
   This paper provides a comprehensive review of the SHM literature, including various sensor technologies and their applications.
2. **Sensor Technologies for Civil Infrastructures**
   Editors: Ming L. Wang
   Published by: Woodhead Publishing, 2014.
   This book discusses various sensor technologies applicable to civil infrastructures, with specific

chapters on their use in SHM.

3. **Wireless Sensor Networks for Structural Health Monitoring**
   Authors: Daniel S. DeFigueiredo, et al.
   Published in: Structural Control and Health Monitoring, 2006.
   This paper explores the use of wireless sensor networks (WSNs) for SHM applications, focusing on communication protocols and data management.

INDIAN KNOWLEDGE SYSTEMS (Theory) (Common to All UG Programs)						
Course Code	**:**	**22IKSAE676**		**CIE**	**:**	**50Marks**
Credits: L:T:P	**:**	**1:0:0**		**SEE**	**:**	**50Marks**
Total Hours	**:**	**15L**		**SEE Duration**	**:**	**02Hours**

Course Learning Objectives: The students will be able to	
1	To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2	To make the students understand the traditional knowledge and analyze it and apply it To their day-to-day life.

Modules	
Module-I	**05Hrs**
Introduction to Indian Knowledge Systems(IKS): Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-à-vis indigenous knowledge, Traditional knowledge vs. western knowledge.	
Module–II	**05Hrs**
Traditional Knowledge in Humanities and Sciences: Linguistics, Number and Measurements - Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.	
Module-III	**05Hrs**
Traditional Knowledge in Professional domain: Town planning and architecture-Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2:	Appreciate the need and importance of protecting traditional knowledge.
CO3:	Recognize the relevance of Traditional knowledge in different domains.
CO4:	Establish the significance of Indian Knowledge systems in the contemporary world.

Reference Books	
1	**Introduction to Indian Knowledge System-concepts and applications**, B Mahadevan, VinayakRajatBhat,NagendraPavanaRN,2022,PHILearningPrivateLtd,ISBN-978-93-91818-21-0
	Traditional Knowledge System in India, AmitJha,2009,AtlanticPublishersandDistributors (P)Ltd.,ISBN-13:978-8126912230,
2	**Knowledge Traditions and Practices of India**, KapilKapoor, AvadeshKumarSingh,Vol.1, 2005,DKPrintWorld(P)Ltd.,ISBN81-246-0334,

	Suggested WebLinks:
1.	**https://www.youtube.com/watch?v=LZP1StpYEPM**
2.	**http://nptel.ac.in/courses/121106003/**
3.	http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63(Centre of Excellence for Indian Knowledge System, IIT Kharagpur)
4.	https://www.wipo.int/pressroom/en/briefs/tk_ip.html
5.	https://unctad.org/system/files/official-document/ditcted10_en.pdf
6.	http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf
7.	https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwE

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%(CIE)**	**50%(SEE)**
QUIZZES		
Quiz-I Quiz-II	Each quiz is evaluated for 05 marks adding upto**10 Marks.**	*****
THEORY COURSE-(Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test–I Test–II	Each test will be conducted for 25 Marks adding upto 50 marks. Final test marks will be reduced To **20 Marks**	*****
EXPERIENTIALLEARNING	**20**	*****
Case Study-based Teaching-Learning	--	*****
Sector wise study & consolidation (viz., Engg. Semiconductor Design, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ ITeS)	--	
Video based seminar(4-5minutes per student)	--	
Maximum Marks for the Theory	---	**50Marks**
Practical	--	--
Total Marks for the Course	**50**	**50**

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

CURRICULUM

FOR B.E.VII SEMESTER AND VIII SEMESTER

(22 Series)

FOR THE ACADEMIC YEAR 2025-26

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr.Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart classrooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical, and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958 with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35 research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, teamwork and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

Hyderabad Karnataka Education Society's

P. D. A COLLEGE OF ENGINEERING, KALABURAGI

B.E in Civil Engineering

Scheme of Teaching and Examination 2022

Outcome Based Education (OBE) and Choice-Based Credit System (CBCS)

Effective from the Academic Year 2022-23

VII Semester

Sl. No	Course	Course Code	Couse Title	Teaching Department	Teaching Hours/Week			Examination				
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
1	IPCC	22CV71	Design and Drawing of Hydraulic Structures	Civil Engineering Department	3	0	2	3	50	50	100	4
2	IPCC	22CV72	Design and Drawing of Steel Structures	Civil Engineering Department	3	0	2	3	50	50	100	4
3	PCC	22CV73	Specifications and Quantity Surveying	Civil Engineering Department	4	0	0	3	50	50	100	4
4	PEC	22CV74x	Professional Elective-III	Civil Engineering Department	3	0	0	3	50	50	100	3
5	OEC	22CVOE75x	Open Elective-II	Civil Engineering Department	3	0	0	3	50	50	100	3
6	PROJ	22CV76	Major Project Phase-II	Civil Engineering Department	0	0	12	3	50	50	100	6
								Total	300	300	600	**24**

Professional Elective Course -III	
22CV741	Pavement Design
22CV742	Design of Bridges
22CV743	Industrial Waste water Treatment
22CV744	Advanced Foundation Engineering
22CV745	Design of Prestressed Concrete structures

Open Elective- II	
22CVOE751	Rural development technology
22CVOE752	Optimization and reliability Analysis
22CVOE753	Finite Element Method
22CVOE754	Solid Waste Management
22CVOE755	Disaster Management

Hyderabad Karnataka Education Society's

P. D. A COLLEGE OF ENGINEERING, KALABURAGI

B.E in Civil Engineering

Scheme of Teaching and Examination 2022

Outcome Based Education (OBE) and Choice-Based Credit System (CBCS)

Effective from the Academic Year 2022-23

VIII Semester

Sl. No	Course	Course Code	Couse Title	Teaching Department	Teaching Hours/Week			Examination				
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
1	PEC	22CV81x	Professional Elective-IV (Online Courses)	Civil Engg Dept	3	0	0	3	50	50	100	3
2	OEC	22CVOE82x	Open Elective-III (Online Courses)	Respective Dept	3	0	0	3	50	50	100	3
3	INT	22CVINT83	Internship (Industry/Research) (14 - 20 Weeks)	Civil Engg Dept	0	0	12	3	50	50	100	10
								Total	150	150	300	**16**

Professional Elective Course-IV (Online courses)	
22CV811	Admixtures and Special Concretes
22CV812	Ground Improvement
22CV813	Municipal Solid Waste Management
22CV814	Pavement Materials (Under Pavement Engineering)
22CV815	Introduction to Multimodal Urban Transportation Systems (MUTS)
22CV816	Foundation Engineering
22CV817	Integrated Waste Management for a Smart City
22CV818	Stability of Structures
22CV819	Sustainable Groundwater Management

Open Elective Courses-III (Online Courses)	
22CVOE821	Sustainable Architecture
22CVOE822	Introduction to Semiconductor Devices
22CVOE823	Indian Art: Materials, Techniques and Artistic Practices
22CVOE824	Basics of Materials Engineering

DESIGN AND DRAWING OF HYDRAULIC STRUCTURES		
Subject code	22CV71	Credit: 04
Lectures Hours/Week	3 hours (Theory) + 2 hours (Practical)	SEE: 50 Marks
Total hours: 42 hours (Theory) + 28 Hours (Practical)	CIE: 50 Marks (25 M Theory + 25 M Practical)	SEE: 3 hours

Prerequisite: Fluid Mechanics, Engineering Mathematics, Water Resources Engineering

Course objectives: The students will be able to acquire knowledge in the following topics

1. Diversion headworks, Design and drawing of vertical drop and impervious floor of hydraulic structures.
2. Design of canals and silt theories.
3. Design and Drawing of Cross drainage works.
4. Detailed study of Gravity and Earthen dams.
5. Spillways and outlets.

Modules	Teaching Hours
Module I **Diversion headwork:** Introduction, components and functions; Weirs – types and causes of failure and their remedies; Design- Impervious floor of hydraulic structures –Bligh's creep theory. **Design and Drawing:** Vertical drop weir and impervious floor of hydraulic structures by Khosla's theory.	09 Hours
Module-II **Design of canals and silt theories:** Types of canals, Cross section of lined and unlined canals and alignment, Types of silt, Silt supporting capacity; Design of canals through alluvial soils- Kennedy's theory and Lacey's silt theory. Defects of Kennedy's theory, Drawbacks of Lacey's theory, Comparison between Kennedy's and Lacey's theory.	08 Hours
Module-III **Design of Cross Drainage work:** Introduction, classification, various types of aqueducts and siphon aqueducts, design consideration for cross drainage works; **Hydraulic design and drawing:** (i) Aqueduct; (ii) Type III Siphon Aqueduct; (iii) Canal drop (Trapezoidal Notch Fall); (iv) Sarda typefall (trapezoidal crest- impervious floor design using Khosla's theory) and (v) Canal regulator (impervious floor design using Khosla's theory).	09 Hours
Module –IV **Dams:** Types; Gravity Dams-computation of forces, modes of failure and stability criteria, stability analysis, limiting height of gravity dams. Earth dams- Design criteria. Seepage Analysis of earth dams. **Design and Drawing:** Elementary and Practical profile of gravity dam,	08 Hours
Module-V **Spillways and outlets:** Types of Spillways, Necessity, location, ogee spillway. Energy dissipation below spillway. Use of hydraulic jump & design of stilling basin. **Design and drawing:** Ogee spillway	08 Hours

Course Outcomes: On completion of this course, students are able to:		
CO	**Course Outcomes**	**Blooms Level**
CO1:	The students will be able to understand and explain diversion headworks, design and drawing of vertical drop and impervious floor of hydraulic structures.	L3,L4
CO2:	The students will gain information about how to design canals and able to understand the concept of silt theories.	L3,L4
CO3:	The students will be able to design and draft drawings of various Cross Drainage Works such as Aqueduct, Type III Siphon Aqueduct, Canal drop, Sarda typefall and Canal regulator.	L3,L4
CO4	The students will be able to analyze the forces acting on gravity and earthen dams along with designing and drawing of elementary and practical profile of Gravity dam.	L3,L4
CO5	The students will be able to assess knowledge about spillways and outlets along with designing and drawing of Ogee spillway.	L3,L4

Question paper pattern:
Scheme of SEE: Two questions to be set from each Module by intermixing the syllabus of respective module. Students have to answer any five full questions by selecting one question from each module. CIE for laboratory is to be conducted with one external examiner from within department.

Text books:

1. Dr. PN Modi & Seth, Hydrology & Water Resources Engg. Standard Publishers, New Delhi
2. R.K. Sharma and Sharma – Hydrology and Water Resource Engineering
3. Linsley, Kohler and Paulhus: Applied Hydrology, McGraw Hill, New Delhi
4. Garg. S.K: Hydrology and Water resources engineering, Khanna Publications.
5. P Novak , A.I.B Moffat, C.Nalluri and R.Narayanan Hydraulic Structures Fourth Edition – Taylor and Francis London and New York

Reference books:

1. Linsley & Frazini, Water Resources Engineering, McGraw-Hill international Edition
2. Birdie G S & Das, Hydrology & Water Resources Engineering, Dhan path rai Publishers New Delhi
3. B.L. Gupta& Amit Gupta, Water resources systems and management, Standard Publishers distributers, New Delhi

Nptel Link: https://youtu.be/FYYJgSMjYB4

E-Books: www.civilenggebooks.com

DRAWING OF HYDRAULIC STRUCTURES LAB	
List of Drawings	**Teaching Hours**
1. Drawing of Vertical drop weir	2 hours
2. Drawing of Impervious floor of hydraulic structures by Khosla's theory.	4 hours
3. Drawing of Aqueduct	4 hours
4. Drawing of Type III Siphon Aqueduct	2 hours
5. Drawing of Canal drop (Trapezoidal Notch Fall)	2 hours
6. Drawing of Sarda typefall (trapezoidal crest- impervious floor design using Khosla's theory)	4 hours
7. Drawing of Canal regulator (impervious floor design using Khosla's theory).	2 hours
8. Drawing of Elementary and Practical profile of gravity dam.	2 hours
9. Drawing of Ogee spillway	2 hours
10.Drawing of Surplus Wier	2 hours
11.Drawing of Tank Sluice	2 hours
Question paper pattern: 1. Instructions as printed on the cover page of answer script for split up of marks to be strictly followed. 2. All exercises are to be included for practical examination.	
Reference books: 1. Dr. PN Modi & Seth, Hydrology & Water Resources Engg. Standard Publishers, New Delhi Garg. S.K: Hydrology and Water resources engineering, Khanna Publications.	

DESIGN AND DRAWING OF STEEL STRUCTURES		
Subject code	22CV72	Credit: 04
Lectures Hours/Week	3 hours (Theory) + 2 hours (Practical)	SEE: 50 Marks
Total hours: 42 hours (Theory) + 28 Hours (Practical)	CIE: 50 Marks (25 M Theory + 25 M Practical)	SEE: 3 hours
Prerequisite: Civil Engineering Materials, Strength of Materials, Structural Analysis		
Course objectives: The objectives of this course are to learn: 1. Design philosophies, loads and load combinations 2. Behavior and design of fasteners typically bolted and welded and simple beam-column connections 3. Behavior and design of axially loaded members and column bases Behavior and design of simple beams		

MODULES	Teaching Hours
Module I **Introduction**: Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Failure criteria for steel, Codes, Specifications, and section classification. **Plastic Behavior of Structural Steel**: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis, Plastic analysis of continuous beams	3hours 5 hours
Module-II **Bolted connections**: Introduction, Behavior of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Design of axially loaded and eccentrically loaded connections. **Welded connections**: Introduction, Welding process, advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of axially loaded and eccentrically loaded joints using fillet and butt welds.	4 hours 4 hours
Module III **Design of Tension Members:** Introduction, Types of tension members, Design of strands, Slenderness ratio, Behavior of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, other sections, Design of tension member, Lug angles **Design of Compression Members:** Introduction, Failure modes, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members: angle struts, laced and battened built up compression members using Bolted and Welded Connections.	4hours 5hours
Module -IV **Design of Beams**: Introduction, Beam types, Lateral stability of beams, factors affecting lateral stability, Behavior of simple and built-up beams in bending(I sections with flange plates only without vertical stiffeners), Design strength of laterally supported beams in Bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, Design of beams	8 hours
Module -V **Design of column bases**: Design of simple slab base and gusseted base subjected to axial loading. Design of concrete pedestal along with anchor bolt design for given uplift load. **Design of beam to beam and beam to column connections**: Design of simple framed and seated (unstiffened and stiffened) connections using bolting and welding	4 hours 5 hours

Course Outcomes: On completion of this course, students are able to:		
CO		BL
CO1:	Explain different design philosophies and analyze continuous beams using plastic analysis technique	C4
CO2:	Design axially loaded and eccentrically loaded bolted and welded connections	C4
CO3:	Design axially loaded tension and compression members	C4
CO4:	Design simply supported beams using single I section and simple builtup sections	C4
CO5:	Design simple beam to column connections using bolting and welding	C4

Textbook:

1. N Subramanian., "Design of Steel Structures" (2016), Oxford University Press, New Delhi.
2. Duggal S K., "Limit State Method of Design of Steel Structures", Tata McGraw Hill, New Delhi
3. Bhavikatti S S Design of Steel structures, , Interline Publications, 2009, ISBN 978938002661
4. Ramachandra , " Design of Steel Structures (Vol I and Vol II)", Standard Book house, Seventh edition, 2016, New Delhi, India
5. Shiyekar M.R, "Limit state design of steel structures ", Prentice Hall India Pvt Ltd, Third Edition, 2019, New Delhi, India,
6. Sai Ram K S , " Design of Steel Structures", Pearson India Publishers, Third Edition, 2020, New Delhi, India
7. Kanthimathinathan S, " Limit state design of steel structures", Wiley India Pvt Ltd, First edition, 2019, New Delhi, India

Reference books:

1. Dayarathnam P, "Design of Steel Structures", Scientific International Pvt. Ltd.
2. Kazim S M A and Jindal R S, "Design of Steel Structures", Prentice Hall of India, New Delhi.

BIS Codes:

i) IS-800-2007, General construction in steel-code of practice.
ii) IS 875-1987, Code of practice for design loads,
iii) SP6(6)- 1972, ISI handbook for structural engineers-application of plastic theory in design of steel structures.
iv) SP6(1)-1964, Reaffirmed in 2003 Handbook for structural engineers- Structural steel Sections

Nptel Link: https://youtu.be/CNE4hk_SGTo

E-Books: www.civilenggebooks.com

DRAWING OF STEEL STRUCTURES LAB

List of Exercises:	**Teaching Hours**
Data given drawing using drafting software of the following	
1. Lap joint and Butt Joint with cover plates (Bolts arranged in chain and diamond Pattern shown in Plan view and elevation View)	2 hours
2. Different types of joints and show pitch, Gauge and Edge distance	2 hours
3.Bolted Bracketed connection (In-plane & Out of Plane load)	2 hours
4.Welded Bracketed connection (In-plane & Out of Plane load)	2 hours
5.Detailing of truss Joint – node configurations, Gusset plate and Bolt pattern	2 hours
6.Detailing of splice connection	2 hours
7.Simple beams and Compound beams including curtailment of flange plates.	2 hours
8.Built up battened Column using Bolted and Welded Connections.	2 hours
9.Built up laced Column using Bolted and Welded Connections.	2 hours
10.Slab base	2 hours
11.Gusset base	2 hours
12.Beam to beam connections - Framed connections- bolted and welded.	2 hours
13.Beam to column connections – unstiffened and stiffened connections - bolted and welded.	2 hours

14. Concrete Pedestal with anchor bolts (Plan & Elevation View)	2 hours
Question paper pattern: All are individual exercise. 1.Instructions as printed on the cover page of answer script for split up of marks to be strictly followed. 2.All exercises are to be included for practical examination.	

SPECIFICATIONS AND QUANTITY SURVEYING		
Subject code	22CV73	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 3 hours
Total hours: 42	CIE Marks: 50 Marks	SEE: 50 Marks

Prerequisite: Building material and construction, building planning and drawing

Course objectives:
To enable the students to obtain the basic knowledge about in the following topics: -
1.Understand the methods of taking out the quantities of each item of building components earth work, Bed concrete, Size stone masonry, Brickwork, RCC work etc. and for sanitary works, culverts, and steel truss.
2. Understand the method of writing the detailed specifications for all items of building of other works
3. Capable of calculate the rate per unit quantity of all items of building and other works.
4. Able to evaluate the value of property for different purposes.

Modules	Teaching Hours
Module I **Estimate:** Different types of estimates, Study of various drawings, important terms, units of measurements, abstracts, approximate methods of estimating **Estimation:** Methods of taking out quantities & their cost – center line method, long wall & short wall method. Preparation of detailed abstract & estimates for the following civil engineering works – Buildings- masonry structures & framed structures with flat & sloped R.C.C roof.	14 Hours
Module-II Building components such as beams, columns, footings & roof slab with T beams. Excel spread sheet for estimation of small buildings. **Estimates:** Steel trusses – fink & Howe trusses, R.C.C. slab culverts, manholes & septic tank with soak pits. Excel spread sheet for estimation of slab culvert bridges	12 Hours
Module-III **Specifications:** Definition, objectives & essentials of specifications. General & detailed specifications for items of works in buildings, specifications of aluminum & wood partitions, false ceiling, aluminum & fiber doors & windows, various types of claddings. **Rate Analysis:** Definitions & purpose, working of quantities of and rates for the following standard items of works – earth work, cement concrete, brick work, stone masonry, flooring, plastering, R.C.C. works, centering & form work for different R.C.C. items, wood & steel works for doors, windows & ventilators.	10 Hours
Module -IV **Measurement of earthwork for roads:** Methods for computation of earthwork by different methods.	08 Hours
Module-V **Contracts:** Types of contracts – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – tender, earnest money deposits, security deposit, tender forms, documents & types. Comparative statements, acceptance of contract documents & issue of work order. Duties & liabilities, termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval, technical sanction, nominal muster roll, measurement books, procedure for reading & checking measurements – preparation of bills. **Valuation:** Definition of terms used, different methods of valuation for different purposes with numerical examples.	12 Hours

Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Prepare the estimate for building items such as foundation, wall, column, beam, roofs lab steel roof trusses and Sanitary works.	C2
CO2:	Prepare the estimate for various components of Slab culvert, manhole, septic tank with soak pits	C2
CO3:	Determine the rates of different items of civil engineering works such as Earth work excavation, stone and brick masonry, woodwork, concrete and Reinforced concrete works.	C3
CO4	Determine the quantity of earthwork by different methods for railways and highway	C3
CO5	Prepare the tender document and tender notice with detailed specifications including the legal aspects of contract of civil engineering projects Determine the fair price of the property by different methods of valuation for different	C3

Text book:

1. Datta B.N., “Estimating and costing”, UBSPD Publishing House, New Delhi.
2. B.S. Patil, “Civil Engineering Contracts and Estimates”, Universities Press.
3. M. Chakraborthi; “Estimation, Costing and Specifications”, Laxmi Publications.
4. MORTH Specification for Roads and Bridge Works – IRC New Delhi.

Reference books:

1. Kohli D. D and Kohli R.C, “Estimating and Costing", 12 th Edition, S.Chand Publishers, 2014.
2. Vazirani V.N and Chandola S.P, “Estimating and costing", Khanna Publishers, 2015.
3. Rangwala, C. "Estimating, Costing and Valuation", Charotar Publishing House Pvt. Ltd., 2015.
4. Duncan Cartlidge, "Quantity Surveyor’s Pocket Book", Routledge Publishers, 2012.
5. Martin Brook, "Estimating and Tendering for Construction Work", A Butterworth-Heinemann publishers, 2008.
6. Robert L Peurifoy, Garold D. Oberlender,“Estimating Construction Costs” – 5ed, Tata McGraw-Hill, New Delhi.

Nptel Link: https://youtu.be/ofkpm4lhJcg

E-Books: www.civilenggebooks.com

PAVEMENT DESIGN		
Subject code	22CV741	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Transportation Engg

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. Gain knowledge about the types of pavements, factors affecting pavement design and Excelin the path of analysis of stress, strain and deflection in pavement.
2. Design Pavement using Burmeister Theory
3. Understand design concepts of flexible pavement by various methods.
4. Determine the stresses in Rigid pavements.
5. Design the Rigid Pavement using IRC:58

Modules	Teaching Hours
Module I **Introduction:** Types and component parts of pavements, functions of various components of flexible and rigid pavements, factors affecting design and performance of pavements. Evaluation of soil strength – by Plate load test and CBR test. Comparison of highway and airport pavements. Advantages and disadvantages of rigid or CC pavement **Stresses and Deflections in Flexible Pavements:** Stresses and deflections in homogenous masses using Bossiness's theory, Principle, assumptions, and limitations. Design of flexible pavement using single layer elastic theory. numerical problems	8 hours
Module II Wheel load stresses various factors in traffic wheel loads, ESWL of dual and multiple wheel loads using equal stress and equal deflection criteria. Repeated loads and EWL factors using Macleod and IRC methods, numerical problems on above. Burmeister two-layer theories Principle, assumptions, and limitations. Vertical stress distribution in two-layer system. Design of pavement using vertical surface deflections, numerical problems on Above.	8 hours
Module-III Burmeister three-layer theories, Principle, assumptions and limitations. stresses and strain using Peattie's charts and forces tables. Numerical problems on above. Perpetual pavement. IRC: 37-2018 methodof pavement design. Principles of pavement design. Design of flexible pavement with following two pavement compositions. i] granular base and granular subbase. ii] cementitious base and granular sub base with rack relief layer of aggregate above cementitious base.	9 hours

Module -IV **Stresses in Rigid Pavements:** Types of stresses and causes, factors influencing stresses, general considerations in rigid pavement analysis, wheel load stresses, warping stresses, frictional stresses, combined stresses. Numerical problems on above. Types of joints in cement concrete pavements and their functions, contraction, warping ad construction joints**.** Joint spacings and layout. numerical problems	8 hours
Module-V **Rigid Pavement Design:** Design of plain jointed rigid pavements for highways using IRC-58:2015. Procedure for slab design. Design of, dowel bars and tie bars by IRC-58:2015. Numerical problems on above. Concept of white topping, design features of CRCP, SFRC and ICPB	9 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Explain types of pavements, factors effecting design of pavement anddetermine stresses and deflection in flexible pavement	**C4**
CO2:	Design Pavement using Burmeister Theory	**C4**
CO3:	Design flexible pavement using empirical, semi-empirical, theoreticaland IRC:37 approach	**C4**
CO4	Explain different types of joints in concrete pavement and determinestresses in rigid pavement	**C4**
CO5	Design a Rigid Pavement using IRC:58 method	**C4**

Textbook:

1.Highway Engineering- Khanna, S.K., and Justo, C.E.G.: Nem Chand and Bros. Roorkee.
2. Construction Equipment and its Management- Sharma, S.C. Khanna Publishers.
3. Hot Mix Asphalt Materials, Mixture Design and Construction- Freddy L. Roberts, Kandhal, P.S: University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

Reference books:.

Reference Books

1. RRL, DSIR, 'Bituminous Materials in Road Construction', HMSO Publication.
2. RRL, DSIR, 'Soil Mechanics for Road Engineers', HMSO Publication.
3. Relevant IRC codes and MoRT& H specifications
4. Yoder E.J and Witczak Principles of pavement design. Edition John Wiley & sons

Nptel Link: https://youtu.be/uJntLQgEHD4

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

E-Books: www.civilenggebooks.com

DESIGN OF BRIDGES		
Subject code	22CV742	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Elements of Engineering and Engineering mechanics, Strength of material, Structural analysis

Course objectives:

1. Types and importance of bridges and basic investigations for proposing bridge at a site.
2. Details of different types of foundations for a proposed bridge its stability analysis for different components of substructures.
3. Loads as per IRC and stresses on different components of bridge and design of RCC slab culvert.
4. Design of pipe culvert and box culvert for a proposed highway road.
5. Design of RCC T-beam girder bridge by different methods and detailing.

Modules	Teaching Hours
Module I **Introduction**: Definition, components of bridges, Classification, types of bridges, importance of bridges. Introduction to Flyovers and Grade Separators Bridge Site Investigation and Hydraulic Design: Selection of bridge site, determination of design discharge, natural, artificial, and linear waterways, afflux, economical span, scour depth for alluvial and quasi alluvial waterways. Numerical problems	**2 hours** **6 hours**
Module-II **Foundation:** Types of foundations. Shallow and deep foundations, spread and raft type foundation. Pile foundation: bearing, friction and combined bearing and friction piles. Caisson foundations and open and pneumatic caissons. **Substructure and Foundations**: Types of abutments, piers, wing walls, forces to be considered for the design, Principles of stability analysis of abutment and pier & wing walls. Codal provisions for fixing of tentative sections of abutment, pier, wing walls. problems on stability analysis of abutments	**4 hours** **4 hours**
Module-III **Loads and stresses:** various loads to be considered while designing bridges. IRC Loading standards. Design of RC slab culvert for IRC class AA tracked and class A two lane loading using effective width method. Neat, dimensioned sketches of slab culvert showing half section plan at foundation, half front elevation, half plan at foundation level and half top view.	**2 hours** **6 hours**

Module -IV **Design of pipe culvert:** Hydraulic and structural design. pipe culvert for shallow and high embankments. Design of pipe culvert for high embankments. given site particulars. Neat, dimensioned sketches of pipe culvert for given site particulars. **Design of Box Culvert**: Design of single box culvert by actual analysis using moment distribution method for different combinations of loads such as dead load, live load, earth pressure from outside and water pressure from inside	**5 hours** **5 hours**
Module-V **Design of T-Beam Bridge:** Design of all the components of T-Beam bridge for class AA tracked vehicle only. Design of interior deck slab panel by Pigeaud's theory. Design of interior longitudinal girder by Courbon's load distribution method. Approximate method of design of interior cross girder. Neat sketches showing reinforcement details in slab and beams**.**	**8 hours**

CO		**BL**
CO1:	Determine hydraulic inputs required for design of bridges	C2
CO2:	Apply the principles of stability analysis of abutment, pier and wing walls and Analyse abutment from stability.criteria	C4
CO3:	Estimate the loads for design of bridges and design a RCC.slab culvert	C5
CO4	Design a Pipe using the IRC class AA loading and Box culvert	C5
CO5	Design a T-Beam Bridge	C5

Textbook:

1. Johnson Victor. D, "Essentials of Bridge Engineering", Oxford Publishing Company.
2. N Krishna Raju, "Design of Bridges, Oxford and IBH publishing company
3. T R Jagadeesh and M A Jayaram, "Design of bridge structures", Prentice Hall of India

Reference books:

1. Jain and Jai krishna, "Plain and Reinforced Concrete", Vol.2 Nem Chand Brothers.
2. Standard specifications and code of practice for road bridges, IRC 6,21 IS 458, IS 456. "Concrete Bridges", The Concrete Association of India

Nptel Link: https://youtu.be/5k8vdDSK6jU

E-Books: www.civilenggebooks.com

INDUSTRIAL WASTE WATER TREATMENT		
Subject code	22CV743	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering Chemistry, Environmental Engineering

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. To enable the students to understand fundamentals of industrial wastewater treatment.
2. To make students to understand treatment of industrial wastewater in order to reduce the cost of treatment.
3. To make students to understand minimize the cost of treatment by joint treatment with municipal wastewater.
4. To enable students to understand the characterization, suitable treatment and disposal of industrial wastewater.

To enable students to understand reuse and recovery of by products from industrial wastewater.

Modules	Teaching Hours
Module I	
Introduction: Industrial wastewater, difference between Industrial and domestic wastewater, effects of industrial wastewater on municipal sewage treatment systems and on receiving streams.	4 hours
Dissolved oxygen sag curve in streams Streeter-Phelps formulation, stream sampling, effluent and stream standards.	4 hours
Module-II	
Treatment methods: Volume reduction, strength reduction, neutralization, equalization, proportioning.	4 hours
Removal of suspended and dissolved solids. Treatment and disposal of sludgesolids.	3 hours
Module-III	
Combined treatment: Feasibility of combined treatment of industrial raw wastewater with domestic wastewater. Discharge of raw, partially treated and completely treated industrial wastes to streams.	6 hours
Module -IV	11 hours
Treatment of industrial wastes: Processes involved, flow chart showing origin of wastes, their characteristics, treatment methods, disposal, reuse, and recovery of by-products. Integrated cotton textile, sugar, dairy, canning, brewery, distillery, and tanning industry.	
Module-V	
Treatment of industrial wastes: Flow chart of process involved, origin of wastes, characteristics, treatment, disposal, reuse and recovery of by-products of canning, paper and pulp, pharmaceutical industries, metal plating and radio-active wastes. Space Waste Management	10 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL

CO1:	Differentiate between domestic wastewater and industrial wastewater.	C1
CO2:	Understand the effects of industrial wastewater on domestic treatment plants and on streams.	C2
CO3:	Understand the different methods of treatment of industrial wastes.	C2
CO4	The feasibility of combined treatment of industrial wastewater with domestic wastewater.	C3
CO5	Understand the origin of wastes in different industries, their characteristics and treatment.	C2C3

Textbook:

1. Howard S. Peavy, Donald R. Rowe, George T, Environmental Engineering - McGraw Hill International Edition. New York,2000
2. S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi2010
3. B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering, Laxmi Publications (P)Ltd., New Delhi2010.

Reference books:

1. CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi.
2. Mark. J Hammer, Water & Waste Water Technology, John Wiley & Sons Inc., NewYork,2008.
3. Industrial wastewater treatment – Nelson Nemerow
4. Industrial waste treatment – M N Rao and A K Dutta
5. Industrial waste disposal – Ross R D
6. Pollution control in process industries – Mahajan.

Nptel Link: https://youtu.be/in3GSRuooRs

E-Books: www.civilenggebooks.com

ADVANCED FOUNDATION DESIGN		
Subject code	22CV744	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Geotechnical Engineering-

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1. Types of shallow foundations, Bearing capacity according to BIS.
2. Classification of pile foundation, Group efficiency of piles.
3. Construction of different types of drilled piers and caissons.
4. Components of well foundation and forces acting on it.
5. Classification of expansive soils, Design of foundations in swelling soils, Drilled piers, Under reamed piles.

Modules	Teaching Hours
Module I **Shallow foundations:** Presumptive Bearing Capacity according to BIS, Factors affecting bearing capacity and settlement. Factors influencing selection of depth of foundation, type of shallow foundations – isolated footing. Combined footing, strap footing, Strip footing and Raft (Proportioning only)	9 hours
Module-II **Pile foundations:** Necessity, Classification, Load bearing capacity by static formula, Dynamic formula, pile load test and Penetration tests, pipe groups, group capacity of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, under reamed piles.	8 hours
Module III Drilled piers and casissons: Introduction, construction, advantages and disadvantages of drilled piers. Design of open, pneumatic and floating caissons. Advantages and disadvantages of floating caissons.	8 hours
Module -IV Well foundation: Different shapes and characteristics of wells. Components of well foundation. Terzaghi's Analysis, IRC method, Forces acting on well foundation. Sinking of wells.	7 hours
Module-V **Foundation in expansive soils**: Expansive soils, Parameters of Expansive soils, Classification of Expansive soils, Causes of moisture changes in soils, Effects of swelling on buildings, Preventive measures for expansive soils, Modification of expansive soils, Design of foundations in swelling soils, Drilled piers, Belled drilled pier, Under-reamed piles, construction of Under-reamed piles, Identification of collapsible soils, Design of foundation on collapsible soils not subjected to wetting, design of foundations subjected to wetting, Illustrative examples, problems.	10 hours

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Apply principles design of shallow foundations.	C3
CO2:	Design pile and pile groups with reference to dimensions.	C5
CO3:	Explain the construction of drilled piers and principles of design foropen, pneumatic and floating caissons.	C2
CO4	Explain the construction of drilled piers and principles of design foropen, pneumatic and floating caissons.	C2
CO5	Determine the effects of expansive soil on foundations and apply soildesign principle for foundation in swelling soil.	C4

Textbook:

1. Punmia B.C., "Soil Mechanics and Foundation Engineering,Laxmi Publications Co., India.
2. Donald P. Coduto, "Geotechnical Engineering Principles & Practices", Prentice-hall of India Ltd, India.
3. Murthy V.N.S., "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", CRC Press, New York.

DESIGN OF PRESTRESSED CONCRETE STRUCTURES		
Subject code	22CV745	Credit:03
Hours/Week	3 hours. (Theory)	SEE:50 Marks
Total hours: 42	CIE: 50 Marks	SEE:3 Hours

Prerequisite: Design of RCC Structures

Course objectives:
1. Explain the fundamental concepts of stress analysis.
2.Apply systems of prestressing for various sections of structural elements.
3.Evaluate and analyse the stresses under various conditions.
4. Design and detail the prestressed concrete members for various loading conditions.

Modules	Hours
Module I **Introduction to Prestressed concrete and codal provisions:** Introduction: Historic development- general principles of Prestressing, Types of prestressing, pre-tensioning and post tensioning, advantages, and limitation of prestressed concrete, Materials for prestressed concrete- high strength steel and concrete, properties, Stress-strain characteristics of high strength steel and concrete. Codal Provisions: Basic principles of prestressing, fundamentals of prestressing, load balancing concept, Stress concept, center of thrust, Pre-Tensioning and post tensioning methods-Analysis of pre and post tensioning, Systems of prestressing, End anchorages	9 Hours
Module-II **Analysis of sections for Flexure**: Elastic analysis of prestressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Eccentric and concentric pre-stressing, Numerical problems	8 Hours
Module-III **Losses of Prestress**: Loss of prestress in pretensioned and post tensioned members due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage and frictional losses, Numerical problems	8 Hours
Module -IV **Deflection of pre-stressed concrete beams**: short term and long-term deflections, Elastic deflections under transferred loads and due to different cable profiles, Deflection limits as per IS 1343, Effect of creep on deflection, Load versus deflection curve, methods of reducing deflection, Numerical problems. Limit state of Collapse: Flexure- IS code recommendations, Ultimate flexural strength of sections, IS code recommendations on shear strength, Shear resistance of sections, shear reinforcement, Limit state of serviceability- Control of deflection.and cracking, Numerical Problems	9 Hours
Module-V	

Design of Beams: Design of prestressing force and eccentricity for post tensioned prismatic beams, permissible stresses, Limiting zone and cable profile		8 Hours
Course Outcomes: On completion of this course, students are able to:		BL
CO1:	Understand the fundamental concepts of stress analysis	C2
CO2:	Apply systems of pre-stressing for various sections of structural elements	C2
CO3:	Analyse and evaluate the stresses under various conditions	C3
CO4	Design the prestressed concrete members for various loading conditions	C4
CO5	Design of Prestressed Beams	C4

Textbook:

1. Krishna Raju. N., "Pre-stressed Concrete - Problems and Solutions", CBS Publishers andDistributors, Pvt. Ltd., New Delhi.
2. Rajagopalan N, "Pre - stressed Concrete", Narosa Publishing House, New Delhi

Reference books:

1.Prestressed concrete, N Krishna Raju, Tata McGraw Hill Publishers, 2009,
2 Prestressed Concrete, P Dayarathnam, Oxford and IBH Publishing Co., 2000,
3. Design of pre stressed concrete structures, T Y Lin and Ned H Burns, John Wiley & Sons,New York, 2008
4. Fundamental of pre stressed concrete, N C Sinha and S K Roy, 3rd Edition, S Chand andCompany Ltd, 2011
5. Code Books: IS 1343:2012; Pre stressed Concrete: Code of practice

Nptel Link: https://youtu.be/4KYPltsNAWs

E-Books: www.civilenggebooks.com

RURAL DEVELOPMENT TECHNOLOGY		
Subject code	22CVOE751	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: None		

Course objectives:
The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:
1.Undertake surveys to decide the status of socio-economic significance.
2.Identify the need of watershed management in rural areas.
3.Suggest relevant government schemes for construction of roads, housing and energy conservation. .
4.Suggest the relevant cottage and agro based industries for the rural areas.
5.Identify water borne diseases, effects of fluoride and methods of fluoride removal in rural water supply.

Modules	Teaching Hours
Module I **Rural Development**: Need, definition, objectives, Rural development as a phenomenon, Rural development as a strategy Significance Of Rural Development Social significance – Rural problems, social change, resource utilization, infrastructure etc. Economic significance – National income, employment, food and fodder, industrial development, internal trade and transport, capital formation, etc. political significance- Political stability, Rural Development Environment, Panchayat raj institution, CAP ART (Council for advancement of people's action and rural technology)-Organizational set up, purposes, objectives, activities. Socio-Economic survey Role of Engineer in Rural Development.	8 Hours
Module-II Indira Awas Yojana – Salient features, beneficiary people, Conversion of Unserviceable blouses into Pucca/Semi-Pucca houses. Credit-cum- Subsidy scheme of rural housing- Salient features, share of Central and state Government, Rural Building Centres-Purpose, technology transfer, skill development, training, eco-friendly materials Pradhan Mantri Gram Sadak Yojna (PMGSY)- Key elements, concept of rural road connectivity.	8 Hours
Module-III Low-Cost Housing- Principles, purposes, use of Local Material for construction Rural Roads- Type, Specifications, Construction Techniques and Road Drainage Biomass – Types of fuel such as Firewood, agricultural residues, dung cakes Renewable energy and Integrated Rural Energy Programme -Objectives, key	8 Hours

elements, implementation, financial provisions, sources of renewable energy Working of Gobar gas and Biogas plant, National project on biogas development-technology, performance and implementation, financial assistance, involvement of Panchayat and local bodies	
Module -IV Cottage Industry- Brick Manufacturing, Concrete hollow Block, Artificial Sandstone crushing plant. Agro based Industry- Dairy, Animal Husbandry, Horticulture, Sericulture, and Fishery sources of funds for rural development Domestic (institutional and non - institutional) foreign institutional and non -institutional)	8 Hours
Module-V Water treatment flow diagram, water borne diseases causes, sources for water borne diseases, its effects., Role of NGO in rural Development Fluoride in water sources, causes effects of fluoride. methods of removal fluoride. Systems of water supply: continuous flow type and intermittent flow type	10 Hours

Course Outcomes: On completion of this course, students are able to:

CO1:	Justify the necessity of planning for the development of the given rural area.
CO2:	Execute the relevant plan at the specified level of the given rural area.
CO3:	Describe the functions of planning at micro and macro levels for the given rural area.
CO4	Describe the process of micro level planning with respect to agriculture.
CO5	Know the water borne diseases, effects of fluoride and types of systems of water supply.

Text book:

1. S.K.garg Environmental engineering (volume I and II), khan publications.
2. Rural development: principle, polices and management Hand cover.
3. Rangwala Engineering Materials.
4. Khan and Justo Khan Publications.

Reference books:

1. S.K.garg Environmental engineering (volume I and II), khan publications.
2. Rural development. Principle polices and management Hand cover.
3. Rangwala Engineering Materials.
4. Khan and Justo Khan Publications.

Nptel Link: https://youtu.be/pv0PhvQ3G4k

E-Books: www.civilenggebooks.com

OPTIMIZATION AND RELIABILTIY ANALYSIS		
Subject code	22CVOE752	Credit: 03
Hours/Week	3 hours. 3T	SEE: 3 hours
Total hours: 42	CIE: 50 Marks	SEE: 50 Marks
Prerequisite: Mathematics		

MODULES	Teaching Hours
Module I **Introduction**: Historical development, Engineering Applications of optimization, Art of Modelling. Optimization Problem and model Formulation, statement of an optimization Problem, constraint surfaces, formulation of design problems as mathematical programming problems.	6 hours
Module-II **Classification of optimization problems,** introduction, description and examples on various types of optimization problems.simplex algorithms, revised simpler methods, duality in linear programming,	7 hours
Module III Applications of optimization in civil engineering, problems on linear programming graphical and Simplex algorithms, problems on stochastic programing problems examples. Unconstrained optimization methods, direct search methods, random search methods, descent methods	7 hours
Module -IV Introduction, probability of failures and reliability, deterministic and probabilistic approaches, risk and reliability, F-N charts, role of consequence cost.	6 hours
Module –V **Sampling:** Concept of sampling, common spatial sampling plans. examples. **Geometric programming:** Geometric programming, conversion of NLP as a sequence of LP/ geometric programming. Dynamic programming: Dynamic programming conversion of NLP as a sequence of LP/ Dynamic programming	6 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Achieve Knowledge of design and development of problem-solving skills.	C2
CO2:	Understand the principles of optimization.	C2
CO3:	Design and develop analytical skills.	C2
CO4:	Summarize the Linear, Non-linear and Geometric Programming	C2
CO5:	Understands the concept of Dynamic programming	C2

Reference books: 1. Spunt, “Optimum Structural Design”- Prentice Hall 2. S.S. Rao, “Optimization – Theory and Practice”- Wiley Eastern Ltd. 3. Uri Krisch, “Optimum Structural Design”- McGraw Hill 4. Richard Bronson, “Operation Research”- Schaum’s Outline Series 5. Bhavikatti S.S.- “Structural optimization using sequential linear programming”- Vikas publishing house

Nptel Link: https://youtu.be/3Bh_viwz6_0

E-Books: www.civilenggebooks.com

FINITE ELEMENT METHOD		
Subject code	22CVOE753	Credit:03
Hours/Week	3Hours theory	SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Mathematics, Mechanics of Structures

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1.To provide the fundamental concepts of the theory of the finite element method

2.To develop the ability to generate the governing finite element equations for systems governed by partial differential equations

3. To learn basic principles of finite element analysis procedure for structural applications using truss, beams, frame, and plane elements.

4. To learn and apply finite element solutions to linear and non-linear Structural analysis problem and to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others

. 5. Learn to model complex geometry problems and solution techniques.

Modules	Teaching Hours
Module I Introduction: Basic concepts of elasticity – Kinematics and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method Finite difference method – Finite element method. Principles of finite element method – advantages & disadvantages – Finite element procedure. Basic principle of variational mechanics.	8 hours
Module II Basic principle of variational mechanics. Discretization of Structures: Finite elements used for one-, two- & three-dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – minimization of band width.	8 hours
Module-III Displacement Model and Element stiffness formulation: Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function – Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one-, two- & three-dimensional elements.	9 hours
Module-IV Hermitian polynomials, Internal nodes, Condensation of internal nodes and higher order elements – Serendipity elements, Development of strain – displacement matrix and stiffness matrix, direct method, and variational approach of formulation of element stiffness, Consistent load vector, Isoparametric Elements, Concept of Isoparametric Elements, sub parametric and super parametric elements –Jacobian transformation Matrix –numerical integration.	9 hours

Module - V Application of Finite Element Method for the analysis of one- & two-dimensional problems: Analysis of simple beams and plane trusses – Application to plane stress / strain / axisymmetric problems using CST & Quadrilateral Elements	8 hours

Course Outcomes: On completion of this course, students can:

CO		BL
CO1:	Understand the concepts behind variational methods and weighted residual methods in FEM	C3
CO2:	Identify the application and characteristics of FEA elements such as bars, Truss, beams, plane and isoperimetric elements, and 3-D element.	C4
CO3:	Develop element characteristic equation procedure and generation of global stiffness equation will be applied	C4
CO4	Able to apply Suitable boundary conditions to a global structural equation and reduce it to a solvable form.	C4
CO5	Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, Continuous beams, Trusses, portal frames, slabs, with different boundary conditions.	C4

Question paper pattern:

Two questions are to be set from each module.
Total five questions are to be answered by selecting minimum one question from each module

Textbook:
Finite Element Analysis" by S.S. Bhavikatti
Finite Element Method: Volume 1 - Basic Concepts and Applications" by G.R. Liu and S.S. Quek
Finite Element Method: Volume 2 - Solid Mechanics" by G.R. Liu and S.S. Quek
Introduction to Finite Element Analysis and Design" by Nam-Ho Kim and Bhavani V. Sankar
Finite Element Method" by A. Chakrabarti

Reference books:

Krishnamoorthy C S, “Finite Element Analysis”- Tata McGraw Hill

1. Bathe K J, “Finite Element Procedures in Engineering Analysis”- Prentice Hall
2. Rajasekaran. S, “Finite Element Analysis in Engineering Design”-Wheeler Publishing

4. Cook R D, Malkan D S & Plesta M.E, “Concepts and Application of Finite Element Analysis” - 3rd Edition, John Wiley and Sons Inc., 1989

3. Shames I H and Dym C J, “Energy and Finite Element Methods in Structural Mechanics”-McGraw Hill, New York, 1985
4. Desai C and Abel J F, “Introduction to the Finite Element Method” – East West Press Pvt. Ltd, 1972 7. Nilson, N.J., “Principals of Artificial Intelligence”- Narosa, New Delhi.

Adeli, H., “Expert Systems in Constructions and Structural Engg”- Chapman & Hall, New

York.
Elaine Rick and Keuin Knight, “Artificial intelligence”- Tata McGraw Hill Edition.
H.Adeli, “Expert system in structural design and construction”- Chapman and Hall, 1988.
. Kostem, “Expert systems in Civil Engineering”- ASCE, 1987.
. C.S.Krishnamoorthy and S Rajeev “Computer Aided Design”

SOLID WASTE MANAGEMENT		
Subject code	22CVOE754	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: Environmental studies, Environmental Engineering.		

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1. Need for solid waste management studies scope and importance of solid waste management.
2. To identify the sources of wastes collection and transportation of wastes.
3. To know the methods of disposal of wastes
4. To know the importance of Reduce, Recycle and Reuse. (3R's)
5. To know the effect of plastic and E-waste.

Modules	Teaching Hours
Module-I **Introduction:** Solid waste – Definition,– scope and importance of solid waste management, functional elements of solid waste management. **Sources:** Classification and characteristics – municipal, hospital / biomedical waste, Quality – generation rate, methods.	8 hours
Module-II **Collection and transportation:** Systems of collection, collection equipment, garbage, chutes, transfer stations – bailing and compacting, route optimization. Treatment / processing techniques: Component's separation, volume reduction, size reduction, chemical reduction and biological processing.	8 hours
Module-III **Incineration:** Processes – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolysis. **Composting:** Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes, Vermicomposting	8 hours
Module -IV **Sanitary land filling**: Definition, methods, trench area, ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate collection and control methods, gas collection systems. Land pollution Open dumping – selection of site, ocean disposal, feeding to hogs	8 hours

Module-V **Disposal method:** Incineration, pyrolysis, composting, sanitary landfilling, merits and demerits. **Recycle and reuse:** Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance, and reuse. E-Waste management		8 hours
Course Outcomes: On completion of this course, students are able to:		
CO		BL
CO1:	Identify the sources, types, composition and characteristics of solid wastes.	C2
CO2:	Identify the systems of collection, equipment's used for the collection of solid waste.	C3
CO3:	Knowledge of the hazardous of solid waste and the necessity to treat solid waste.	C2
CO4	Identify the methods of disposal for different solid waste.	C2
CO5	know the importance of reduce, recycle and reuse of solid wastes.	C2

Textbook:

1. George Tchobanoglous, Hilary Theisen, Samuel A Vigil, "Integrated Solid Waste Management Engineering principles and management issues", M/c Graw hill Education. Indian edition
2. Howard S Peavy, Donald R Rowe and George Tchobanoglous, "Environmental Engineering", Tata Mc graw Hill Publishing Co ltd.,

Reference books:

1. Municipal Solid Wastes (Management and Handling) Rules, 2000.Ministry of Environment and Forests
2. Notification, New Delhi, the 25th September, 2000. Amendment – 1357(E) – 08-04-2016
3. Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Central
4. Public Health and Environmental Engineering Organization (CPHEEO), 2016, Ministry of Urban Development, Government of India.
5. Handbook of Solid waste management, second edition, George Tchobanoglous, Frank Kreith, published by M/c Graw hill Education, 2002, ISBN-13 978-0071356237 ISBN -10 0071356231

Nptel Link: https://youtu.be/cjIacnNRLHE
E-Books: www.civilenggebooks.com

DISASTER MANAGEMENT		
Subject code	22CVOE755	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite:

Course objectives:
1 Study the environmental impact of natural and manmade calamities
2 Learn to analyze and assess risk involved due to disasters.
3 Understand the role of public participation.
4 Learn the management tools and mitigation techniques.

Modules	Teaching Hours
Module I Natural disasters and Disaster management Introduction to natural and Industrial Hazards- floods, landslides, earthquakes, volcanoes, avalanche, cyclones, drought, fire, release of effluents, harmful gases, Blast etc. Prediction and perception. Environmental risk due to project activities. Preparation of on-site and off-site disaster management plans - Pre disaster, actual disaster, Post disaster plans. Relief camp organization. Role of voluntary organization and armed forces during disasters	8 Hours
Module-II Risk analysis and assessment Basic concept. Purpose of risk analysis. Analytical techniques and tools of risk assessment. Toxicology. Significance of risk. Risk characterization. Risk communication and Management, AI in emergency responses.	9 Hours
Module-III Environmental Impact Assessment (EIA) Definition, Basic concepts and principles of EIA. Regulatory framework in India. Environmental inventory. Base line studies. Over view of EIA studies	8 Hours
Module -IV Assessment and Methodologies Physical, Biological, Natural resources, Socio economic and cultural environmental assessment. EIA methodologies- Adhoc, Matrix, Checklist approaches. Economic evaluation of impacts- cost benefits of EIA. Public participation in environmental decision making. Procedures for reviewing EIA analysis and statement. Decision methods for evaluation of alternatives.	8 Hours
Module-V Disaster Mitigation and Management Introduction, types, modes of disaster management, tools and techniques, primary and secondary data. Natural disasters its causes and remedies-Earthquake Hazards-Causes and remedies, Flood and Drought assessment, causes and remedies, Landslides-causes and remedies. Fire hazards in buildings, Fire hazard management, Traffic management, Cyclones and hurricanes, inter department cooperation. Regional and global disaster mitigation. Disaster management Act, Disaster management authority at central, state and district levels.	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO1:	Explain the different types of disasters and manage the pre and post disaster situation.

CO2:	Estimate and communicate the risk by conducting the risk assessment and Environmental Impact Assessment
CO3:	Identify the methods of disaster mitigation based on the basis of the risk assessment.
CO4	Analyze and evaluated the impact of measures adopted to mitigate the impacts.
CO5	

Text book:

1.David Dowrick, "Earthquake resistant design and risk reduction", John Wiley and Sons Ltd.

2. C. V. R. Murty, Rupen Goswami, A. R. Vijayanarayanan& Vipul V. Mehta, "Some Concepts in Earthquake Behaviour of Buildings", Published by Gujarat State Disaster Management Authority, Government of Gujarat.

3. IS-13920 – 2016, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces, BIS, New Delhi.

4. IS-1893 – 2016, Indian Standard Criteria for Earthquake Resistant Design of Structures, Part-1, BIS, New Delhi.

5. IS- 4326 – 2013, Earthquake Resistant Design and Construction of Buildings, BIS, New Delhi.

6. IS-13828 – 1993, Indian Standard Guidelines for Improving Earthquake Resistance of Low Strength Masonry Buildings, BIS, New Delhi.

7. IS-3935 – 1993, Repair and Seismic Strengthening of Buildings-Guidelines, BIS, New Delhi

Reference books:

Environmental Impact Analysis Hand Book, John G Rau and David C Wooten, Edition: 2013, ISBN: 978-0070512177.

2 Introduction to environmental Impact assessment, John Glasson, Riki Therivel, Andrew Chadwick, Edition: 2012, Research Press, ISBN:000-0415664705.2005, Reliance Publishing House, New Delhi.

3 Natural Disaster Reduction, Girish K Mishrta, G C Mathew (eds), Edition, 2005, Reliance Publishing House, New Delhi,

4 Remote Sensing and Image Interpretation, Thomas M. Lillisand and R.W. Keifer, 6th Edition, 2002, John Wiley, ISBN:9780470052457.

5. National Building Code Government of India Publication

Nptel Link: https://youtu.be/DExlZTfKZAM

E-Books: www.civilenggebooks.com

PROJECT WORK (PHASE II)		
Subject code	22CV76	Credit: 06
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: None

Course objectives:
To enable the students to conduct the project in the field related to civil engg such as construction materials, drinking water, waste water or design of structures, pavement, irrigation structures, Analysis of structures using latest software's.

Project work Phase-II shall be carried out in par with literature survey and the objectives finalized in Project Phase-I.

The project report shall be presented in the following form:
1. Definition of the problem
2. Literature survey
3. Analysis of results and Discussion
4. Conclusions
5. References

The project report shall be submitted in the prescribed standard format (04 copies) to the HOD on or before the last working day of the semester after the certification of the concerned guide and HOD.

Question paper pattern:
Evaluation of CIE marks:60% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 40% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee.
Evaluation of SEE marks: Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Demonstrate the technical knowledge of the selected project topic.	C5
CO2	Execute the project work independently in small group of 4-5 members demonstrating strong working knowledge of ethics & professional responsibility.	C6
CO3	Compile and analyze the project data using modern tools and produce a good quality project work.	C5
CO4	Present the project outcomes effectively using good presentation skills.	C4
CO5	Prepare a well-organized and compiled project thesis.	C4

VIII Semester

INTERNSHIP		
Subject code	22CVINT83	Credit: 10
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 03

Prerequisite:

Course objectives:
This course will enable students to get the field exposure and experience

Note: Internship /Professional Practice:

1. This shall be carried out by students in industry set-up related to the construction/ materials testing laboratories/research organizations/project management consulting firms/QS and QA organizations/ planning and design offices/Professional organizations like ACCE/ICI/INSTRUCT/RMCMA/QCI, PMI, CIDC etc. and other avenues related to the civil engineering domain in consultation and approval of internship guide/HOD /internship committees of the institutions.

2. The professional certification programs like ACCE(I)- SMP, ICI-BMTPC certifications, NSTRUCT certifications, CIDC certifications, RMC-QCI's RMCPCS Certification Programs, RMCMA-NRMCA'S Concrete Technologist India (CTI) programs and such similar programs by professional bodies with adequate industry exposures at sites/RMC plants can be considered as Internship /Professional Practice with due approvals from the guide/HOD /internship committees of the institutions

3. The industry/organization should issue certificates of internship offer and its completion. The offer letter should clearly have the nature of work to be done by the student and the supervisor's name and duration of internship.

4. The duration of the internship shall be 12 weeks. The student shall make a midterm and final presentation of the activities undertaken during the first 8 weeks and at the end of 12th week of internship respectively, to a panel comprising internship guide, a senior faculty from the department and head of the department. Each student should submit the internship report at the end of semester with internship certificate.

5. Viva-Voce examination shall be conducted by a panel of examiners consisting of internship supervisor from industry or industry professional approved by university and internship guide from the institute.

6. The College shall facilitate and monitor the student internship program.