UG-R22 Curriculum
With effective from 2022-23

Civil Engineering

Scheme of Instruction and Syllabi of
B.E I to IV Semester of
Four Year Degree Course

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institute | Affiliated to Osmania University)
Accreditated by NBA & NAAC (A++)
Kokapet Village, Gandipet Mandal, Hyderabad -500075, Telanagana.
E-mail: principal@cbit.ac.in, Website: www.cbit.ac.in
Phone No. : 040-24193276 / 277 / 279

SCHEME OF INSTRUCTION AND SYLLABI

OF

B.E. / B.TECH. I TO IV SEMESTERS

FOR

CIVIL ENGINEERING

(Inline with AICTE Model Curriculum with effect from AY 2022-23)

(R–22 Regulation)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Affiliated to OU, Approved by AICTE, Accredited by NBA, NAAC (A++)

Kokapet Village, Gandipet Mandal, Hyderabad– 500 075. Telangana

E-Mail: principal@cbit.ac.in; Website: www.cbit.ac.in;

Phone Nos.: 040-24193276 / 277 / 279

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
DEPARTMENT OF CIVIL ENGINEERING

INSTITUTE VISION AND MISSION

Vision
To be a centre of excellence in technical education and research.

Mission
To address the emerging needs through quality technical education and advanced research.

DEPARTMENTVISION AND MISSION

Vision
To strive for excellence in academics, research and consultancy in the field of Civil Engineering and contribute to the sustainable development of the country by producing quality Civil Engineers with professional and ethical values.

Mission
- Maintaining high academic standards to develop analytical thinking and independent judgment among the students so that they are fit for industry and higher studies.
- Promoting skills and values among the students to prepare them as responsible global citizens who can solve complex problems.
- Preparing the students as good individuals and team members with professional attitude, ethics, concern for environment and zeal for lifelong learning who can contribute to society.

PROGRAM EDUCATIONAL OBJECTIVES:

The PEOs are to facilitate the graduating students to

PEO1: Acquire basic knowledge and expertise necessary for professional practice in Civil Engineering for higher studies and research.
PEO2: Attain and practice technical skills to identify, analyze and solve complex problems and issues related to Civil Engineering.
PEO3: Possess a professional attitude as an individual or a team member to work for the betterment of the society and environment.
PEO4: Work with professional ethics as refined technocrats with a thirst for lifelong learning.

PROGRAM SPECIFIC OUTCOMES:
The graduates of this program will:

1. Effectively apply engineering fundamentals for the development and management of eco-friendly Civil engineering systems which benefit the society at large.
2. Develop the ability to provide solutions to complex problems in civil engineering through individual and team work with a spirit for lifelong learning
3. Develop the competence to plan, build and maintain sustainable infrastructural facilities like housing, water management, transportation and geotechnical services.

PROGRAM OUTCOMES:

Engineering graduate 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 of 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 public health and safety, and 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 the 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	Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of I Semester of B.E. –Civil Engineering
(Inline with AICTE Model Curriculum with effect from AY 2022-23)

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC02	Calculus	3	1	0	3	40	60	4
2	22CYC01	Chemistry	3	0	0	3	40	60	3
3	22EEC01	Basic Electrical Engineering	2	1	0	3	40	60	3
4	22CSC01	Problem Solving and Programming	2	1	0	3	40	60	3
PRACTICAL									
5	22CYC02	Chemistry Lab	0	0	3	3	50	50	1.5
6	22MBC02	Community Engagement	0	0	3	3	50	0	1.5
7	22CSC02	Problem Solving and Programming Lab	0	0	3	3	50	50	1.5
8	22MEC37	Robotics & Drones Lab	0	2	2	2	50	0	3
9	22EEC02	Basic Electrical Engineering Lab	0	0	2	3	50	50	1
TOTAL			**10**	**5**	**13**				**21.5**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

22MTC02

CALCULUS
(CIVIL)

Instruction	3 L+1T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss mean value theorems.
3. To explain the Partial Derivatives and the extreme values of functions of two variables.
4. To explain the shape of curves, their areas and volumes of revolutions.
5. To discuss the convergence and divergence of the series.

COURSE OUTCOMES: Completion this course, students will be able to

1. Apply the Matrix Methods to solve system of linear equations.
2. Analyze the geometrical interpretation of Mean value theorems and curvature.
3. Determine the extreme values of functions of two variables.
4. Find the shape of the curve, surface areas and volumes of revolution.
5. Examine the convergence and divergence of infinite Series.

CO-PO Articulation Matrix:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	-	-	-	-	-	-	-	2	1	1	-
CO 2	3	3	3	3	-	-	-	-	-	-	-	2	1	1	-
CO 3	3	3	3	3	-	-	-	-	-	-	-	2	1	1	-
CO 4	3	3	3	3	-	-	-	-	-	-	-	2	1	1	-
CO 5	3	3	3	1	-	-	-	-	-	-	-	1	1	1	-

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear system of equations, Linear dependence and independence of vectors. Eigen values, Eigenvectors, Properties of Eigen values and Eigen vectors, Cayley Hamilton theorem, Quadratic form, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Calculus: Rolle's Theorem, Lagrange's Mean value theorem, Cauchy's Mean value theorem (without proofs). Curvature, Radius of curvature, Centre of curvature, Evolute and Involute, Envelopes.

UNIT-III

Partial Differentiation and Its Applications: Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Applications of definite integrals: Curve tracing of standard curves (Cartesian only), Applications of definite integrals to evaluate length of curves, surface areas and volumes of revolutions.

UNIT-V

Sequences and Series: Convergence of sequence and series. Tests for convergence of series: Comparison test, limit comparison test, D'Alembert's ratio test, Raabe's test, Cauchy's root test, Alternating series, Leibnitz's series, absolute and conditional convergence**.**

TEXT BOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

SUGGESTED READING:

1. B.V.Ramana., "Higher Engineering Mathematics", 11th Reprint, Tata McGraw-Hill, New Delhi, 2010.
2. R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics", 5th edition, Narosa Publications, 2016.
3. David.Poole, "Linear Algebra: A Modern Introduction", 2nd Edition, Brooks/ Cole, 2005.

CHEMISTRY

(CIVIL)

Instruction:	3L Hours per Week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits:	3

COURSE OBJECTIVES: This course aims to

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

COURSE OUTCOMES: Completing this course, students will be able to

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	-	-	2	2	-	-	-	-	2
CO 2	3	2	2	-	-	2	2	-	-	-	-	2
CO 3	3	2	3	-	-	2	2	-	-	-	-	2
CO 4	3	2	3	-	-	2	2	-	-	-	-	2
CO 5	3	2	2	-	-	2	2	-	-	-	-	2

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2, He_2^+, N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, and – Reference electrodes (NHE, SCE) electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.
Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.
Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions
Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.
Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)
Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides), Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process), ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

TEXT BOOKS
1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson,Delhi, 7th edition(2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla ,Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

SUGGESTED READINGS
1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition(2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley,12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

22EEC01

BASIC ELECTRICAL ENGINEERING

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To comprehend the basic principle of operation of AC and DC machines
3. To infer about different types of electrical wires and cables, domestic and industrial wiring, safety rules and methods of earthing.

COURSE OUTCOMES: Completion this course, students will be able to

1. Understand the concepts of Kirchhoff's laws and their application various theorems to get solution of simple dc circuits.
2. Predict the steady state response of RLC circuits with AC single phase/three phase supply.
3. Infer the basics of single phase transformer
4. Describe the construction, working principle of DC machine and 3-phase Induction motor.
5. Acquire the knowledge of electrical wires, cables, earthing, Electrical safety precautions to be followed in electrical installations and electric shock and its safety and energy calculations.

CO-PO Articulation Matrix:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO-1	3	3	2	-	-	-	-	-	1	2	-	3
CO-2	3	3	2	-	-	-	-	-	1	2	-	3
CO-3	3	3	2	1	-	-	-	-	1	2	-	3
CO-4	2	1	-	-	-	-	-	-	1	2	-	3
CO-5	2	-	2	-	-	-	-	-	1	2	-	3

UNIT-I

DC Circuits: Electrical circuit elements (R,L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin's and Norton's Theorems.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, series RL and RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Single Phase Transformer: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt generators. DC Motors: Classification, Torque Equation, Characteristics and Speed control of DC Shunt and Series Motors, Losses and efficiency Three - Phase Induction Motors: Principle of operation, Applications

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, and first aid for electric shock, safety rules. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

TEXT BOOKS:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

SUGGESTED READING:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
4. P.V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

22CSC01

PROBLEM SOLVING AND PROGRAMMING

Instruction	2L + 1T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Develop logical skills and basic technical skills so that students should be able to solve basic computational problems.
2. Learn any basic programming language.

COURSE OUTCOMES: Completion of this course, students will be able to

1. Understand real world problems and develop computer solutions for those problems.
2. Understand the basics of Python.
3. Apply Python for solving basic programming solutions.
4. Create algorithms/flowcharts for solving real-time problems.
5. Build and manage dictionaries to manage data.
6. Handle data using files.

CO-PO Articulation Matrix:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	3	1	1	-	1	-	-	-	-	-	-	1
2	3	1	1	-	1	-	-	-	-	-	-	1
3	3	1	1	-	1	-	-	-	-	-	-	1
4	3	1	1	-	1	-	-	-	-	-	-	1
5	3	1	1	-	1	-	-	-	-	-	-	1
6	3	1	1	-	1	-	-	-	-	-	-	1

UNIT I

Introduction to Programming - *Evolution of languages*: Machine, Assembly and High-level languages. *Software requirements for programming*: OS, compiler, linker, loader, editor. Design specification: Algorithms and Flowcharts.

UNIT II

Data Types and Operators, Variable, Sequences and Iteration - Data types, Expressions, Precedence Rules, Operators: arithmetic, relational, logical, bit-wise and miscellaneous operators; local variable, global variables, List, String, Tuples, Sequence mutation and accumulating patterns.

UNIT III

Conditional Statement, Loops, Arrays and Strings, user-defined Data Types - if..else, for, while, nested iteration, Concept and use of arrays, declaration and usage of arrays, 2-dimensional arrays, different types of user defined data types.

UNIT IV

Dictionaries and Dictionary Accumulation, Functions/Methods - Dictionary basics, operations, methods, accumulation, advantages of modularizing program into functions, function definition and function invocation. Positional parameters passing arrays to functions, recursion, library functions.

UNIT V

File Handling and Memory Management - Concepts of files and basic file operations, writing/reading data to/from a .csv file, Memory Management Operations.

TEXT BOOKS AND REFERENCES:

1. R.S. Salaria, “Programming for Problem Solving”, First Edition, Khanna Book Publishing Co., Delhi.
2. Jeeva Jose, “Taming Python by Programming”, Revised Edition, Khanna Book Publishing Co., Delhi.
3. Mark Lutz, “Learning Python”, 5th Edition, O'Reilly Media, Inc.
4. Python Crash Course: A Hands-On, Project-Based Introduction to Programming by Eric Matthes, No Starch Press.
5. “Programming in Python”, R.S. Salaria, Khanna Book Publishing Co., Delhi.

NPTEL/SWAYAM Course:

1. Introduction to Problem Solving and Programming, Video Lectures, Prof. D Gupta, IIT Delhi.
2. Problem Solving Aspects and Python Programming, Dr. S Malinga, Dr Thangarajan, Dr. S V Kogilavani, Kongu Engineering College.
3. https://www.coursera.org/specializations/python-3-programming

CHEMISTRY LAB
(CIVIL)

Instruction:	3P Hours per Week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	50 Marks
Continuous Internal Evaluation:	50 Marks
Credits:	1.5

COURSE OBJECTIVES: This course aims to

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theorical concepts in the preparation of new materials like drugs and polymers.

COURSE OUTCOMES: Completion of this course, students will be able to

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	-	-	2	2	-	-	-	-	2
CO 2	3	2	1	-	-	1	2	-	-	-	-	2
CO 3	3	2	3	-	-	2	2	-	-	-	-	2
CO 4	3	2	2	-	-	2	2	-	-	-	-	2
CO 5	3	2	3	-	-	2	2	-	-	-	-	2

List of Experiments:

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2} & Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution with effect from the A.Y. 2022-23
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

TEXT BOOKS

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt.Ltd. New Delhi ,6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

SUGGESTED READINGS

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

22MBC02

COMMUNITY ENGAGEMENT

Instruction	3P Hours per week
SEE	Nil
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

COURSE OUTCOMES: Completion this course, students will be able to

1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: SarvaShikshaAbhiyan, BetiBhachao, BetiPadhao, Ayushman, Bharat, Swachh Bharat, PM AwasYojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

TEXT BOOKS:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

22CSC02

PROBLEM SOLVING AND PROGRAMMING LAB

Instruction	3P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Master the fundamentals of writing Python scripts
2. Learn Python elements such as variables, flow controls structures, and functions
3. Discover how to work with lists and sequence data, and files

COURSE OUTCOMES: Completion this course, students will be able to

1. Understand various Python program development Environments
2. Demonstrate the concepts of Python.
3. Implement algorithms/flowcharts using Python to solve real-world problems.
4. Build and manage dictionaries to manage data.
5. Write Python functions to facilitate code reuse.
6. Use Python to handle files and memory.

Laboratory / Practical Experiments:

1. Explore various Python Program Development Environments.
2. Demonstration of input/output operations.
3. Demonstration of operators.
4. Demonstration of selective control structures.
5. Demonstration of looping control structures.
6. Demonstration of List, Tuple and Set
7. Demonstration of Python Dictionaries.
8. Implementation of searching and sorting techniques.
9. Implementation of string manipulation operations.
10. File handling and memory management operations

Text Books and References:

1. R.S Salaria, “Programming for Problem Solving”, Khanna Book Publishing Co., Delhi
2. Jeeva Jose, “Taming Python by Programming”, Khanna Book Publishing Co., Delhi

22MEC37

ROBOTICS AND DRONES LAB

(Common to All Branches)

Instruction	2T + 2P Hours per week
CIE	100 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To develop the students' knowledge in various robot and drone structures and their workspace.
2. To develop multidisciplinary robotics that have practical importance by participating in robotics competitions
3. To develop students' skills in performing spatial transformations associated with rigid body motions, kinematic and dynamitic analysis of robot systems.
4. Through projects done in lab, increase the true hands-on student learning experience and enhance their conceptual understanding, increase students' ability, competence and teamwork skills on dealing with real-life engineering problems

COURSE OUTCOMES: Completion this course, students will be able to

1. Demonstrate knowledge of the relationship between mechanical structures of robotics and their operational workspace characteristics
2. Understand mechanical components, motors, sensors and electronic circuits of robots and build robots.
3. Demonstrate knowledge of robot controllers.
4. Use Linux environment for robotic programming.
5. Write Python scripts to control robots using Python and Open CV.

CO-PO Articulation Matrix:

PO#/ CO#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO11	PO12
CO1	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**
CO2	**2**	**3**	**1**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**2**	**1**
CO3	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**
CO4	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**
CO5	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**

LAB EXPERIMENTS:

1. Assembling of robot mechanical components, mounting of motors, sensors, electronic circuits to the chassis.
2. Connecting to electronic circuitry: motor drivers, incremental encoders proximity sensors, micro controller,
3. Different types of batteries, selection of suitable battery for application, safety precaution.
4. Introduction to Linux Command Line Interface: basic file and directory management and other useful commands
5. Controlling robot using Python: i) Move robot using Python code, ii) Make robot move in patterns using Python
6. Robot programming with Sensor inputs: i) Read sensor data using Python, ii) Visualize sensor data using Python, iii) Code robot to avoid obstacles by using sensor data
7. Open CV: i) Create an Image and display an image; ii) Read and change pixel values; iii) Create colored shapes and save image; iv) Extract the RGB values of a pixel; v) Reading and Writing Videos
8. Open CV: i) Extraction of Regions of Interest; ii) Extraction of RGB values of a pixel
9. Coding robot to work with colors, follow colored objects, identifying shape of the object-oriented
10. Projects: i)Making a line follower robot using a Camera; ii) Writing code for a complex function
11. Assembly of a drone

Suggested readings

1. https://www.geeksforgeeks.org/robotics-introduction/
2. https://www.ohio.edu/mechanical-faculty/williams/html/PDF/IntroRob.pdf
3. https://www.idtechex.com/en/research-report/new-robotics-and-drones-2018-2038-technologies-forecasts-players/584
4. https://dronebotworkshop.com/

22EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to

1. To acquire the knowledge on different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switch gear components

COURSE OUTCOMES: Completion this course, students will be able to

1. Comprehend the circuit analysis techniques using various circuital laws and theorems.
2. Analyse the parameters of the given coil and measurement of power and energy in AC circuits
3. Determine the turns ration/performance parameters of single-phase transformer
4. Infer the characteristics of DC shunt motor different tests.
5. Illustrate different parts and their function of electrical components, equipment and machines.

CO-PO Articulation Matrix:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	-	-	2	2	-	-	-	-	2
CO 2	3	2	1	-	-	1	2	-	-	-	-	2
CO 3	3	2	3	-	-	2	2	-	-	-	-	2
CO 4	3	2	2	-	-	2	2	-	-	-	-	2
CO 5	3	2	3	-	-	2	2	-	-	-	-	2

List of Laboratory Experiments/Demonstrations:

1. Verification of KCL and KVL.
2. Verification of Thevenin's theorem.
4. Verification of Norton's theorem.
5. Charging and discharging of Capacitor.
6. Determination of parameters of a choke or coil by Wattmeter Method.
7. Power factor improvement of single-phase AC System.
8. Active and Reactive Power measurement of a single-phase system using
   (i) 3-Ammeter method (ii) 3-Voltmeter method
9. Measurement of 3-Phase Power in a balanced system
10. Calibration of single-phase energy meter.
11. Verification of Turns/voltage ratio of single-phase Transformer.
12. Open Circuit and Short Circuit tests on a given single phase Transformer
13. Brake test on DC Shunt Motor
14. Speed control of DC Shunt Motor
15. Demonstration of Measuring Instruments and Electrical Lab components.
16. Demonstration of Low-Tension Switchgear Equipment/Components
17. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted to cover all five Course Outcomes.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of II Semester of B.E. –Civil Engineering
(Inline with AICTE Model Curriculum with effect from AY 2022-23)

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L		P/D		CIE	SEE	
THEORY									
1	22MTC05	Vector Calculus and Differential Equations	3	1	0	3	40	60	4
2	22PYC05	Mechanics and Materials Science	3	0	0	3	40	60	3
3	22CEC01	Engineering Mechanics	3	1	0	3	40	60	4
4	22EGC01	English	2	0	0	3	40	60	2
PRACTICAL									
5	22PYC08	Mechanics and Materials Science Lab	0	0	3	3	50	50	1.5
6	22EGC02	English lab	0	0	2	3	50	50	1
7	22MEC01	CAD AND DRAFTING	0	1	3	3	50	50	2.5
8	22MEC38	Digital Fabrication Lab	0	0	3	3	50	50	1.5
TOTAL			**11**	**3**	**11**				**19.5**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

22MTC05

VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS (CIVIL)

Instruction	3 L+1T per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to

1. To explain scalar and vector functions with its Physical interpretations.
2. To discuss vector line, surface and volume integrals.
3. To explain relevant methods to solve first order differential equations.
4. To discuss the solution of higher order Differential Equations
5. To learn Numerical solution of ODE and Engineering problems.

COURSE OUTCOMES: Completion this course, students will be able to

Upon completing this course, students will be able to:

1. Apply the vector differential operators to Scalars and Vector functions.
2. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
3. Calculate the solutions of first order linear differential equations.
4. Solve higher order linear differential equations.
5. Find solution of algebraic, transcendental and ODE by Numerical Methods.

CO-PO Articulation Matrix

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	3	-	-	-	-	-	-	-	2
CO 2	3	3	3	3	-	-	-	-	-	-	-	2
CO 3	3	3	3	3	-	-	-	-	-	-	-	2
CO 4	3	3	3	3	-	-	-	-	-	-	-	2
CO 5	2	2	2	2	-	-	-	-	-	-	-	1

UNIT-I

Vector Differential Calculus and multiple Integrals: Scalar and Vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities), Irrotational fields and Solenoidal fields, Double integral, Change of order of Integration and Triple integrals.

UNIT-II

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Verification of Green's theorem in a plane (without proof), verification of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

UNIT-III

First Order Ordinary Differential Equations: Exact differential equations, Equations reducible to exact equations, Linear equation, Bernoulli's equation, Clairaut's equation, Riccati's equation, Orthogonal trajectories, Rate of decay of Radio-active materials**.**

UNIT-IV

Higher Orders Linear Differential Equations: Higher order linear differential equations with constant coefficients, rules for finding Complementary function, Particular Integral and General solution. Method of variation of parameters, solution of Cauchy- Euler equation, LR and LCR circuits

UNIT-V:

Numerical Methods: Solution of Algebraic and transcendental equations by Bisection method, Regula-Falsi method Newton-Raphson method. Numerical Solutions of First Order Ordinary differential equations by Taylor's series method, Euler's method, Modified Euler's method and Runge-Kutta method of fourth order.

TEXT BOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

SUGGESTED READING:

1. N.P.Bali and Dr. Manish Goyal, "A text book of Engineering Mathematics", 9th edition, Laxmi Publications, 2017.
2. R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics", 5th edition, Narosa Publications, 2016.

22PYC05

MECHANICS AND MATERIALS SCIENCE
(Civil & Mechanical)

Instruction	3L Hours per week
Duration of SEE	3Hours
SEE	60Marks
CIE	40Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Acquire knowledge about physics of oscillations and rotational motion
2. Understand the physical properties of crystalline and magnetic materials
3. Aware of characteristic properties of dielectric materials and superconductors
4. Familiarize with coherent properties of light waves.

COURSE OUTCOMES: Completion this course, students will be able to

1. Compare the various types of oscillations
2. Demonstrate rotational motion of rigid body
3. Classify different types of crystals and their imperfections
4. Identify magnetic and dielectric materials for engineering applications
5. Make use of lasers and superconductors in technological applications

CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	1	1	1	1	2	2	1	1	2	1	2
C02	3	1	2	1	2	2	2	1	2	2	2	2
C03	2	2	1	1	1	1	1	1	1	2	1	2
C04	3	2	2	2	2	2	2	1	1	2	1	2
C05	3	2	2	2	2	1	2	2	1	2	1	2

UNIT-I

Oscillations: Simple harmonic motion–Harmonic oscillator–Damped harmonic motion–over damped, critically damped and under damped oscillators–Forced oscillations and resonance.

UNIT-II

Rigid body Dynamics: Definition of rigid body–Rotational kinematic relations–Angular momentum and torque–Equation of motion for a rotating rigid body–Inertia tensor and its properties– Euler's equations and applications: law of energy conservation and law of conservation of angular momentum.

UNIT-III

Crystallography: Space lattice –Unit cell –Crystal systems –Bravais lattices –Number of atoms per unit cell –Coordination number –Atomic radius –Packing fraction (for *sc, bcc, fcc*) –Lattice planes – Miller indices –Bragg's law –Experimental determination of lattice constant of a cubic crystal by powder X-ray diffraction method–Structure of NaCl.

Crystal Imperfections: Classification of defects–Point defects–Concentration of Schottky and Frenkel defects.

UNIT-IV

Dielectric Materials: Introduction–Dielectric polarization–Types of dielectric polarization: electronic & ionic polarizations (quantitative); orientation & space-charge polarizations (qualitative) –Frequency and temperature dependence of dielectric polarization–Determination of dielectric constant (Schering bridge method) – Ferroelectricity–Barium titanate–Applications of ferroelectrics.

Magnetic Materials: Origin of magnetism – Magnetic moment - Bohr magneton–Classification of magnetic materials: dia, para, ferro, anti-ferro and ferrimagnetic materials – Weiss molecular field theory–Domain theory– Hysteresis curve, soft and hard magnetic materials –Applications.

UNIT-V

Lasers: Characteristics of lasers – Einstein's coefficients – Amplification of light by population inversion - Ruby, He-Ne, semiconductor laser – Applications of lasers in engineering and medicine.

Fiber Optics: Introduction – Construction – Principle – Propagation of light through an optical fiber – Numerical aperture and acceptance angle – Step-index and graded-index fibers – Pulse dispersion – Fiber losses – Fiber optic communication system – Applications

Superconductors: General properties of superconductors – Meissner's effect – Type I and Type II superconductors – BCS theory (qualitative) – Applications.

TEXT BOOKS:

1. B. K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M. N. Avadhanulu and P. G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science,* Anuradha Publications, 2015.
4. S. L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

SUGGESTD READING:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P. K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

22CEC01

ENGINEERING MECHANICS

Instruction	3L+1T Periods per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to

1. Understand the resolution of forces and to obtain resultant of all force systems,
2. Understand equilibrium conditions of static loads for smooth and frictional surface
3. Analyse simple trusses for forces in various members of a truss
4. Obtain centroid, centre of gravity for various regular and composite areas and bodies
5. Obtain Moment of inertia for various regular and composite areas and bodies and also to obtain Mass moments of inertia of elementary bodies

COURSE OUTCOMES: Completion this course, students will be able to

1. Calculate the components and resultant of coplanar forces system and Draw free body diagrams to analyze the forces in the given structure
2. Understand the mechanism of friction and can solve friction problems
3. Analyse simple trusses for forces in various members of a truss.
4. Determine the centroid of plane areas, composite areas and centres of gravity of bodies.
5. Determine moments of inertia, product of inertia of plane and composite areas and mass moments of inertia of elementary bodies,

CO-PO Articulation Matrix:

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-

UNIT – I

Resolution and Resultant of Force System: Basic concepts of a force system. Components of forces in a plane. Resultant of coplanar concurrent force system. Moment of a force, couple and their applications. Resultant of coplanar non-concurrent force system

Equilibrium of force system: Free body diagrams, equations of equilibrium of planar force systems and its applications. Problems on general case of coplanar force systems.

UNIT – II

Theory of friction: Introduction, types of friction, laws of friction, application of friction to a single body & connecting systems. Wedge and belt friction

UNIT – III

Analysis of Simple Trusses: Introduction to trusses, Assumptions, analysis of simple trusses using method of joints and method of sections.

UNIT– IV

Centroid: Significance of centroid, moment of area, centroid of line elements, plane areas, composite areas, theorems of Pappus & its applications. Center of gravity of elementary and composite bodies

UNIT – V

Moment of Inertia: Definition of MI, Area MI. Polar Moment of Inertia, radius of gyration, transfer theorem, Moment of Inertia of elementary & composite areas, and Product of inertia. Mass moments of inertia of elementary bodies.

TEXT BOOKS:

1. K. Vijay Kumar Reddy and J. Suresh Kumar, Singer's Engineering Mechanics, BS Publications, Hyderabad, 2011.
2. Ferdinand L Singer, Engineering Mechanics, Harper and Collins, Singapore, 1904.

SUGGESTED READING:

1. A. Nelson, Engineering Mechanics, Tata McGraw Hill, New Delhi, 2010.
2. S. Rajashekaran & G. Sankarasubramanyam, Engineering Mechanics, Vikas publications, Hyderabad, 2002.
3. S.B. Junarkar and H.J Shah, Applied Mechanics**,** Charotar publishers, New Delhi, 2001.
4. Basudeb Bhattacharyya, Engineering Mechanics, Oxford University Press, New Delhi, 2008.
5. A K Tayal, Engineering Mechanics, Umesh Publications, New Delhi, 2010

22EGC01

ENGLISH
(Common to All Branches)

Instruction	2L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

COURSE OBJECTIVES: This course aims to
1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

COURSE OUTCOMES: Completion this course, students will be able to
1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

CO-PO-PSO Articulation Matrix

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	1	1	1	1	1	1	2	3	3	2	3
CO 2	1	1	1	1	-	1	1	1	2	2	1	2
CO 3	-	2	1	1	-	2	1	1	2	2	1	2
CO 4	1	2	1	2	1	2	2	1	2	2	1	2
CO 5	1	2	1	2	1	1	1	1	1	2	1	2

UNIT-I
Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II
Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III
Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement. Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV

Developing Writing Skills III:

Report writing – Importance, structure, elements of style of formal reports; Writing a formal report.

Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V

Developing Reading Skills:

The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.

Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

TEXT BOOKS:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan,2017.
2. Swan Michael, Practical English Usage.OUP.1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press,2011.

22PYC08

MECHANICS AND MATERIALS SCIENCE LABORATORY
(Civil & Mechanical)

Instruction	3P Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Apply the concepts of physics while doing experiments
2. Learn the working of lasers and optical fibers
3. Understand the properties of magnetic and dielectric materials
4. Capable of measuring mechanical properties of solids and liquids
5. Understand the motion of electrons in electric and magnetic fields

COURSE OUTCOMES: Completion this course, students will be able to

1. Estimate the error in an experimental measurement
2. Make use of lasers and optical fibers in engineering applications
3. Recall the physical properties of dielectrics and magnetic materials
4. Find the mechanical properties of solids and viscosity of liquids
5. Demonstrate the motion of electrons in electric and magnetic fields

CO-PO Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	2	3	1	3	1	3	3	2	1	2
C02	3	2	1	2	2	2	1	2	2	1	1	3
C03	3	2	3	2	3	1	2	2	3	2	1	2
C04	3	3	2	2	2	1	2	3	2	1	1	3
C05	3	1	2	3	2	1	1	2	2	2	1	2

Experiments

1. Error Analysis : Estimation of errors in the determination of time period of a torsional pendulum
2. Flywheel : Determination of moment of inertia of given flywheel
3. Compound Pendulum : Determination of acceleration due to gravity
4. Young's Modulus : Determination of Young's modulus of the given steel bar/wooden scale by non-uniform bending method
5. Helmholtz's Resonator : Determination of resonating volume of air and neck correction
6. Melde's Experiment - : Determination of frequency of the electrically maintained vibrating bar/fork
7. Viscosity of Liquid : Determination of viscosity of a given liquid by oscillating disc method
8. Coupled Oscillator : To determine the coupling constant of a coupled oscillator performing parallel and antiparallel oscillation
9. Dielectric Constant : Determination of dielectric constant of given PZT sample

10.	M & H Values	:	Determination of magnetic moment M of a bar magnet and absolute value H of horizontal component of earth's magnetic field
11.	B-H Curve	:	Determination of hysteresis loss of given specimen
12.	Thermoelectric Power	:	Determination of thermoelectric power of given sample
13.	Laser	:	Determination of wavelength of given semiconductor laser
14.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
15.	e/m of an electron	:	Determination of specific charge of an electron by J.J. Thomson method

NOTE: A minimum of TWELVE experiments should be done.

22EGC02

ENGLISH LAB
(Common to All Branches)

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To listen to listening comprehension material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

COURSE OUTCOMES: Completion this course, students will be able to

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

CO-PO-PSO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	-	-	-	-	-	-	-	-	1	1	-	1
CO 2	-	-	-	-	-	1	-	1	2	2	1	2
CO 3	-	-	-	-	-	1	1	1	2	1	1	2
CO 4	1	-	-	-	-	1	2	2	2	3	1	3
CO 5	1	1	1	1	1	2	2	2	3	3	2	3

EXERCISES

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to International Phonetic Alphabet, classification and description of English phonemic sounds, minimal pairs. The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm & Intonation:** Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with Software available in (K-van solutions)
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and representation.

SUGGESTED READING

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan,2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India,2005.
3. PriyadarshiPatnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd2011
4. ArunaKoneru, Professional Speaking Skills, Oxford University Press,2016

22MEC01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2.5

COURSE OBJECTIVES: This course aims to

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

CO-PO-PSO Correlation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	2	-	1	2	3	1	3
CO2	3	2	2	1	2	2	-	1	2	2	1	2
CO3	3	3	2	1	2	2	-	1	2	2	1	2
CO4	3	3	3	2	2	2	-	1	2	2	1	2
CO5	3	2	2	1	2	2	-	1	2	2	1	2

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice-versa.

TEXT BOOKS:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt.Ltd,2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

SUGGESTED READING:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

22MEC38

DIGITAL FABRICATION LAB

Instruction	3P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization positive &team work attitude to get things right the first time.
3. Provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting manufacturing, metrology, and allied skills.
5. Advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

COURSE OUTCOMES: Completion this course, students will be able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in carpentry, house wiring and plumbing.
3. Make a given model by using workshop trades like carpentry, plumbing, House wiring and 3d modeling using solid works software for Additive Manufacturing.
4. Perform pre-processing operations on STL files for 3D printing, also understand reverse engineering process.
5. Conceptualize and produce simple device/mechanism of their choice.

CO-PO-PSO Correlation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	1
CO2	1	-	-	-	1	-	-	-	-	-	-	2
CO3	2	1	1	1	3	-	1	-	-	-	-	2
CO4	2	2	2	1	3	-	-	-	-	-	-	2
CO5	3	2	1	-	3	-	-	-	-	-	-	2

List of exercises:

Group-1

1. To make a lap joint on the given wooden piece according to the given dimensions.
2. To make a dove tail-joint on the given wooden piece according to the given dimensions.
3.
    a. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch
    b. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
4. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- way switches.
5. To make external threads for GI pipes using die and connect the GI pipes as per the given diagram using taps, couplings & bends.
6.
    a. A. To connect the GI pipes as per the given diagram using, couplings, unions, reducer & bends.
    b. To connect the GI pipes as per the given diagram using shower, tap & valves and Demonstrate by giving water connection

Group- 2

1. To Study the method of Additive Manufacturing process using a 3D printer
2. To create a 3D CAD model of a door bracket using a modeling software
3. To Print a door bracket using an extruder type 3D Printer.
4. To create a 3D CAD model by reverse Engineering
5. To Design an innovative component using the CAD software
6. To Print the selected innovative component by the students using a 3D printer

TEXT BOOKS:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Elements of Workshop Technology, Vol. I, 2008 and Vol. II, Media promoters and publishers private limited, Mumbai, 2010.
2. Kalpakjian S. And Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
3. Sachidanand Jha, 3D PRINTING PROJECTS: 200 3D Practice Drawings For 3D Printing On Your 3D Printer, June 7, 2019.

SUGGESTED READING:

1. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
2. Oliver Bothmann , 3D Printers: A Beginner's Guide , January 1, 2015

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(Inline with AICTE Model Curriculum with effect from AY 2023-24)

BE (Civil Engineering)

SEMESTER – III:

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
	THEORY								
1	22MTC10	Partial Differential Equations and Statistics	3	1	-	3	40	60	4
2	22CE C03	Surveying-I	3	-	-	3	40	60	3
3	22CE C04	Solid Mechanics	3	-	-	3	40	60	3
4	22CE C05	Fluid Mechanics	3	-	-	3	40	60	3
5	22CE C06	Building Construction Practices	2	-	-	3	40	60	2
6	22EEM01	Universal Human Values – II Understanding Harmony	-	1	-	2	50	-	1
7	22CE C07	Computer Aided Drafting Lab	-	-	2	3	50	50	1
8	22CE C08	Fluid Mechanics Lab	-	-	2	3	50	50	1
9	22EG M01	Indian Constitution & Fundamental Principles	2	-	-	2	-	50	NC
	22CE I01	MOOCs/Training/ Internship	2-3 weeks/ 90 hours						2
Clock hours per week: 23									

L: Lecture **T: Tutorial** **P: Practical/Drawing/Seminar/Project**
CIE: Continuous Internal Evaluation **SEE: Semester End Examination**

22MTC10

PARTIAL DIFFERENTIAL EQUATIONS AND STATISTICS

(CIVIL)

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to

1. To explain the expansion of functions in sine and cosine series.
2. To form PDE and to find its solution.
3. To know the model of wave and heat equations.
4. Able to analyze random phenomena using basic probability.
5. To learn fitting of distribution and predicting the future values.

COURSE OUTCOMES: Completion this course, students will be able to

1. Calculate the Euler's coefficients for Fourier series expansion of a function.
2. Solve Linear and Nonlinear PDEs.
3. Solve One-Dimension Wave and Heat equations and Two Dimensional Laplace equations.
4. Use the basic probability for fitting the Random phenomenon.
5. Analyze the random fluctuations of probability distribution and Principles of Least Squares approximations for the given data.

CO-PO Articulation Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	1	1	1	-
CO2	2	2	2	2	-	-	-	-	-	-	-	1	1	1	-
CO3	2	2	2	2	-	-	-	-	-	-	-	1	-	1	-
CO4	2	2	2	1	-	-	-	-	-	-	-	1	1	1	1
CO5	2	2	2	1	-	-	-	-	-	-	-	1	1	1	1

UNIT-I

Fourier series : Periodic functions, Euler's formulae, Conditions for a Fourier series expansion, Fourier series of Functions having points of discontinuity, Change of interval, even and odd functions, Half range Sine & Cosine Series.

UNIT-II

Partial Differential Equations: Formation of Partial Differential Equations, Linear Equations of First Order (Lagrange's Linear Equations), Solution of First Order Nonlinear Partial Differential Equations (Standard forms) and Charpits Method.

UNIT-III

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

UNIT-IV

Basic probability: Basic probability, Conditional probability, Baye's theorem. Random variable, Discrete probability distribution and Continuous probability distribution. Expectation, Addition and Multiplication theorem of expectation, properties of variance, Moments (Moments about the mean and moments about a point)

UNIT-V

Probability Distributions and Curve Fitting: Poisson distribution, MGF and Cumulants of the Poisson distribution, Normal distribution, Characteristics of Normal distribution, MGF and CGF of Normal distribution, Areas under normal curve. Correlation, Coefficient of Correlation and Lines of Regression. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola and exponential curves.

TEXT BOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
2. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

SUGGESTED READING:

1. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. S. J. Farlow, "Partial Differential Equations for Scientists and Engineers", Dover Publications, 1993.
3. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

22CE C03

SURVEYING I

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To understand basic concepts of surveying and use of chains for developing the map of a given area
2. To perform levelling operations and developing contour maps
3. To know the concepts and use of Tacheometry technique in surveying
4. To give exposure to the latest instruments like Total Station and GPS for solving the surveying problems
5. To understand the importance of trigonometric levelling and applying the same for finding the elevations of objects by various methods.

COURSE OUTCOMES: Completion this course, students will be able to

1. Select basic surveying instruments such as chains, tapes etc., to measure areas.
2. Apply the principles of levelling and prepare contour maps to estimate volumes of earthwork using Simpsons and/or trapezoidal rules.
3. Apply the principles of tacheometry on the field.
4. Operate modern instruments like Total Station and GPS in the field
5. Make use of principles of trigonometric levelling for measuring elevations of required objects

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	1	-	-	-	-	-	-	2	3	1
CO2	2	3	-	-	-	1	-	-	-	-	-	-	2	3	1
CO3	2	3	-	-	-	1	-	-	-	-	-	-	2	3	1
CO4	2	3	-	-	-	1	-	-	-	-	-	-	2	3	1
CO5	2	3	-	-	-	1	-	-	-	-	-	-	2	3	1

UNIT- I: Introduction and Basic Principles of Surveying

Concepts of surveying, principles of surveying, various classifications of surveying. Chain survey- Concepts of survey lines, offsets. Errors in chain survey. Measurement of area - Simpson's method, average ordinate, mid ordinate and trapezoidal rules. Basics of compass survey and plane table survey- accessories and methods.

UNIT – II: Levelling and Contours

Definition of levelling, terms used in levelling. Instruments of levelling, methods of booking levels, Height of Instrument and Rise and Fall methods. Concepts of balancing levels. Types of levelling, reciprocal levelling, profile levelling, precise levelling. Correction to refraction, errors in levelling. Definition of contours- Characteristics of contours, contour interval, methods of contouring-direct and indirect. Development and use of contour maps.

UNIT – III: Tacheometry

Tacheometry - Theory and use of stadia wires in levelling instruments and theodolite. Fixed hair tacheometers, and concepts and use of Tangential tacheometry. Concepts of Reduction Diagrams, tacheometric, tables, Principle and use of substance bar and concepts of Beaman's stadia arc.

UNIT – IV: Modern Surveying Instruments Total Station and GPS

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Total station-Parts of a Total Station – Accessories, Advantages and Applications, Field Procedure for total station survey, traversing by Total Station, Errors in Total Station Survey. Concepts of consecutive coordinates- Closing error adjustment and accuracy of a traverse – Gale's traverse table. Advantages of plotting traverse by co-ordinates, solutions to omitted measurements in traverse .Global Positioning: Systems- Segments, GPS measurements, errors and biases, surveying with GPS, co-ordinate transformation, accuracy considerations.

UNIT – V: Trigonometric Levelling

Trigonometrical levelling – Calculation of elevations and distances of accessible and inaccessible objects, numerical problems. Geodetic observations-refraction and curvature. Corrections, axis signal correction, determination of difference in elevation by single and reciprocal observations, numerical problems.

TEXT BOOKS:

1. C. Venkataramaiah, "A Textbook of Surveying", Universities Press, Hyd, 2011.
2. R. Subramanian,''*Surveying and Levelling*", Oxford Higher Education, 2012.
3. B.C. Punmia & Ashok Jain, "Surveying", Vol II, 12th edition, Laxmi Publication, 2010.

Suggested Reading

1. AM. Chandra, "Plane Surveying", New Age International", 2007.
2. Arora, K.R," Surveying Vol II & III", Standard Book House & SBH Publishers & Distributors,1705, A Nai Sarak, New Delhi - 110 006, 12th edition, 2013.
3. S. K. Duggal, "Surveying", Tata McGraw-Hill Education Private Ltd, New Delhi India, 2013.

22CE C04

SOLID MECHANICS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Understand the stress - strain behavior of different materials and temperature stresses, in compression and tension.
2. Analyze the statically determinate beams and sketch shear force and bending moment diagrams.
3. Understand the bending and shear stresses across various cross sections of beams.
4. Comprehend compound stresses, direct and bending stresses.
5. Analyze thin and thick cylinders for fluid pressures.

COURSE OUTCOMES: Completion this course, students will be able to

1. Evaluate the strength of various materials, against structural actions such as compression, tension.
2. Analyze statically determinate beams and sketch SFD and BMD.
3. Draw variation of shear and bending stresses.
4. Evaluate direct and bending stresses, compound stresses.
5. Design thin and thick cylinders for resisting internal and external pressures.

CO-PO Articulation Matrix:

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO2	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO3	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO4	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO5	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1

UNIT- I:

Simple Stresses and Strains: Various types of stresses and strains. Hooke's law, Modulus of Elasticity, Stress-Strain curve for ductile & brittle materials, Working stress and factor of safety. Deformation of bars of uniform, varying and tapering sections under axial loads, Elongation of bars due to self-weight, Compound bars and temperature stresses.

Elastic Constants: Poisson's ratio, volumetric strain and derivation of relationship between elastic constants.

UNIT- II:

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

UNIT- III:

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

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

UNIT- IV:

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

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

UNIT- V:

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

Thick cylinders: Lame's equations, stresses under internal and external fluid pressures.

TEXT BOOKS:

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

22CE C05

FLUID MECHANICS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To understand fluid properties, fluid pressure and forces, basic concepts and continuity equation
2. To understand the fluid motion, energy equation, analyze the forces on various objects.
3. To know various measuring instruments in finding the fluid pressure, velocity, and discharge.
4. To understand and analyze different flow characteristics of laminar and turbulent flows
5. To understand water hammer effect in pipes and to understand dimensional analysis and models studies.

COURSE OUTCOMES: Completion this course, students will be able to

1. Evaluate the various properties of fluid, analyse fluid flow and forces.
2. Apply the various laws and principles governing fluid flow to practical problems.
3. Measure pressure, velocity and discharge of fluid flow in pipes, channels, and tanks.
4. Apply laws related to laminar and turbulent flow in pipes.
5. Evaluate water hammer effect in pipes and to apply dimensional and model laws to fluid flow applications.

CO-PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO2	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO3	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO4	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1
CO5	2	3	-	-	-	-	-	-	-	-	-	-	2	3	1

UNIT-I

Fluid Properties: Definition of fluid, Properties of fluids- Density, Specific Weight, Specific Volume, Specific Gravity, Bulk Modulus, Vapour Pressure, Viscosity, Capillarity and Surface tension, Newton's law of Viscosity.

Fluid Statics: Pascal's Law, Hydrostatic Law, Absolute and gauge pressure. Forces on immersed bodies: Total pressure, centre of pressure, pressure on curved surface.

Buoyancy: Buoyancy, Metacentre, stability of submerged and floating bodies**.**

Fluid Kinematics: Classification of fluid flow- steady unsteady, uniform, non-uniform-, one-, two- and three-dimensional flows. Concept of streamline, stream tube, path line and streak line.

Law of mass conservation – continuity equation from control volume and system analysis. Rotational and Irrotational flows, Stream function, Velocity potential function, flow net.

UNIT-II

Fluid Dynamics: Convective and local acceleration, body forces and surface forces, Euler's equation of motion from control volume and system analysis.

Law of Energy Conservation: Bernoulli's equation from integration of the Euler's equation. Signification of the Bernoulli's equation, its limitations, modifications and application to real fluid flows.

Impulse Momentum Equation: Momentum and energy Correction factor. Application of the impulse momentum equation to evaluate forces on nozzles and bends. Pressure on curved surface- vortex flow- forced and free vortex.

UNIT-III

Measurement of Pressure: Piezometer and Manometers - Bourdon Gauge.

Measurement of Velocity: Pitot tube and Current meter.

Measurement of Discharge in pipes and tanks: Venturi-meter, Orifice-meter, nozzle meter, elbow meter and rotameter. Flow through mouthpiece and orifice.

Measure of Discharge in Free surface flows: Notches and weirs.

UNIT-IV

Flow through Pressure Conduits: Reynold's Experiment and its significance. Upper and Lower Critical Reynold's numbers, Critical velocity. Hydraulic gradient. Laminar flow through circular pipes. Hagen Poiseuille equation. Turbulent flow characteristics. Head loss through pipes. Darcy-Weisbach equation. Friction factor. Moody's diagram. Minor loss, Pipes in Series and Pipes in parallel.

UNIT-V

Unsteady Flow in Pipes: Water hammer phenomenon, pressure rise due to gradual and sudden valve closure, critical period of the pipeline, power transmission through pipes.

Dimensional Analysis and Models Studies: Dimensional analysis - Rayleigh Method, Buckingham method, geometric, kinematic and dynamic similarity, similarity laws, significance of Reynolds and Froude model law, different types of models and their scale ratios, distorted and undistorted models, scale effect in models.

TEXT BOOKS:

1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics Including Hydraulic Machines, Standard Book House, Delhi, 22nd Edition, 2019.
2. A.K. Jain, Fluid Mechanics including Hydraulic Machines By A.K. Jain Khanna Publishers, Delhi, First Reprint, 2016.

Suggested Books:

1. K.L. Kumar, Engineering Fluid Mechanics, Eurasia Publishing House, 2008.
2. R.K. Rajput, Fluid Mechanics and Hydraulic Machines, S. Chand and Company, 2017.

22CE C06

BUILDING CONSTRUCTION PRACTICES

Instruction	2L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

COURSE OBJECTIVES: This course aims to

1. To study about traditional building materials.
2. To study about new/composite building materials.
3. To understand the concepts of building planning and various practices adopted
4. To understand different types of roofs, doors, windows and stairs.
5. To understand different types of masonry adopted in construction sites.

COURSE OUTCOMES: Completion this course, students will be able to

1. Study about traditional building materials.
2. Study about new/composite building materials.
3. Understand the concepts of building planning and various practices adopted.
4. Understand different types of roofs, doors, windows and stairs.
5. Understand different types of masonry adopted in construction sites.

CO-PO Articulation Matrix:

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3				1							1	2	3
CO2	2	3				1							1	2	3
CO3	2	3				1							1	2	3
CO4	2	3				1							1	2	3
CO5	2	3				1							1	2	3

UNIT- I

Traditional Building Materials: Cement, Sand, Coarse Aggregates, Mortar, Concrete, Steel.

UNIT- II

Introduction to new materials/composites: Plastics, Tiles, AAC Blocks, CLC Blocks
Emerging Building Materials: Smart and Eco-Friendly materials - Sustainable materials - Recycled materials.

UNIT- III

Concepts of Building Planning: Types of Buildings as per National Building Code, Functional needs and difference in their planning requirements – Principles of Planning - Building Byelaws – Planning of a building with byelaws.

UNIT- IV

Plumbing services – HVAC services – Formwork & Shuttering – Plastering & Pointing - Types of roofs, doors, windows and staircases – Representation of Building materials and Plumbing services.

UNIT- V

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

TEXT BOOKS:

1. S.P. Arora & S. P. Bindra, "*A text book of Building Construction*", Dhanpat Rai Publications, 2010.
2. B.C Punmia, Ashok Kumar Jain &Arun Kumar Jain "*Building Construction*", Laxmi Publications (P) LTD, 2016.
3. A.M Neville., "Properties of Concrete", Pearson Education. 2012.
4. M.S. Shetty, and A. K. Jain, "Concrete Technology: Theory and Practice", S. Chand & Company, 2018.
5. R. Santhakumar, "Concrete Technology", Oxford University, Press 2018.

SUGGESTED READING:

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

22EEM01

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY

(**B.E/B. Tech** - Common to all Branches)

Instruction	1Tutorial Hour per Week
CIE	50Marks
Credits	1

Introduction:

This course discusses the role of human values in one's family, in society and in nature. During the Induction Program, students would get an initial exposure to human values through Universal Human Values–I. This exposure is to be augmented by this compulsory full semester foundation course.

COURSE OBJECTIVES: This course aims to

1. Understand the concept of universal human values
2. Cultivate empathy and respect for diversity
3. Inspire the social responsibility and global citizenship

COURSE OUTCOMES: Completion this course, students will be able to

1. Become familiar about themselves, and their surroundings (family, society, nature).
2. Develop empathy and respect for diversity by gaining an appreciation for different cultures, perspectives, and identities
3. Exhibit responsible and ethical behavior by adhering to principles of integrity, honesty, compassion, and justice.
4. Recognize their role as global citizens.
5. Exhibit a sense of social responsibility.

Module -1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and
- Experiential Validation- as the process for self-exploration.
- Natural acceptance of human values.
- Definitiveness of Ethical Human Conduct.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario.
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Module- 2: Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module-3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
- Understanding the meaning of Trust; Difference between intention and competence.
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
- Understanding the harmony in society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive Human Goals.
- Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists, and managers.
b. At the level of society: as mutually enriching institutions and organizations.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss scenarios. Elicit examples from students' lives.

Module -4: Understanding Harmony in Nature and Existence - Whole existence as Coexistence.

- Understanding the harmony in Nature.
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all - pervasive space.
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
- Holistic perception of harmony at all levels of existence.
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. To discuss the conduct as an engineer or scientist etc.

Mode of Conduct (L-T-P-C 0-1-0-0)

- While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
- In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection, and self- exploration.
- Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentors, in a group sitting.
- **Tutorials (experiments or practical) are important for this course**. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included.
- The practice sessions would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to the development of commitment, namely behaving and working based on basic human values.
- **It is advised to share the experience of the Faculty to the class in a capsule form.**
- **Involve more in evaluating the student by different activities with proper RUBRCCS**

Assessment:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.

Example:

Module-1:	10 M
Module -2:	10 M
Module- 3:	10 M
Module-4:	10 M
Attendance & Attitude:	10 M

The overall pass percentage is 50%. In case the student fails, he/she must repeat the course.

TEXTBOOKS

1. "A Foundation Course in Human Values and Professional Ethics" by R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2022.
2. "Teacher's Manual for A Foundation Course in Human Values and Professional Ethics" by R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2022.

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth – by Mohandas Karamchand Gandhi

CO-PO Articulation Matrix:

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	-	-	1	-	-	1	-	-	1	1	1	-
CO 2	-	-	1	-	-	1	1	-	1	-	1	1	-	1	-
CO 3	--	-	-	-	-	1	-	-	-	1	-	-	-	1	-
CO 4	-	-	-	-	-	1	1	1	-	-	-	-	1	1	1
CO 5	-	-	-	-	-	1	1	1	-	-	-	-	1	1	1

22CE C07

Computer Aided Drafting Lab

Instruction	2P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OUTCOMES: Completion this course, students will be able to

1. Create basic 2D geometry shapes.
2. Draft elevation and sections of doors and windows.
3. Develop plan, section and elevations of buildings.
4. Draft plan and section of a staircase.
5. Draft RCC detailing of beams and footings.

COURSE OUTCOMES: Completion this course, students will be able to

1. Create basic 2D geometry shapes.
2. Draft elevation and sections of doors and windows.
3. Develop plan, section and elevations of buildings.
4. Draft plan and section of a staircase.
5. Draft RCC detailing of beams and footings.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	3	-	-	2	3	2	-	-	1	-	3
CO2	-	-	-	-	3	-	-	2	3	2	-	-	1	-	3
CO3	-	-	-	-	3	-	-	2	3	2	-	-	1	-	3
CO4	-	-	-	-	3	-	-	2	3	2	-	-	1	-	3
CO5	-	-	-	-	3	-	-	2	3	2	-	-	1	-	3

Introduction to Computer Aided Drafting - features and environment, initial settings. Coordinates - absolute, relative cartesian and polar coordinates. Snap, object snap, grid, ortho and polar modes. Draw tools and editing tools. Zoom and pan. Creating and managing – text and Dimensions. Managing object properties and hatching. Creating and inserting blocks, working in view ports and Layers.

LIST OF EXPERIMENTS:

1. Creating basic 2D geometry shapes.
2. Drafting elevation and sections of windows
3. Drafting elevation and sections of doors.
4. Developing plan, section and elevation of a single room house.
5. Developing plan, section and elevation of a single bedroom house.
6. Drafting the plan and section of a staircase (without reinforcement).
7. Detailing of RCC beam and footing.
8. Interpretation of Civil Engineering Drawings.
9. Guest lecture on – digitization of Industrial legacy drawings.

TEXT BOOKS:

1. S.P Arora and S.P Bindra, ‘A text book of Building Construction’, Dhanpat Rai & sons, 2010.
2. George Omura, Brian C. Benton, ‘Mastering AutoCAD 2019 and AutoCAD LT 2019’, Wiley, 2018.

SUGGESTED READING:

1. K.Veenugopal, ‘Engineering Drawing and Graphics + Autocad’, New Age International Pvt.Ltd, 2010.
2. Balagopal A and Prabhu T. S, ‘Building Drawing and Detailing’, Spades publishers, Calicut, 1987.

22CE C08

FLUID MECHANICS LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to

1. To understand the governing parameters for the discharge measurement for flows through various measuring devices.
2. To determine the Reynold's number to understand laminar and turbulent flow.
3. To understand Bernoulli's principle through experiment.
4. To determine Hydrostatic forces on flat and curved surfaces by conducting experiments.
5. To understand stability of floating bodies by conducting experiments.
6. To understand the viscosity of different fluid.

COURSE OUTCOMES: Completion this course, students will be able to

1. Compute the co-efficient of discharge for flows through various flow measuring devices.
2. Differentiate between laminar and turbulent flows in Reynold's experiment and identify the governing parameters for both.
3. Apply the Bernoulli's energy principle in real field cases.
4. Apply the concept of hydrostatic forces on flat and curved surfaces.
5. Compute the centre of buoyancy, stability and metacentre of floating body.
6. Differentiate between viscous and non-viscous flows and identify the governing parameters for both.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO2	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO3	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO4	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO5	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO6	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1

LIST OF EXPERIMENTS

1. Determination of Cd, Cv, and Cc for circular Orifice (constant Head method).
2. Determination of Cd for mouthpiece (Falling Head method).
3. Determination of Cd for V notch.
4. Determination of minor losses and major loss in pipes.
5. Determination of Cd for venturi meter and orifice meter.
6. Determination of types of flow using Reynold's apparatus.
7. Verification of Bernoulli's principle.
8. Measurement of viscosity.
9. Stability of Floating Body.
10. Hydrostatics Force on Flat Surfaces/Curved Surfaces.

TEXT BOOKS:

1. M.N. Shesha Prakash, "Experiments in Hydraulics and Hydraulic Machines – Theory and Procedures", PHI Learning Private Limited, 2011.
2. R.V.Raikar, "Laboratory Manual Hydraulics and Hydraulic Machines-PHI Learning Private Limited, 2012.

22EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

(BE/B.Tech - Common to all branches)

Instruction	2L Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
IE	-
Credits	No Credits

Prerequisite: Knowledge of social studies.

COURSE OBJECTIVES: This course aims to

1. Understand the history of framing of the Indian Constitution.
2. Awareness on Fundamental Rights, Duties and Directive Principles of State Policy.
3. Explore the organization of Union Government, and functions of President and Prime Minister.
4. Gain an insight into the inter-functionality of Union Legislature and Judiciary
5. Educate on the local governance and problems in development of rural and urban areas.

COURSE OUTCOMES: Completion this course, students will be able to

1. Understand the history of framing of the Indian Constitution and its features.
2. Assess the realization of Fundamental Rights and Directive Principles of State Policy.
3. Analyze the challenges to federal system and position of the President and the Prime Minister in the Union Government.
4. Underline the role of the Legislature and the Judiciary in Union Government and their mutual relations.
5. Evolve the development of the local governments in India and assess the role of Collector in district administration.

CO-PO-PSO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	-	-	1	1	1	1	-	-	-	1	-	1
CO 2	-	-	2	-	-	3	2	2	1	-	-	-	2	1	2
CO 3	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-
CO 4	-	-	1	-	-	1	1	-	-	-	-	-	2	-	2
CO 5	-	-	2	-	-	3	2	1	1	-	-	-	2	1	2

UNIT-I

Constitutional History and Framing of Indian Constitution

East India Company rule (1757-1857): Social, Economic, Political and Administrative impact of Company rule in India. British Rule (1858-1947): Indian National Movement, Government of India Acts 1909, 1919 and 1935, and Indian Independence Act 1947. Framing of the Indian Constitution: Constituent Assembly, Preamble and Salient Features.

UNIT-II

Fundamental Rights, Duties and Directive Principles of State Policy

The Fundamental Rights**:** Features and significance of Rights. Fundamental Duties: Importance and the legal status of Duties. Directive Principles of State Policy: Socialist, Gandhian and Liberal-intellectual principles, importance and relevance.

UNIT-III

Union Government and its Administration

Federalism: Division of legislative and financial powers between the Union and the State. Union Executive: Role and position of President, Prime Minister and Council of Ministers. Emergency Provisions: National Emergency, Constitutional Emergency and Financial Emergency.

UNIT-IV

Union Legislature and Judiciary

Union Legislature: Parliament of India-Composition and functions of Parliament, and Parliamentary Committees. Union Judiciary: Supreme Court of India-Composition and Functions.

UNIT-V

Local Self Governments

Rural Local Governments: Zilla Parishad- CEO and functions of Zilla Parishad, Mandal Parishad- Role of Elected and Officials, Gram Panchayat- Sarpanch, Secretary and Gram Sabha. Urban Local Governments: Structure and functions of Municipalities and Municipal Corporations. District Collector: Powers and functions of Collector.

TEXT BOOKS

1. **Indian Government & Politics**, Ed Prof V Ravindra Sastry, Telugu Akademy, 2nd edition, 2018.
2. **Indian Constitution at Work,** NCERT, First edition 2006, Reprinted in 2022.

SUGGESTED READING

1. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st Edition, 2015.
3. Granville Austin, The Indian Constitution: the Cornerstone of a Nation, OUP, 2nd Edition 1999
4. M.V. Pylee, India's Constitution, S. Chand Publishing, 16th Edition, 2017
5. Rajeev Bhargava (ed), Politics and Ethics of the Indian Constitution, OUP, 2008

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(Inline with AICTE Model Curriculum with effect from AY 2023-24)

BE (Civil Engineering)

SEMESTER – IV:

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
	THEORY								
1	22CE C09	Hydraulic Engineering	3	-	-	3	40	60	3
2	22CE C10	Surveying II	3	-	-	3	40	60	3
3	22CE C11	Structural Analysis I	3	-	-	3	40	60	3
4	22CE C12	Reinforced Concrete Design - I	3	-	-	3	40	60	3
5	22CE C13	Concrete Technology	3	-	-	3	40	60	2
6	-	PE-1	3	-	-	3	40	60	3
7	22CE C14	Hydraulic Engineering Lab	-	-	3	3	50	50	1.5
8	22CE C15	Surveying & Geomatics Lab	-	-	3	3	50	50	1.5
9	22CE C16	Solid Mechanics Lab	-	-	3	3	50	50	1.5
Total			**18**	**-**	**9**	**-**	**340**	**510**	**21.5**
Clock hours per week: 26									

L: Lecture **T: Tutorial** **P: Practical/Drawing/Seminar/Project**
CIE: Continuous Internal Evaluation **SEE: Semester End Examination**

Professional Elective-1 (PE-1)

Subject code	Subject Name
22CE E01	Green Building Technologies
22CE E02	Principles of Geographical Information Systems
22CE E03	Ground Water Engineering

22CE C09

HYDRAULIC ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Understand and analyze the open channel flows, steady uniform flow and computation of friction and energy losses.
2. Understand and analyze the non-uniform flows and flow profile, energy dissipation
3. Exposure to the basic principles of aerodynamic forces, boundary layer formation and effects.
4. Understand the turbines; design the impulse turbine and its performance.
5. Familiarize with reaction turbines and its design, understand performance of reaction turbines and centrifugal pump

COURSE OUTCOMES: Completion this course, students will be able to

1. Apply the concepts of open channel flow and design the efficient channel cross section.
2. Apply the concepts of non-uniform open channel flow to the field problems.
3. Interpret the basics of computation of drag and lift forces in the field of aerodynamics, boundary layer effect.
4. Design the impulse turbines, run the turbines under efficient conditions.
5. Design the reaction turbines, draw characteristic curves of turbines and centrifugal pump

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**1**
CO2	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**1**
CO3	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**1**
CO4	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**1**
CO5	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**1**

UNIT–I

Uniform Flow Through Open Channels: Introduction, Difference in pipe flow and open channel flow, classification of flow in channels, velocity and pressure distributions in channel cross-sections, energy and momentum correction coefficients, discharge through open channel by Chezy's and Manning's formula, most economical section of channels-rectangular, trapezoidal, circular and triangular channel sections, concept of critical depth and its computations, Significance of Froude number, specific energy and specific force.

UNIT–II

Non-Uniform Flow through Open Channels:

Gradually Varied Flow: Dynamic equation of gradually varied flow, classification of channel bottom slopes and water surface profiles, back water curve and afflux, expression for length of back water curve-Direct step method.

Rapidly Varied flow: Hydraulic jump, conjugate depths, Expression for depth and length of hydraulic jump, loss of energy, introduction to surges.

UNIT–III

Boundary Layer Theory: Introduction, development of Boundary layer on the thin flat plate, laminar and turbulent boundary layers, laminar sub layer, boundary layer thickness- displacement thickness, momentum thickness and energy thickness, hydro-dynamically smooth and rough boundaries. Effect of pressure gradient on boundary layer separation, location of separation point, methods of preventing the separation of boundary layer.

Drag and Lift: Fundamental concepts of drag and lift forces, co-efficient of drag and lift, principles of streamlinng, Magnus effect.

UNIT-IV

Impact of Jets: force exerted by the jet of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-angular momentum principle and torque.

Hydraulic Turbines-I: Introduction, classification, head and efficiencies, unit quantities, specific speed, power developed by turbine, principles and design of impulse turbine- Pelton wheel turbine, velocity triangles, characteristic curves.

UNIT-V

Hydraulic Turbines-II: Reaction turbine - main components and working, work done and efficiencies, Design of Francis turbine and Kaplan turbine, unit quantities, specific speed, characteristic curves, draft tube theory, cavitation: causes, effects.

Centrifugal Pumps: Components, work done and efficiency, minimum starting speed, Euler head equation, specific speed and characteristic curves of centrifugal pumps.

TEXT BOOKS:

1. P.N.ModiandS.M.Seth,"*HydraulicandFluidMechanics*",StandardBookHouse,Delhi,2013.
2. K.Subramanya,"*FlowinOpenChannels*",TataMcGraw-HillEducation,2009.

SUGGESTED READING:

1. K. Subramanya, "*1000 Solved Problems in Fluid Mechanics*", TataMc-GrawHillPublications2005.
2. VenTeChow,"*Open-ChannelHydraulics",*McGraw-Hill,NewYork,1959.
3. K. Jain, "Fluid Mechanics: Including Hydraulic Machines", Khanna Publisher, 12th edition, 2016.
4. R. L. Streeter, G. Z. Watters, and J. K. Vennerd, "Elementary Fluid Mechanics", John Wiley International Publications, 7th Edition, 1996

22CE C10

SURVEYING II

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To understand the importance of various horizontal curves and the methods of setting
2. To understand the importance of transition curves and vertical curves and the methods of setting.
3. To understand the concepts of photogrammetric surveying
4. To know the simple concepts of Remote Sensing and image processing
5. To know the basics of adjustments of errors in survey and basics of LiDAR survey.

COURSE OUTCOMES: Completion this course, students will be able to

1. Execute setting of simple and compound curves on the field by overcoming obstructions in curve ranging
2. Select suitable transition curves based on real world conditions and execute it on field
3. Apply the concepts of photogrammetry for solving problems in civil engineering
4. Choose appropriate remote sensing technique for data acquisition and image processing techniques for identification of ground features accurately
5. Adjust the errors that are cropping while carrying surveying and adopt LiDAR survey for acquiring topographic data at high speed.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	2	-	-	-	-	-	-	1	2	2
CO2	1	2	-	-	-	2	-	-	-	-	-	-	1	2	2
CO3	1	2	-	-	-	2	-	-	-	-	-	-	1	2	2
CO4	2	3	-	-	-	1	-	-	-	-	-	-	2	3	1
CO5	2	3	-	-	-	1	-	-	-	-	-	-	2	3	1

UNIT- I

CURVE SETTING: Curves: Introduction, Designation of curves, Elements of simple curves. Setting out simple curves by angular methods-Rankine's principle. Compound curves-Elements – solutions to different cases. Reverse curves-parallel straights and non-parallel straights.

UNIT – II

TRANSITION CURVES AND VERTICAL CURVES: Transition curves: Requirements-super elevation-equilibrium cant – cant deficiency-centrifugal ratio, length of transition curve-arbitrary gradient, the time rate, rate of change of Radial Acceleration. Ideal transition curve - Clothoid-cartesian coordinates-computations of Deflection angles. Modified ideal transition curves- The cubic Parabola, the cubic spiral, Characteristics of Transition curves and setting out of transition curves.

Vertical curves: Introduction, concepts of grade and change of grade-types of vertical curves, computations and setting of vertical curves-elevations by tangent correction, chord gradient-influence of sight distances.

UNIT – III

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

UNIT – IV

REMOTE SENSING AND VISUAL IMAGE INTERPRETATION: Remote sensing: Definition, Energy Principles, radiation principles, principles and Use of EMR spectrum, Energy interactions in atmosphere-Scattering, Absorption, Energy interactions with h surface features and concepts of spectral reflectance curve. Spectral reflectors, Diffuse reflectors, spectral reflectance on –vegetation, soils, water, pavement surface, spectral response pattern-atmospheric influences, characteristics of ideal remote sensing system and applications remote sensing to civil engineering problems.

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

UNIT – V

THEORY OF ERRORS AND LIDAR SURVEY: Theory of errors: Theory of errors and survey adjustments introduction, types of errors, laws of weights, Principles of Least squares, most probable value, method of displacements, Method of correlates, probable errors, distribution error. **LiDAR Survey:** Introduction to LiDAR survey and fundamental concepts.

TEXT BOOKS:

1. K. R. Arora, "*Surveying, Vol-I, II and III*", Standard Book House, 2015.
2. Gopi Satheesh and R.Sathikumar, "*Advanced Surveying: Total Station, GIS and Remote Sensing*", Pearson India, 2006.
3. T. Lillesand, R. W. Kiefer, "Remote Sensing and Image Interpretation", Jhon Willey & Sons, 2015.

SUGGESTED READING:

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

22CE C11

STRUCTURAL ANALYSIS-I

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Comprehend the concept of determination of flexural deflections statically determinate beams using various methods.
2. Analyze the indeterminate beams.
3. Understand the behavior of circular shafts subjected to torsion and also to the combined effect of bending and torsion.
4. Compute the strain energy in bars subjected to the action of various types of loads and significance and analysis of types of springs.
5. To compute maximum load carrying capacity of various columns.

COURSE OUTCOMES: Completion this course, students will be able to

1. Compute slopes and deflections in determinate beams, under various types of static loads, using a suitable method.
2. Analyze the propped cantilevers and fixed beams subjected to various types of loads.
3. Analyze and design circular shafts subjected a given torque and bending.
4. Determine the strain energy in members under various loading situations, and to analyze various types of springs.
5. Analyze various types of columns with different end conditions.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	2	3	2
CO2	2	3	-	-	-	-	-	-	-	-	-	-	2	3	2
CO3	2	3	-	-	-	-	-	-	-	-	-	-	2	3	2
CO4	2	3	-	-	-	-	-	-	-	-	-	-	2	3	2
CO5	2	3	-	-	-	-	-	-	-	-	-	-	2	3	2

UNIT-I

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

UNIT - II

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

Fixed beams: Analysis of fixed beams subjected to point loads, uniformly distributed loads, uniformly varying loads. Slope and deflections in fixed beams with and without sinking of supports.

UNIT - III

Torsion: Theory of pure torsion, Torsion equation, solid and hollow circular shafts, strength and stiffness of shafts, Transmission of power. Shafts in series and Shafts in parallel. Combined torsion and bending. Equivalent Bending and Torsional Moments.

UNIT - IV:

Strain energy: Strain energy, proof resilience and modulus of resilience. Strain energy in bars subjected to gradually applied loads, suddenly applied and impact loads. Strain energy due to shear, bending and torsion.

Springs: Types of springs and significance, analysis of Closed and open coiled helical springs under axial load and twist.

UNIT- V:

Columns and Struts: classification of columns, Euler's theory for different end conditions of columns, effective length factors, radius of gyration and slenderness ratio, limitations of Euler's theory. Empirical formulae- Rankine's - Gordon's formula, Secant and Prof. Perry's formulae.

TEXT BOOKS:

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

SUGGESTED READING:

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

22CE C12

REINFORCED CONCRETE DESIGN – I

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

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

COURSE OUTCOMES: Completion this course, students will be able to

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

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	2	3
CO2	2	2	3	-	-	-	-	-	-	-	-	-	2	2	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	2	2	3
CO4	2	2	3	-	-	-	-	-	-	-	-	-	2	2	3
CO5	2	2	3	-	-	-	-	-	-	-	-	-	2	2	3

UNIT - I: Introduction to Reinforced Cement concrete: Concept of reinforced concrete - basic requirement of RC structures-Stresses, loads & combinations- Design Philosophies: Development of design philosophies – Introduction to working stress method and Limit state method - classification of limit states – characteristic loads - partial safety factors – Factors for material and load - design stress – stress and strain diagram of concrete and steel - Merit and demerits. Introduction to IS: 456- General design requirements and specifications. Working Stress method: Assumptions made in design of flexural members –Theory of bending in RC beams - Balanced, under and over reinforced sections. Analysis and design for flexure of singly reinforced rectangular beams- Analysis and design T- beams using WSM.

UNIT- II: Limit state method of design: Assumptions made in design of flexural members - Stress block parameters - Analysis and flexural design of singly reinforced, doubly reinforced rectangular beams and singly reinforced flanged beams. Limit state of serviceability: Short term, long term, total deflection - check for deflection - cracking - IS code provisions.

UNIT - III: Limit state of collapse in shear and torsion: Types of shear reinforcement – analysis and design for shear and torsion in beams - Bond - development length and curtailment of reinforcement in beams and detailing of bars: IS code provision.

UNIT - IV: Analysis and design of slabs as per IS 456: Solid rectangular slabs – one-way slabs (cantilever, simply supported and continuous), two-way slabs (simply supported and continuous slabs) subjected to uniformly distributed loads - Detailing of reinforcement and check for serviceability in slabs, Design of stairs - Design and detailing of dog legged slab type staircase.

UNIT - V: Analysis and design of columns as per IS 456: Short and long columns - End conditions, effective length of columns - assumptions made in design - design and detailing of axially loaded rectangular and circular columns with lateral reinforcement - Design of axially loaded short columns subjected to uniaxial and bi-axial moments using interaction diagrams, Design of isolated footings as per IS 456: Design and detailing of axially loaded rectangular and circular footings.

TEXT BOOKS:

1. N. Subramanian, "*Design of Reinforced Concrete Structures*" Oxford University Press. First Published in 2013, Second impression 2014.
2. S. Unni Krishnan Pillai and Devadas Menon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Co Ltd, (Third Edition), 2009.

SUGGESTED READING:

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

22CE C13

CONCRETE TECHNOLOGY

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objective: To enable the students to

1. Learn the properties & conduct tests on various ingredients of concrete.
2. Understand the behavior of concrete in fresh and hardened states.
3. Understand the Mix design of concrete using various design methods.
4. To learn the durability of concrete & acquire knowledge on the properties and effective usage of various admixtures.
5. Gain knowledge of various special concretes and their applications

COURSE OUTCOMES: Completion this course, students will be able to

1. Understand the properties of concrete making materials and production of concrete.
2. Analyze the properties of fresh and hardened concretes.
3. Design the concrete mix using various methods for a specified grade.
4. Evaluate durability of concrete and apply suitable admixtures in concrete making.
5. Evaluate and choose appropriate concrete for field application.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	1	-	-	-	-	-	-	2	1	3
CO2	2	3	-	-	-	1	-	-	-	-	-	-	2	1	3
CO3	2	3	-	-	-	1	-	-	-	-	-	-	2	1	3
CO4	2	3	-	-	-	1	-	-	-	-	-	-	2	1	3
CO5	2	3	-	-	-	1	-	-	-	-	-	-	2	1	3

UNIT- I

Concrete Materials & Production of Concrete: Manufacturing process of cement, Types of cements, Properties of cement and aggregate (fine & coarse), tests conducted on cement and aggregate (fine & coarse). Production of concrete – Various methods of batching, mixing, compaction and curing. Water cement ratio, gel space ratio, Segregation and bleeding of concrete.

UNIT- II

Fresh concrete: Workability, factors affecting workability, measurement of workability using slump cone, compaction factor.

Hardened concrete: Behavior of concrete under various types of loading - compression, Tension and flexure. Non - destructive testing methods. Time dependent behavior of concrete –Maturity, shrinkage & creep. Stress-Strain behavior of concrete.

UNIT - III

Durability of concrete:

Durability – Factors affecting Durability, Cracking of Concrete - types of cracks, causes, remedies. Deterioration of concrete and its prevention.Behavior of concrete under various types of extreme environments, Freezing and Thawing, Acid attack on concrete, Efflorescence, fire resistance.

Concrete Admixtures:

Classification of admixtures, Mineral and Chemical admixtures, Influence of various admixtures onproperties of concrete.

UNIT - IV

Concrete Mix Design: Basic considerations, Factor to be considered in choice of mix design, Different mix design methods – I.S. code method and ACI methods. Quality control of Concrete**.**

UNIT- V

Special Concretes: Properties & applications of High Strength Concrete, High Performance Concrete, Polymer Concrete, High Density Concrete, Light Weight Concrete, and Ferro cement, Recycled Aggregate Concrete, Self-Compacting Concrete (SCC), Fly Ash Concrete, Ready Mix Concrete (RMC), Self-healing Concrete (Bacterial Concrete).

Fiber Reinforced Concrete (FRC): Types of fibers, Constituent materials , Mechanism, Properties & Applications of Steel Fiber Reinforced Concrete , Geopolymer concrete.

TEXT BOOKS:

1. A.M Neville., "Properties of Concrete", Pearson Education. 2012.
2. M.S. Shetty, and A. K. Jain, "Concrete Technology: Theory and Practice", S. Chand & Company, 2018.
3. R. Santhakumar, "Concrete Technology", Oxford University, Press 2018.

SUGGESTED READING:

1. A.M. Neville and J.J. Brooks, "Concrete Technology", Dorling and Kindersley Publications, 2002.
2. P. K. Mehta, and J. M. M. Paulo, "Concrete- Microstructure – properties and Material", Mc. Graw Hill Publishers, 2017.
3. N. Krishnaraju, "Design of Concrete Mixes", CBS Publishers and Distributors, 2010.

22CE E01

GREEN BUILDING TECHNOLOGIES
(PROFESSIONAL ELECTIVE-I)

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To understand the basic principles of green building technologies and their significance.
2. To understand the judicial use of energy and its management.
3. To know about the Sun-earth relationship and its effect on climate.
4. To enhance awareness of end-use energy requirements in the society.
5. To know about the suitable technologies for energy management and audit procedures.

COURSE OUTCOMES: Completion this course, students will be able to

1. Identify the fundamentals of energy use and energy processes in building.
2. Identify the energy requirement and its management.
3. Apply the knowledge about Sun-earth relationship vis-a-vis its effect on climate.
4. Deal with the end-use energy requirements.
5. Familiar with the audit procedures of energy.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	1	3	-	-	-	-	-	1	-	3
CO2	2	2	-	-	-	1	3	-	-	-	-	-	1	-	3
CO3	2	2	-	-	-	1	3	-	-	-	-	-	1	-	3
CO4	2	2	-	-	-	1	3	-	-	-	-	-	1	-	3
CO5	2	2	-	-	-	1	3	-	-	-	-	-	1	-	3

UNIT- I

Overview of the significance of energy use and energy processes in building: Indoor activities and environmental control - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT- II

Indoor environmental requirement and management: Thermal comfort – Ventilation and air quality – Visual perception – Illumination requirement - Auditory requirement.

UNIT- III

Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT- IV

End-use, energy utilization and requirements: Lighting and day lighting - Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

UNIT- V

Energy management options: Energy audit and energy targeting – Technological options for energy management. Certification- Study of the LEED and TERI (GRIHA) parameters and certification of Green Buildings

TEXT BOOKS:

1. Charles J. Kibert,"Sustainable Construction - Green Building Design and Delivery", John Wiley & Sons, New York, 2008
2. Norbert Lechner,"Heating, Cooling, Lighting - Sustainable Design Methods for Architects", Wiley, New York, 2015.
3. James Kachadorian, "The Passive Solar House: Using Solar Design to Heat and Cool Your Home", Chelsea Green Publishing Co., USA, 1997.

SUGGESTED READING:

1. Michael Bauer, Peter Mosel and Michael Schwarz, "Green *Building – Guidebook for Sustainable Architecture", S*pringer, Heidelberg, Germany, 2010.
2. Mike Montoya,"*Green Building Fundamentals*", Pearson, USA, 2010.
3. Regina Leffers*, "Sustainable Construction and Design*", Pearson / Prentice Hall, USA, 2009

22CE E02

PRINCIPLES OF GEOGRAPHICAL INFORMATION SYSTEM (PROFESSIONAL ELECTIVE – I)

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. Understand the basics and applications of GIS, and concepts of Maps , projections
2. Understands the basic difference between vector GIS and raster GIS.
3. Understand the various types of data, realize the importance of spatial data and also in a position to apply methods of data compression techniques. 4.Identify various types analysis functions used integrated analysis GIS data
4. Understand the basics of use of GIS softwares and apply the principles of cartographic modelling to watershed modeling, environmental modeling and watershed management.

COURSE OUTCOMES: Completion this course, students will be able to

1. Apply the principles of GIS to various field problems and take decisions under uncertain conditions.
2. Understand advantages and disadvantages of using vector GIS and raster GIS.
3. Apply the methods of data Compression using GIS.
4. Perform the data modeling and analysis using GIS.
5. Apply the Cartographic modelling techniques for Watershed modeling, Environmental Modeling and for Watershed Management, visibility analysis.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	3	2	-	-	-	-	-	1		3
CO2	2	2	-	-	-	3	2	-	-	-	-	-	1		3
CO3	2	2	-	-	-	3	2	-	-	-	-	-	1		3
CO4	2	2	-	-	-	3	2	-	-	-	-	-	1		3
CO5	2	2	-	-	-	3	2	-	-	-	-	-	1		3

UNIT– I:

Introduction: Definition of GIS, History of development , Components of GIS-Data, Technology, System and Users, Map- introduction, scale, types of maps, mapping process-planning, data acquisition , cartographic production phase, product delivery, Plane coordinate system -rectangular, polar , Linear coordinate transformation system, Geographic coordinate system,

Map projections -Properties-area, shape, distance and direction, Classification -cylindrical, Conical, Azimuthal, Aspects of Projections-Normal, Transverse, oblique, View Points -Gnomonic, Orthographic and stereographic, Map projections for GIS, Datums-Geodetic and vertical, relationship between Coordinate system and map projections, UTM Projections

UNIT-II:

GIS Data: Nature of Geographic data-Geographic position, attributes, spatial relationship, time, Data types– spatial non spatial (attribute data)–data-structure, data format – point, line Polygon, Spatial data models - Raster data- data compression-point coding Run length coding, Quadtrees, Vector models- The spaghetti model, topological models, Triangulated irregular network model, Data files strucutre in computer – Hierarchical, Network, Relational data base , object based data models Concepts of Geo referencing, Existing digital data cartographic database. Digital elevation data

UNIT-III:

GIS Data analysis function : Introduction , organising Geographic data -data layers, coverage Classifications of analysis functions Spatial data analysis, data retrieval, query (SQL)–Organizing data for analysis, classification of GIS analysis function, maintenance and analysis of spatial data – transformation, conflation, Edge matching and Editing, Maintenance and analysis for non-spatial attribute data- Attribute editing and Attribute query functions.

UNIT-IV:

Integrated analysis functions: Retrieval and classification function: Overlay operations, neighborhood operations, connectivity function, output formatting – Map annotations, text pattern and line styles, graphic symbols, cartographic modeling by GIS analysis procedure with an example.

Presentation of Geo-data Analysis: Types of output data–types of errors elimination and accuracies – sampling - components of data quality.

UNIT-V:

Software scenario – Functions: Introduction of Arc GIS, QGIS sfotwares,

Cartographic modelling - concepts, applications to Watershed modeling, Watershed Management, Environmental modeling – Visibility analysis. Vehicle tracking.

TEXT BOOKS:

1. C.P.LO, Albert K.W. Yeung " Concepts And Techniques of Geographic information systems" Prentice Hall of India Private Limited New Delhi,2016
2. P.A. Burrough, "*Principles of Geographical Information Systems for Land Resources Assessment (Monographs on Soil and Resources Survey)",* Oxford University Press, 1986.
3. Lillesand and Kiefer, "*Remote Sensing and Image Interpretation*", Wiley; Sixth edition, 2011.

SUGGESTED READING:

1. Heywood, S. Cornelius and Steve Carver, "*An Introduction to Geographical Information Systems*", Pearson, 4th Edition, 2012.
2. B. Bhatta, "*Remote Sensing and GIS*", Oxford, Second edition, 2011.
3. S. Kumar, "*Basics of Remote Sensing and GIS*", Laxmi Publications, First edition, 2016.
4. S. Aronoff, "*Geographic Information Systems: A Management Perspective*", WDL Publications Ottawa, 1991.
5. Michael N Demers ,"Fundamentals of Geographic system" Jhon Wiley sons, INC, 4th edition, 2008

22CE E03

GROUND WATER ENGINEERING
(PROFESIONAL ELECTVE-I)

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to
1. Basics of groundwater hydrology, familiar with aquifer parameters.
2. Unsteady flow and its flow computation.
3. Exploring groundwater through surface and subsurface methods.
4. Artificial recharge and causes, methods of recharge.
5. Various models in groundwater, quality of groundwater, pollutant transport.

COURSE OUTCOMES: Completion this course, students will be able to
1. Assess groundwater potential and head.
2. Estimate hydraulic conductivity and storage coefficient for time variant flow.
3. Investigate groundwater availability for a given area.
4. Plan and design artificial recharge.
5. Construct model and analyze groundwater flow.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	3	2	-	-	-	-	-	2	1	3
CO2	2	2	-	-	-	3	2	-	-	-	-	-	2	1	3
CO3	2	2	-	-	-	3	2	-	-	-	-	-	2	1	3
CO4	2	2	-	-	-	3	2	-	-	-	-	-	2	1	3
CO5	2	2	-	-	-	3	2	-	-	-	-	-	2	1	3

UNIT- I:

Introduction: Occurrence of groundwater, problems and perspectives regarding groundwater in India, groundwater basin, ground water in hydrologic cycle, vertical distribution of ground water, Hydrologic balance equation, types of aquifers. Darcy's law and limitations, aquifer parameters, specific yield, safe yield, three-dimensional groundwater flow equation, Steady radial flow to a well in unconfined and confined aquifers.

UNIT- II:

Unsteady radial flow to a well: Non equilibrium equation for pumping tests. This method of solution, Cooper Jacob method, Chow's methods of solution. Law of times, well flow near aquifer boundaries, Image well theory, multiple well systems, well losses, pumping and recuperation tests.

UNIT- III:

Geophysical Exploration: Surface investigations: Surface investigations of ground water – electrical resistivity method, seismic refraction method, gravity and magnetic methods, geologic methods, dowsing, remote sensing.
Subsurface Investigations: Test drilling, resistivity logging, temperature logging, caliper logging, Interpretation of logs and selecting the groundwater potential zones.

Unit- IV:

Artificial Recharge of groundwater: Methods of recharge, water spreading, sewage discharge, recharge through pits and shafts, recharge through well, induced recharge.
Sea water intrusion in coastal aquifers, occurrence, Ghyben – Herzberg relation, shape of fresh – salt water interface, Length of the intruded sea water wedge. Prevention and control of sea water intrusion.

Unit-V:

Modelling techniques: Introduction, ground water models, sand models, viscous fluid models, membrane models, thermal models, electric-Analog models. Numerical modelling, finite difference method.

Quality of groundwater: Groundwater Contamination, sources of groundwater contamination, groundwater quality criteria, advection process, diffusion and dispersion process, pollutant transport equation and modelling of pollutant transport.

TEXT BOOKS:

1. D.K. Todd, "*Ground Water Hydrology*", John Wiley & Sons, Inc., USA, 2015
2. H.M. Raghunath, "*Ground Water*", Wiley Eastern Limited, New Delhi, 2007.

SUGGESTED READING:

1. Bouwer, "*Ground Water Hydrology*", Mc. Graw Hill, Newyork, 2013
2. A. K. Rastogi, "*Numerical Groundwater Hydrology*", Penram International Publishing, Mumbai, 2007.

22CE C14

HYDRAULIC ENGINEERING LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. To understand uniform and non-uniform flows and the importance of Froude number in open channel flows.
2. To measure the discharge in venture flume open channel.
3. To determine super elevation in a curved channel and coefficient of discharge in a hemi spherical tank.
4. To determine the force exerted by fluid jet on vanes, efficiency and performance of turbines and centrifugal pumps.

COURSE OUTCOMES: Completion this course, students will be able to

1. Compute roughness coefficient in uniform flows and Froude number, energy losses in non-uniform flows.
2. Determine the coefficient of discharge of a venturi flume in open channels.
3. Compute super elevation in curved channel and coefficient of discharge in a hemi spherical tank.
4. Determine work done by fluid jet on vane.
5. Compute work done and draw performance characteristic curves for turbines and centrifugal pumps.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO2	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO3	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO4	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1
CO5	-	-	-	3	-	-	-	2	3	2	-	-	-	3	1

List of experiments

1. Uniform flow in channels - Determination of Manning's Rugosity coefficient, Chezy's constant.
2. Curved Channel flow - Determination of super elevation
3. Hydraulic Jump - Determination of Froude number, loss of energy, type of jump.
4. Venturi flume - determine coefficient of discharge in open channel.
5. Impact of Jets - Determination of force on flat vane and curved vane.
6. Unsteady flow in a hemi -spherical tank.
7. Pelton Wheel turbine-Determine the efficiency and construct performance characteristics of Pelton wheel turbine.
8. Francis Turbine- Determine the efficiency and construct performance characteristics of Francis turbine.
9. Kaplan Turbine- Determine the efficiency and construct performance characteristics of Kaplan turbine.
10. Centrifugal Pump- Determine the efficiency and construct operating characteristics curves for constant speed pump.

TEXT BOOKS:

1. M.N. Shesha Prakash, "Experiments in Hydraulics and Hydraulic Machines – Theory and Procedures", PHI Learning Private Limited, 2011.
2. R.V.Raikar, "Laboratory Manual Hydraulics and Hydraulic Machines-PHI Learning Private Limited,2012

22CE C15

SURVEYING AND GEOMATICS LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

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

COURSE OUTCOMES: Completion this course, students will be able to

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

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	2	3	2	-	-	1	-	2
CO2	-	-	-	3	-	-	-	2	3	2	-	-	1	-	2
CO3	-	-	-	3	-	-	-	2	3	2	-	-	1	-	2
CO4	-	-	-	3	2	-	-	2	3	2	-	-	1	-	2
CO5	-	-	-	3	2	-	-	2	3	2	-	-	1	-	2

LIST OF EXPERIMENTS:

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

SUGGESTED READING:

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

22CE C16

SOLID MECHANICS LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Mechanical properties of engineering materials under different structural actions like direct tension, compression, flexure and torsion.
2. Measurement of deflections and hence there by finding elastic properties.
3. To assess the behavior of steel rods under impact loads and shear.
4. To conduct torsion test and to conduct deflection test on helical spring and
5. To conduct compressive strength on brick and concrete cube

COURSE OUTCOMES: Completion this course, students will be able to

1. Understand the stress strain behavior of mild steel bar under direct tension.
2. Compute the modulus of elasticity of given materials by conducting deflection tests on different types of beams.
3. Determine the impact/ shear strength of steel specimen.
4. Determine the rigidity modulus of a given material by conducting torsion test and deflection test on helical spring.
5. Determine the compressive strength of brick and concrete cube.

CO-PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	2	3	2	-	-	2	2	1
CO2	-	-	-	3	-	-	-	2	3	2	-	-	2	2	1
CO3	-	-	-	3	-	-	-	2	3	2	-	-	2	2	1
CO4	-	-	-	3	-	-	-	2	3	2	-	-	2	2	1
CO5	-	-	-	3	-	-	-	2	3	2	-	-	2	2	1

List of Experiments:

1. Direct tension test on mild steel bar.
2. Deflection test on Simply Supported beam.
3. Deflection test on Cantilever beam.
4. Deflection test on Propped cantilever beam.
5. Deflection test on Continuous beam.
6. Impact test.
7. Shear strength of a steel bar.
8. Torsion test.
9. Deflection test on helical spring.
10. Compression test on brick and concrete cube.

SUGGESTED READING:

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

TM

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

స్వయం తేజస్వీన్ భవ

1979

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institute | Affiliated to Osmania University)

Accreditated by NBA & NAAC (A++)

Kokapet Village, Gandipet Mandal, Hyderabad -500075, Telanagana.

E-mail: principal@cbit.ac.in, Website: www.cbit.ac.in

Phone No. : 040-24193276 / 277 / 279