DEPARTMENT OF CIVIL ENGINEERING

FEEDBACK ON CURRICULUM – 2023-24

ANALYSIS AND ACTION TAKEN REPORT

Structured feedbacks on curriculum are obtained from stakeholders. The suggestions are analysed and corrective measures suggested by stakeholders are considered.

Sr. No.	Suggestions/Comments	Action Taken
1	Building Construction Practises and concrete technology cannot be merged as one course for 3 credits.	As per the said suggestion both the courses were split and included in curriculum for 2 credits each.
2	As Human universal values is not a core subject. the credits can be reduced.	Credits for the course have been reduced to 1 from 3.
3	Industry experts feel students lack in practical aspects in civil engineering.	Practical skills in civil engineering lab is introduced in VIII semester.

Head, CED

PROFESSOR & HEAD
DEPARTMENT OF CIVIL ENGINEERING
CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
GANDIPET, HYDERABAD - 500 075

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: To enable the student

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: At the end of the course the student is able

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.

CO-PO Articulation Matrix

	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.

22FEM01

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY

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

Instruction	1 Tutorial Hour per Week
CIE	50 Marks
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: Student is able 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: By the end of the course, student 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.

CO-PO Articulation Matrix

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

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 fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario.
- Method to fulfill 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 fulfillment 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 individuals: 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 fulfillment among the four orders of nature - recyclability and self-regulation in nature.
- Understanding Existence as Coexistence 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 practicals 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

Mapping of **Course Outcomes** with **Program Outcomes** and **Program Specific Outcomes**

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

1. Mechanical properties of engineering materials under different structural actions like direct tension, compression, flexure and torsion.
2. Measurement of deflections and hence there by finding elastic 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: At the end of the course, the students will be able

1. To understand the stress strain behavior of mild steel bar under direct tension.
2. To compute the modulus of elasticity of given materials by conducting deflection tests on different types of beams.
3. To determine the impact/ shear strength of steel specimen.
4. To determine the rigidity modulus of a given material by conducting torsion test and deflection test on helical spring.
5. To 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.

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: To enable the student

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

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

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

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

22CEC14

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:

1. To understand uniform and non-uniform flows and the importance of Froude number in open channel flows.
2. To measure the discharge in venturi 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: At the end of the course, the students can 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, compute work done and draw performance characteristic curves for turbines and centrifugal pumps.

CO-PO Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO 10	PO11	PO12	PSO 1	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 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 Objectives: Using the basic tools of Autocad - the student will be able to

1. Practice different Brick bonds.
2. Apply the AutoCAD tools to create building plans, sections and elevations from a given line drawing and specifications.
3. Draw different components of Doors and Windows.
4. Generate the structural drawings of structural elements.

Course Outcomes: At the end of the course, using the basic tools of AutoCAD - the student is 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 E20

RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM

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: To enable the students

1. To identify the problems pertaining to rural water supply and sanitation.
2. To understand water treatment systems for rural community.
3. To understand wastewater treatment and sanitation systems in rural areas.
4. To apply on-site sanitation system for Industrial Hygiene and Sanitation.
5. To design low-cost waste management systems for rural areas, plan and design an effluent disposal mechanism.

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

1. Identify the problems related to rural water supply and sanitation.
2. Apply different stages of water treatment and sanitation system for rural community.
3. Plan wastewater collection system in rural areas and identify compact wastewater treatment units.
4. Develop occupation related onsite sanitation, hygiene system and identify occupational hazards.
5. Design an effluent disposal mechanism and develop solid waste management system in rural areas.

CO-PO Articulation Matrix:

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

UNIT- I:

Rural Water Supply: Issues of rural water supply, various techniques for rural water supply- merits, National rural drinking water program, rural water quality monitoring and surveillance, operation and maintenance of rural water supplies, Relationships between diseases and water quality, hygiene and sanitation.

UNIT- II:

Water Treatment: Need for water treatment, point of use water treatment systems, filters, bio-sand filters, disinfection systems for rural areas, chlorination, solar disinfection systems, removal of arsenic, fluoride and iron. Hygiene and sanitation, Low cost treatment: Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

UNIT- III:

Rural Sanitation: Introduction to rural sanitation, community and sanitary latrines, planning of wastewater collection system in rural areas, Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas.

UNIT- IV:

Onsite sanitation system: Nexus between water quality and sanitation. Importance of hydrogeology on selection of onsite sanitation systems, Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings-Hospitals, Industrial plant sanitation.

UNIT- V:

Septic tanks: Design of septic tanks, single pit and double pit toilets. Small bore systems, bio digesters, constructed wetlands, sludge/seepage management systems, solid waste management: Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Text Books:

1. Gupta, S. "Rural Water Supply and Sanitation", Vayu Education of India, New Delhi, 2014, 1st Edition.
2. Ahluwalia, P. and Nema, A. K., "Water and Wastewater Systems: Source, Treatment, Conveyance and Disposal", S. K. Kataria & Sons, 2012, Reprint edition.

Suggested Reading:

1. Christine Sijbesma and Meine Pieter van Dijk, "Water and Sanitation-Institutional Challenges in India", Manohar Publishers and Distributors, India, June 2006
2. A handbook on "Technological Options for On-site sanitation in rural areas", Ministry of Drinking water & Sanitation, Govt. of India, New Delhi, June 2016.
3. Guidelines "Research & Development for Rural Water Supply & Sanitation Sector", Ministry of Rural Development, Govt. of India, New Delhi, 2003.

E Resources:

1. https://archive.nptel.ac.in/courses/105/101/105101215/
2. https://onlinecourses.nptel.ac.in/noc22_ce45/preview
3. https://nptel.ac.in/courses/105104102
4. https://www.expertnotes.in/courses/water-supply-or-rural-water-supply-and-onsite-sanitation-system/

22CE E16

CONTAMINANT TRANSPORT MODELLING

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: To enable the students to

1. Understand the fundamental concepts of contaminant pollution
2. Acquire the knowledge on modelling and mathematical techniques
3. Apply numerical and computational concepts for the contaminant transport modelling
4. Analyze the importance of different modelling processes in model development
5. Evaluate the model simulations on air and water pollution monitoring

Course Outcomes: on completion of the course, students will be able to

1. Demonstrate comprehensive knowledge on fate and transport of contaminant through different phenomenon.
2. Develop an idea to apply fundamental principles in contaminant transport modelling.
3. Analyze the role of model constraints on efficacy of pollutant simulations
4. Evaluate the performance of different model approaches of water and air pollutants.
5. Apply the model simulation knowledge on computing the ideal tracer transport in a soil or air medium.

CO-PO Articulation Matrix:

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

UNIT-I:

Introduction to contaminant transport modelling; Conservation laws: Systems approach, Control volume approach and Differential element approach; Continua; Source, Sinks and Reactions; Box models.

UNIT-II:

Particles behaviour in fluid media: Particle in suspension, Interaction of particles surface with liquid or gaseous pollutants: Settling, Sedimentation, Coagulation, Adsorption and absorption. Stoke's law of settling: particle settling in -water and -air media. Adsorption at soild-liquid and solid-gas interfaces. Adsorption Isotherms: Longmuir and Freundlich isotherms

UNIT-III:

Transport phenomenon: advection, diffusion, dispersion; conservative and non-conservative pollutants. Fick's law of diffusion: I & II law; Governing Equations for flow and transport in surface and subsurface waters - chemical and biological process models - simplified models for lakes, streams, and estuaries, Turbulent diffusion models: Eulerian and Lagrangian Approach; Indoor air quality models.

UNIT-IV:

Model Simulations: Model complexity, model resolution, coupled and uncoupled models, linear and nonlinear models; Solution techniques: Model input parameters, Initial and boundary conditions, calibration, sensitivity analysis; application and evaluation of environmental control; bioremediation.

UNIT-V:

Numerical & Computational models: FDM, explicit vs. implicit methods, numerical errors, High resolution techniques; Finite volume techniques; Stream quality modelling using QUAL2K; Groundwater transport modelling using VISUAL MODFLOW; Computational models: Global and regional climate models Reg-Chem & WRF-Chem and Indoor air quality models IAQx.

Text Book:

1. Mark M. Clark, Transport Modeling for environmental engineering and scientists, A John wiley & sons, inc, publication, Newyork, 1996.
2. Dunnivant, F. M., & Anders, E. (2006) A basic introduction to pollutant fate and transport: an integrated approach with chemistry, modeling, risk assessment, and environmental legislation. John Wiley & Sons.

Reference Books:

1. Zheng, C. and Bennett, G. D., Applied contaminant Transport Modeling, A John wiley & sons, inc, publication, Newyork, 2002.
2. Martin, L.J. and McCucheon, S.C, *Hydrodynamics of transport for water quality modeling*, Lewis Publishers, Boca Raton, 1999.
3. Sun, N. Z., Mathematical modeling of groundwater Pollution, Springer –Verlac Newyork Inc., and Geological publishing house, 1996.

E Resources:

1. http://acl.digimat.in/nptel/courses/video/105101200/L40.html
2. https://nptel.ac.in/courses/111105099

23CE E102

DESIGN OF HYDRAULIC STRUCTURES
(PROGRAM SPECIFIC ELECTIVE-I)

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

COURSE OBJECTIVES: This course aims to

1. Demonstrate the importance of different hydraulic structures used widely for irrigation and hydro power generation.
2. Explain the concept of designing of gravity dam and reinforcement detailing for its section.
3. Describe the design of energy dissipater and horizontal apron.
4. Explain the concept of designing vertical drop weirs.
5. Understand the importance of aqueduct, syphon aqueduct, super passage, syphon Super passage, level crossing.

COURSE OUTCOMES: After the completion of this course, the student will be able to At the end of the course, the student will be able to

1. Understand and analyze forces acting on a gravity dam.
2. Analyze a gravity dam under dynamic loading such as earthquake.
3. Design of an Energy Dissipater with horizontal apron.
4. Investigate and design different components of vertical drop weir such as weir wall.
5. Explore different types of cross drainage work and design a Syphon aqueduct.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4
CO1	2	2	--	--
CO2	2	3	1	1
CO3	2	2	1	2
CO4	2	2	2	3
CO5	3	3	2	2

Unit I:

Hydraulic Analysis of Gravity Dams: Advanced topics in design and construction of Gravity dams, Investigation area for a dam construction, Stages of investigations, subsurface investigation: Seismic measurements and Resistivity measurements, Gravity Dam parameters. Forces acting on Gravity Dams, Failure of Gravity Dam

Unit II:

Structural Design of Gravity Dams: Classification of loading for design, Load combinations Seismic analysis, Class of Earthquake, Dynamic analysis of gravity dams under earthquake loading, Finite element method for stability analysis, Safety criteria, Gravity Design: Assumptions in design and Internal stress distribution, Determination of Profile of a Gravity Dam: Design and Reinforcement Detailing of the section.

Unit III:

Design of Energy Dissipater: Hydraulic Jump phenomenon, Momentum Principle, Loss of Energy, Location and Profile of Hydraulic Jump, Normal Depth, End Depth, Forms of the hydraulic Jump, Energy Dissipaters, Design criteria of stilling basin with horizontal apron, Design and Detailing of RCC floor.

Unit IV:

Design of Weir: Diversion headwork, Location of canal headwork, Components of diversion headwork, Types of weir, Failure of weirs, Criteria for the Design, Design of impervious floor by Khosla's Theory, Exit Gradient,

Design of vertical drop weir: Calculation for various elevations, Design of weir wall, impervious floor and protection works on upstream and downstream.

Unit V:

Cross Drainage Works: Types of cross drainage works: Aqueduct, Syphon aqueduct, Super passage, Syphon Super passage, Level crossing, Factors affecting suitability of aqueduct, Feature of design of siphon aqueduct. Hydraulic design and structural design.

TEXT BOOKS:

1. R. S. Varshney, Hydro Power Structures, Nem Chand & Bros, 2002.Revised Edition 2014.
2. P. N. Modi, Irrigation Water Resources and Water Power Engineering, Standard Book House, 2014.

SUGGESTED READING:

1. K. R. Arora, Irrigation Water Power and Water Resources Engineering, Standard Publisher Distributors, 2002

23CE E103

INFRASTRUCTURAL ENGINEERING & MANAGEMENT
(PROGRAM SPECIFIC ELECTIVE-I)

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

COURSE OBJECTIVES: This course aims to

1. To enable the student to understand the fundamental concepts of infrastructure management.
2. To study the concepts of planning for supply and demand of infrastructure
3. To make the students to understand the importance of Risk management framework for infrastructure projects
4. To understand the importance of contract laws & legal frame work in infrastructure project.
5. To get the knowledge on various risks involved in infrastructure project.

COURSE OUTCOMES: After the completion of this course, the student will be able to

1. Understand the concept of basic infrastructure terminology and Indian scenario of infrastructure.
2. Understand infrastructure planning and forecast the demand and level of service of infrastructure
3. Develop a risk management framework for infrastructure project.
4. Understand the challenges in various risks involved in infrastructure project.
5. Apply the concepts contract laws and legal agreement in infrastructure project.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4
CO1	--	1	1	2
CO2	1	1	2	2
CO3	2	2	2	2
CO4	2	1	2	2
CO5	1	2	2	2

UNIT I
INTRODUCTION TO INFRASTRUCTURE
Definition of basic terminologies, role of infrastructure in economic development, types of infrastructure, measurement of infrastructure capacity, Indian scenario in respect of adequacy and quality

UNIT II
INFRASTRUCTURE PLANNING
Goals and objectives of infrastructure planning, identification and quantification of the casual factors are influencing the demand for infrastructure, review and application of techniques to estimate supply and demand for infrastructure, models to forecast the demand and level of service of infrastructure.

UNIT III
STRATEGIES FOR INFRASTRUCTURE PROJECTS
Risk management framework for infrastructure projects, shaping the planning phase of infrastructure projects to mitigate risks, designing sustainable contracts, sustainable development of infrastructure, innovative design and maintenance of infrastructure facilities

UNIT IV
CHALLENGES IN INFRASTRUCTURE PLA NNING
Mapping and facing the landscape of risks in infrastructure projects, economic and demand risks, socio-environmental risks, cultural risks in international, infrastructure projects, legal and contractual issues in infrastructure, challenges in construction and maintenance of infrastructure

UNIT V

CONTRACT LAWS & LEGAL FRAMEWORK OF CONSTRUCTION

Introduction contracts: Indian contract act-1872, provision of the act, classification of contracts, contract documents, types of contract, alternative dispute resolution methods-negotiations, mediations, conciliation, dispute resolution boards, arbitration, litigation.

Text Book:

1. Goodman, Alvin S. and Makar and Hastak. Infrastructure Planning Handbook: 2006.
2. Revelle, C.S., Whit latch, E.E. and Wright, J.R. Civil and Environmental Systems Engineering: Prentice Hall, 2004.

SUGGESTED READING:

1. Hudson, W.R., Haas, R. and Uddin, W. Infrastructure Management; McGraw Hill, 1997.

23CE C103

STRUCTURAL DESIGN LAB

Instruction	3P Hours per week
Duration	3 Hours
SEE	0 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Learn the principles of idealization of beam grids and frames for the given plan of a building
2. Know the methods of calculating loads on the building elements
3. Grasp the concepts of Analysis of building frames manually & also using software elements
4. Understand the concepts of design of building elements with a practical approach, and also concepts of grouping the designs.
5. Learn the professional practices of preparing structural drawings with good detailing.

COURSE OUTCOMES: After the completion of this course, the student will be able to

1. Idealize beam grids and frames for the given plan of a building
2. Calculate loads on building elements for a given plan
3. Analyse building frames using a manual method and software
4. Design all structural elements of a given building with a practical approach and grouping the design.
5. Prepare structural drawings with good detailing, in a professional way.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	2	3	3	3
CO3	2	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3

Design Project:

Design and Detailed drawing of complete G +3 structures: Idealization of beam grid and frames for a given plan – Load calculations and preliminary design – Analysis of frames using software, manual check for at least one frame - Design of building elements using software - grouping of members – design of typical elements (manually) - detailing of reinforcement for various groups of elements–preparation of structural drawings– introduction to processional practices in drawing.

TEXT BOOKS:

1. V. L. Shah and V. R. Karve, "*Illustrated Design of Reinforced Concrete Buildings (Design of G+3 Storeyed Buildings + Earthquake Analysis & Design)* ", Assorted Editorial; 8th edition (2017).
2. **SP: 34 (1987),"***Handbook on Concrete Reinforcement and Detailing*", Bureau of Indian Standards.

SUGGESTED READING:

1. **IS: 456(2000),"***Plain and Reinforced Concrete-Code of Practice*", Bureau of Indian Standards.
2. **SP: 16** (1978),"Design Aids for Reinforced Concrete to IS456:1978", *Bureau of Indian Standards.*

23CE-CT04

ADVANCED CONCRETE LAB

Instruction	3P Hours per week
Duration	3 Hours
SEE	0 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Learn the principles of fundamental RCC and properties of materials.
2. Know the method of developing and calculating stress - strain curves for different grades of concretes.
3. Learn the correlation between the cube strength, cylindrical strength split tensile strength etc.,
4. Understand the concepts of cyclic loading and develop design of stress - strain curves for steel under cyclic loads.
5. Learn the mix design procedures for high strength concrete using different codes of practice.

COURSE OUTCOMES: After the completion of this course, the student will be able to

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

1. Develop the stress - strain values for a given high strength concrete and checks its suitability for a purpose.
2. Interpret the correlation between the cube strength, cylindrical strength split tensile strength and modulus of rupture.
3. Suggest suitable grade and quality of steel for resisting cyclic loads.
4. Conduct suitable non-destructive test for the condition assessment of existing concrete members
5. Carryout the mix design procedure for high strength concrete using various codes
6. Take proper precaution to avoid flexural and shear failures in concrete beams
7. Analyze the beam for torsion and calculate the torsional forces and moments.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4
CO1	3	3	3	2
CO2	2	3	3	2
CO3	2	3	3	2
CO4	3	3	3	2
CO5	3	3	3	2
CO6	3	3	3	2
CO7	3	3	3	2

List of Experiments / Assignments:

1. Study of stress - strain curve of high strength concrete
2. Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
3. Testing of steel element under cyclic loading.
4. Non-Destructive testing of existing concrete members.
5. Design of High strength concrete using ACI and IS code
6. Behavior of Beams under flexure / Shear
7. Behavior of Beams under Torsion (Demo)

Text Book:

1. M. Neville," *Properties of concrete*", 5th Edition, Prentice Hall, 2012

SUGGESTED READING:

1. M. S. Shetty, "Concrete *technology*", S. Chand and Co., 2006.

23CE C104

ADVANCED CONCRETE LAB

Instruction	3P Hours per week
Duration	3 Hours
SEE	0 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Learn the principles of fundamental RCC and properties of materials.
2. Know the method of developing and calculating stress - strain curves for different grades of concretes.
3. Learn the correlation between the cube strength, cylindrical strength split tensile strength etc.,
4. Understand the concepts of cyclic loading and develop design of stress - strain curves for steel under cyclic loads.
5. Learn the mix design procedures for high strength concrete using different codes of practice.

COURSE OUTCOMES: After the completion of this course, the student will be able to

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

1. Develop the stress - strain values for a given high strength concrete and checks its suitability for a purpose.
2. Interpret the correlation between the cube strength, cylindrical strength split tensile strength and modulus of rupture.
3. Suggest suitable grade and quality of steel for resisting cyclic loads.
4. Conduct suitable non-destructive test for the condition assessment of existing concrete members
5. Carryout the mix design procedure for high strength concrete using various codes
6. Take proper precaution to avoid flexural and shear failures in concrete beams
7. Analyze the beam for torsion and calculate the torsional forces and moments.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4
CO1	3	3	3	2
CO2	2	3	3	2
CO3	2	3	3	2
CO4	3	3	3	2
CO5	3	3	3	2
CO6	3	3	3	2
CO7	3	3	3	2

List of Experiments / Assignments:

1. Study of stress - strain curve of high strength concrete
2. Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
3. Testing of steel element under cyclic loading.
4. Non-Destructive testing of existing concrete members.
5. Design of High strength concrete using ACI and IS code
6. Behavior of Beams under flexure / Shear
7. Behavior of Beams under Torsion (Demo)

Text Book:

1. M. Neville," *Properties of concrete*", 5th Edition, Prentice Hall, 2012

SUGGESTED READING:

1. M. S Shetty, "Concrete *technology*", S. Chand and Co., 2006.

23CE C108

MODAL TESTING LAB

Instruction	3P Hours per week
Duration	3 Hours
SEE	0 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Learn to estimate natural frequencies and mode shapes of abeam.
2. Understand the evaluation process of dynamic response of a building model using shake table / mini shake table
3. Learn to compute the response of building models to wind loads, using wind tunnel setup.
4. Know the pattern of deflection and cracking in RC slab elements and portal frames under gravity loading.
5. Understands the use of Piezoelectric sensors in the determination of vibration characteristics of abeam

COURSE OUTCOMES: After the completion of this course, the student will be able to

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

1. Estimate the natural frequencies and mode shapes of a beam.
2. Evaluate the dynamic response of a building model using shake table
3. Evaluate the response of building models under wind loads, using wind tunnel setup.
4. Determine the pattern of deflection and cracks in RC slab elements
5. Determine the pattern of deflection and cracks in portal frames subjected to gravity loading.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4
CO1	2	3	3	2
CO2	2	2	3	2
CO3	2	3	2	2
CO4	3	2	2	2
CO5	2	2	2	2

List of Experiments:

1. Estimation of natural frequencies and mode shapes of abeam.
2. Evaluation of dynamic response of building model using shake-table setup.
3. Evaluation of response of building models subjected to wind loads using wind tunnel setup.
4. Deflections and crack pattern study of RC slab elements subjected to static loading.
5. Deflections and crack patterns in portal frame subjected to gravity loading.
6. Demonstration of use of Piezoelectric Sensors for the determination of Vibration Characteristics of a beam.

23CE C109

NUMERICAL ANALYSIS LAB

Instruction	3P Hours per week
Duration	3 Hours
SEE	0 Marks
CIE	50 Marks
Credits	1.5

Course Objectives:
To enable the student
1. Find Roots of non-linear equations by Bisection method and Newton's method.
2. Do curve fitting by least square approximations
3. Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration / Gauss - Jordan Method
4. To Integrate Numerically Using Trapezoidal and Simpson's Rules
5. To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method.
6. Apply computational methods in engineering using MAT Lab program

COURSE OUTCOMES: After the completion of this course, the student will be able to
1. Find roots of nonlinear equations by using numerical methods
2. Fit the given data in different curves
3. Solve system of linear equations by using direct and indirect methods
4. Integrate by using numerical methods
5. Find solution of first order ODE by numerical methods
6. Apply computational methods in engineering by using MAT Lab program

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4
CO1	1	1	3	2
CO2	1	1	3	2
CO3	1	1	3	2
CO4	1	1	3	2
CO5	1	1	3	2
CO6	1	1	3	2

List of Programs:

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss – Elimination Method.
5. Solve the System of Linear Equations Using Gauss-Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss-Jordan Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations by Euler's Method.
10. Numerical Solution of Ordinary Differential Equations by Runge Kutta Method.

TEXT BOOKS:
1. Rudra Pratap." *Getting started with MATLAB: A quick Introduction for Scientists and Engineers*", Oxford University press, 2010.
2. Grewal B. S." *Numerical Methods in Engineering and Science with Programs in C, C++ & MATLAB*", Khanna Publishers, 2014.

SUGGESTED READING:
1 Dukkipati Rao V. "*Applied Numerical Methods using MATLAB*", New Age International Pvt. Ltd. Publishers, 2011.