DEPARTMENT OF CIVIL ENGINEERING
JNTU-GV, COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA, VIZIANAGARAM
II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

B.Tech.– II Year I Semester

No.	Category	Title	L	T	P	Credits
1	BS	Numerical and Statistical Methods	3	0	0	3
2	HSMC	Universal Human Values–Understanding Harmony & Ethical Human Conduct	2	1	0	3
3	Engineering Science	Surveying	3	0	0	3
4	Professional Core	Strength of Materials	3	0	0	3
5	Professional Core	Fluid Mechanics	3	0	0	3
6	Professional Core	Surveying Lab	0	0	3	1.5
7	Professional Core	Strength of Materials Lab	0	0	3	1.5
8	Skill Enhancement Course	Computer Aided Civil Engineering Drawing	0	1	2	2
9	Audit Course	Environmental Science	2	0	0	-
Total			16	2	8	20.0

B.Tech.– II Year II Semester

No.	Category	Title	L	T	P	Credits
1	Management Elective-I	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science	Engineering Geology (Layered Learning)	2	0	2	3.0
3	Professional Core	Building Materials & Concrete Technology	3	0	0	3.0
4	Professional Core	Structural Analysis	3	0	0	3
5	Professional Core	Hydraulics & Hydraulic Machinery	3	0	0	3
6	Professional Core	Concrete Technology Lab	0	0	3	1.5
7	Professional Core	Building Planning and Drawing Lab	1	0	2	1.5
8	Skill Enhancement course	Advanced Surveying Course	0	1	2	2
9	Engineering Science	Design Thinking & Innovation	1	0	2	2
Total			15	1	10	21.0
Mandatory Community Service Project Internship of 06-08 weeks duration during summer vacation						

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II Year-I Semester	**NUMERICAL & STATISTICAL METHODS (CIVIL)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Outcomes:
After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Apply numerical methods to solve algebraic and transcendental equations	L2, L3
CO2	Derive interpolating polynomials using interpolation formulae	L3, L5
CO3	Solve differential and integral equations numerically	L3
CO4	To identify real life problems into Mathematical Models.	L2, L3
CO5	To apply the probability theory and testing of hypothesis in the field of civil engineering Applications.	L3, L5

Pre-requisite: Basic algebraic Equations, Probability, random variables (discrete and continuous) and probability distributions.

UNIT I: Solution of Algebraic & Transcendental Equations 8 hrs
Introduction-Bisection Method-Iterative method, Regula-falsi method, Secant method and Newton Raphson method

UNIT II Interpolation 10 hrs
Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae.- Gauss forward and backward interpolation formula- Newton's divided difference formula

UNIT III Solution of Initial value problems to Ordinary differential equations 10 hrs
Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order).

UNIT IV Estimation and Testing of hypothesis, large sample tests 10 hrs
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

UNIT V Small sample tests 10 hrs
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Textbooks:
1. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.

2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition
3. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.India.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 2021 5th Edition(9th reprint).
3. Ronald E. Walpole, Probability and Statistics for Engineers and Scientists, PNIE
4. H. K Das, Er. Rajnish Verma,Higher Engineering Mathematics, S. Chand Publications,2014, Third Edition (Reprint 2021)

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma05/preview
3. http://nptel.ac.in/courses/111105090

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		L	T	P	C
II Year-I Semester	**UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT (Common to CE, EEE, ME, ECE, CSE, IT, MET)**	**2**	**1**	**0**	**3**

Course Objectives:

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

Course Outcomes:

- Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
- Identify one's self, and one's surroundings (family, society nature) (L1, L2)
- Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
- Relate human values with human relationship and human society. (L4)
- Justify the need for universal human values and harmonious existence (L5)
- Develop as socially and ecologically responsible engineers (L3, L6)

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions. The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I Introduction to Value Education (6 lectures and 3 tutorials for practice session)
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

a. The Textbook
R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
b. The Teacher's Manual
R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,* 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. *JeevanVidya: EkParichaya,* A Nagaraj, JeevanVidyaPrakashan, 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
5. *Small is Beautiful* - E. F Schumacher.
6. *Slow is Beautifu*l - Cecile Andrews
7. *Economy of Permanence* - J C Kumarappa
8. *Bharat Mein Angreji Raj* – PanditSunderlal
9. *Rediscovering India* - by Dharampal
10. *Hind Swaraj or Indian Home Rule* - by Mohandas K. Gandhi
11. *India Wins Freedom* - Maulana Abdul Kalam Azad
12. *Vivekananda* - Romain Rolland (English)
13. *Gandhi* - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.
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 mentor, in a group sitting.

Tutorials (experiments or practical) are important for the 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 assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.
It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.
Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

II Year-I Semester	**Surveying**	L	T	P	C
		3	0	0	3

Course Outcomes

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

Course Outcomes		RBT Level
CO 1	Utilize the principles & methods of surveying to measure horizontal & vertical distances and angles	L2
CO 2	Diagnose sources of errors and implement rectification methods	L3
CO 3	Employ surveying principles to calculate areas and volumes	L2
CO 4	Set out curves and operate modern surveying equipment	L3
CO 5	Apply the fundamentals of photogrammetry surveying in the field	L4

Unit 1

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying. Lineardistances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip –systems and W.C.B and Q.B systems of locating bearings.

Unit 2

Leveling- Types of levels, methods of levelling, and Determination of levels, Effect of Curvature of Earth and Refraction. Contouring- Characteristics and uses of Contours, methods of contour surveying. Areas - Determination of areas consisting of irregular boundary and regular boundary. Volumes -Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

Unit 3

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible. Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.

Unit 4

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. Introduction to Tacheometric Surveying. Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LiDAR Survey (Light Detection and Ranging.

Unit 5

Photogrammetry Surveying:

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, 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.

Textbooks:

1. Duggal S. K., Surveying (Vol. 1 & 2), Tata McGraw Hill Publishing Co. Ltd., New Delhi, 5th edition, 2019.
2. C. Venkatramaiah, Textbook of Surveying, Universities Press, 1st edition, 2011.

Reference Books:

1. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Surveying (Vol. 1), Laxmi Publications (P) Ltd., New Delhi, 18th edition, 2024.
2. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Surveying (Vol. 2), Laxmi Publications (P) Ltd., New Delhi, 17th edition, 2022.
3. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Surveying (Vol. 3), Laxmi Publications (P) Ltd., New Delhi, 16th edition, 2023.
4. Chandra A. M., Plane Surveying and Higher Surveying, New Age International Pvt. Ltd., Publishers, New Delhi, 3rd edition, 2015.
5. N. Basak, Surveying and Levelling, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 4th edition, 2014.
6. Arora K. R., Surveying (Vol. 1, 2 & 3), Standard Book House, Delhi, 12th edition, 2015.

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II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-I Semester	**Strength of Materials**	L	T	P	C
		3	0	0	3

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

Course Outcomes		RBT Level
CO 1	Explain the basic materials' behavior under the influence of different external loading and support conditions.	L2
CO 2	Illustrate diagrams indicating the variation of key performance features like axial forces, bending moments, and shear forces in structural members.	L3
CO 3	Understand and calculate section modulus for determining stresses developed in beams.	L2
CO 4	Analyze deflections due to various loading conditions.	L3
CO 5	Evaluate stresses across sections of thin and thick cylinders and columns to determine optimum sections to withstand internal pressure using Lame's equation.	L4

Unit 1

Simple Stresses and Strains: Elasticity and plasticity — Types of stresses and strains — Hooke's law — Factor of safety, Poisson's ratio - Relationship between Elastic constants — Bars of varying section — stresses incomposite bars.

Unit 2

Shear Force and Bending Moment: Definition of beam — Types of beams — Concept of shear force and bendingmoment — Point of contra flexure — Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

Unit 3

Flexural and Shear Stresses: Flexural Stresses: Theory of simple bending — Assumptions — Derivation ofbending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular andcircular sections (Solid and Hollow), I, T, Angle and Channel sections — Design of simple beams. Shear Stresses: Derivation of formula — Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections. Torsion – circular shafts only.

Unit 4

Deflection of Beams: Double integration and Macaulay's methods — Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems — Moment area method — application to simple cases of cantilever.

Unit 5

Columns and Cylindrical Shells: Introduction– Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalentlength – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

Thin and Thick cylindrical shells — Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders. Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses

Textbooks

1. B. S. Basavarajaiah and P. Mahadevappa, Strength of Materials, Universities Press, 3rd edition, 2010.
2. L. S. Srinath, Advanced Mechanics of Solids, McGraw Hill Education, 3rd edition, 2017.
3. R. K. Bansal, Strength of Materials, Lakshmi Publications, 16th edition, 2022.
4. J. K. Gupta and S. K. Gupta, Strength of Materials, Cengage Publications, 2nd edition, 2024.

References

1. Beer and Johnston, Mechanics of Materials, McGraw Hill India Pvt. Ltd., 8th edition (SI Units), 2020.
2. E. P. Popov, Mechanics of Solids, Prentice Hall, 2nd edition, 2015
3. T. D. Gunneswara Rao and Mudimby Andal, Strength of Materials - Fundamentals and Applications, Cambridge University Press, 1st edition, 2018
4. R. K. Rajput, A Textbook of Strength of Materials (Mechanics of Solids, SI Units), S. Chand & Co., New Delhi, 7th edition, 2022
5. S. S. Ratan, Strength of Materials, Tata McGraw Hill Publications, 3rd edition, 2016

II Year-I Semester	**Fluid Mechanics**	L	T	P	C
		3	0	0	3

Course Outcomes

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

Course Outcomes		RBT Level
CO 1	Explain the principles of fluid statics, kinematics, and dynamics.	L2
CO 2	Apply the laws of fluid statics and concepts of buoyancy.	L3
CO 3	Describe the fundamentals of fluid kinematics and differentiate between types of fluid flows.	L2
CO 4	Apply the principle of conservation of energy for flow measurement.	L3
CO 5	Analyze the losses in pipes and discharge through pipe networks.	L4

Unit 1

Basic concepts and definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility. Fluid statics: Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical, inclined and curved surfaces. Buoyancy and stability of floating bodies.

Unit 2

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

Unit 3

Fluid Dynamics: Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – Derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced.

Unit4

Laminar Flow And Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydro dynamically smooth and rough flows. Closed Conduit Flow: Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, Concept of equivalent length–Pipes in Parallel and Series.

Unit5

Boundary Layer Theory: Boundary layer (BL) – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers(no deviations)- BL in transition, separation of BL, Control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

Textbooks:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

Reference Books:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011

II Year-I Semester	**Surveying Laboratory**	L	T	P	C
		0	0	3	1.5

Course Outcomes

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

Course Outcomes	
CO 1	Operate various linear and angular measuring instruments. (Apply)
CO 2	Record linear and angular measurements accurately. (Apply)
CO 3	Calculate area and volume by analyzing data obtained from surveying activities. (Analyze)
CO 4	Utilize modern equipment such as a total station. (Apply)
CO 5	Compile field notes from survey data. (Create)

List of Field Works:

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Plane table survey; finding the area of a given boundary by the method of Radiation
4. Fly levelling: Height of the instrument method (differential leveling)
5. Fly levelling: rise and fall method.
6. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method
7. Theodolite survey: finding the distance between two in accessible points.
8. Theodolite survey: finding the height of far object.
9. Determination of area perimeter using total station.
10. Determination of distance between two inaccessible point by using total station.
11. Setting out a curve
12. Determining the levels of contours

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II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-I Semester	**Strength of Materials Laboratory**	L	T	P	C
		0	0	3	1.5

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

Course Outcomes	
CO 1	Conduct tensile strength tests and illustrate stress-strain diagrams for ductile metals. (Apply)
CO 2	Perform bending tests and determine load-deflection curves for steel/wood. (Analyze)
CO 3	Conduct torsion tests and calculate torsion parameters. (Apply)
CO 4	Perform hardness, impact, and shear strength tests, and compute hardness numbers, impact, and shear strengths. (Evaluate)
CO 5	Conduct tests on closely coiled and open coiled springs and compute deflections. (Apply)

List of experiments

1. Tension test on mild steel / HYSD bars
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test
2. Hardness test
3. Compression test on Open coiled springs
4. Tension test on Closely coiled springs
5. Compression test on wood
6. Izod / Charpy Impact test on metals
7. Shear test on metals
8. Continuous beam – deflection test

II Year-I Semester	Computer aided Civil Engineering Drawing Lab	L	T	P	C
		0	1	2	2

SKILL ENHANCEMENT COURSE

List of Experiments:

1. Introduction to computer aided drafting and different coordinate system
2. Drawing of Regular shapes using Editor mode
3. Introduction GUI and drawing of regular shapes using GUI
4. Exercise on Draw tools
5. Exercise on Modify tools
6. Exercise on other tools (Layers, dimensions, texting etc.)
7. Drawing of building components like walls, lintels, Doors, and Windows. using CAD software
8. Drawing a plan of Building and dimensioning
9. Drawing a plan of a residential building using layers
10. Drawing various types of Footings

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh – Laxmi publications.
2. Engineering Graphics by P. J. Sha – S. Chand &Co.

II Year-I Semester	ENVIRONMENTAL SCIENCE (Common to CE, EEE, ME, ECE, CSE, IT, MET)	L	T	P	C
		2	0	0	-

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

UNIT I **7h**

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Water resources – Mineral resources- Food resources–Land resources and Energy resources - Use and over exploitation, case studies.

UNIT II **7h**

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem (Producers, consumers and decomposers), Energy flow in the ecosystem and ecological pyramids – Introduction, types, characteristic features of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation: Introduction - Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III **6h**

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV **6h**

Social Issues and the Environment: From Unsustainable to Sustainable development – Water conservation, rain water harvesting, watershed management – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act.

UNIT V **6h**

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

References:

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice hall of India Private limited
5. G.R.Chatwal, “A Text Book of Environmental Studies” Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, “Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

DEPARTMENT OF CIVIL ENGINEERING
JNTU-GV, COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA, VIZIANAGARAM
II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-II Semester	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (Common to CE, EEE, ECE, CSE, IT & MET)**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**2**

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes:

- Define the concepts related to Managerial Economics, financial accounting and management(L2)
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision (L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of business entity (L5)

UNIT - I Managerial Economics 6h

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT - II Production and Cost Analysis 4h

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT - III Business Organizations and Markets 4h

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT - IV Capital Budgeting 8h

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT - V Financial Accounting and Analysis 10h

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance-Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

DEPARTMENT OF CIVIL ENGINEERING
JNTU-GV, COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA, VIZIANAGARAM
II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-II Semester	**Engineering Geology**	L	T	P	C
		2	0	2	3

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

Course Outcomes	
CO 1	Explain the significance of geological agents on the Earth's surface and their importance in civil engineering. (Understand)
CO 2	Identify and understand the properties of megascopic minerals and rocks. (Understand)
CO 3	Describe the concepts of groundwater and its geophysical methods and apply knowledge to identify site parameters such as contour, slope, and aspect for topography. (Understand, Apply)
CO 4	Classify earthquake-prone areas, landslides, and subsidence zones, and measure these hazards to practice hazard zonation. (Analyze)
CO 5	Investigate project sites for civil engineering projects, including site selection for mega projects like dams, reservoirs, and tunnels, using strike and dip problem-solving. (Evaluate, Analyze)

Unit 1

Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies, Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

Unit 2

Mineralogy And Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sandstone, Limestone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

Unit 3

Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

Unit 4

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering

properties of rocks.

Unit 5:

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs.Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

List of experiments

1. Physical properties of minerals: Mega-scopic identification of

    a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmaline, Calcite, Gypsum, etc…
    b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyrolusite, Graphite, Chromite, etc

2. Megascopic description and identification of rocks
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems
5. Bore hole data
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology.

    a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Porphyry,Basalt, etc.
    b) Sedimentary rocks – Sandstone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglomerate, etc.
    c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotite schist, Marble, Khondalite, etc.

Lab examination Pattern

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems
5. Bore hole problems
6. Project report geology

Textbooks

1. Parbin Singh, Engineering & General Geology, Katson Educational Series, 8th edition, 2023.
2. N. Chenna Kesavulu, Engineering Geology, Laxmi Publications, 2nd edition, 2014.

References

1. Subinoy Gangopadhay, Engineering Geology, Oxford University Press, 1st edition, 2012.
2. D. Venkat Reddy, Engineering Geology, Vikas Publishing, 2nd edition, 2017.
   Alan E. Kehew, Geology for Engineers and Environmental Society, Pearson Publications, 3rd edition, 2013.
3. K. S. Valdiya, Environmental Geology, McGraw Hill Publications, 2nd edition, 2013

II Year-II Semester	**Building Materials and Concrete Technology**	L	T	P	C
		3	0	0	3

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

Course Outcomes	
CO 1	Understand the various engineering properties of building construction materials and assess their suitability.
CO 2	Identify the basic ingredients of concrete, explain their roles in production and behavior in the field, and test the properties of fresh and hardened concrete. (Apply)
CO 3	Describe the fundamental concepts of concrete. (Understand)
CO 4	Develop a concrete mix using the BIS method. (Apply)
CO 5	Analyze the ingredients of concrete through lab test results and recognize the significance of concrete quality. (Evaluate)

Unit 1

Stones: Classification of Stones – Properties of stones in structural requirements. Bricks: Composition of good brick earth. Tiles: Characteristics of good tile, Wood: Structure – Properties – Seasoning of timber – Defects in timber. Paints: White washing– Types of paints – Painting of new and old wood – Varnish.

Cements: Portland cement – Chemical composition – Hydration, setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash andsilica fume. Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates

Unit 2

Fresh Concrete: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

Unit 3:

Hardened Concrete: Water / Cement – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression test – Tension test – Factors affecting strength – Flexure test –Splitting test – Non-destructive testing methods – Codal provisions for NDT.

Unit 4

Elasticity, Creep and Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep –

Shrinkage –types of shrinkage.

Unit 5

Mix Design and Special Concretes: Ready mixed concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self-healing concrete, sustainable materials, green building materials. Factors in the choice of mix proportions –Quality control of concrete-Statistical methods- Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method

Textbooks

1. S. K. Duggal, "Building Materials", 2nd Edition, New Age International Publishers, 2010.
2. S.C. Rangwala, "Engineering Materials", Charotar Publications, New Delhi, 2nd Edition.
3. M. S. Shetty, Concrete Technology, S. Chand & Co., 2004.
4. M. L. Gambhir, Concrete Technology, Tata McGraw Hill Publishers, New Delhi, 5th edition, 2013.
5. Job Thomas, Concrete Technology, Cengage Publications, 1st edition, References

References

1. A. R. Santha Kumar, Concrete Technology, Oxford University Press, New Delhi
2. M. Neville, Properties of Concrete, Pearson, 4th edition, 2019
3. P. K. Mehta and Moterio, Concrete Microstructure, Properties of Materials, McGraw Hill, 4th edition, 2014
4. P.C. Varghese, "Building Materials" by Prentice-Hall of India Private Ltd, 3rd Edition, New Delhi.

II Year-II Semester	Structural Analysis	L	T	P	C
		3	0	0	3

Course Outcomes

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

Course Outcomes	
CO 1	Apply energy theorems to evaluate trusses. (Apply)
CO 2	Analyze indeterminate structures using Castigliano's Second Theorem. (Analyze)
CO 3	Analyze the behavior of fixed and continuous beams. (Analyze)
CO 4	Evaluate continuous beams and portal frames using the slope-deflection method. (Evaluate)
CO 5	Evaluate continuous beams and portal frames using the moment-distribution method. (Evaluate)

Unit 1

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first theorem, Deflections of simple beams and pin jointedtrusses.

Unit 2

Indeterminate Structures: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's–II theorem.

Unit 3

Fixed and Continuous Beams: Fixed beams: Analysis, SF and BM and calculations of deflections, effect ofsinking and rotation of a support. Statically indeterminate (maximum of three span using three moment theorem) beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams–

Unit 4

Slope - Deflection Method: Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bay and single storeyed portal frames without sway.

Unit 5

Moment Distribution Method: Introduction to moment distribution method- Application to continuous beams with and without settlement of supports-Analysis of Analysis of single bay and single storeyed portal frames without sway.

Textbooks:

1. C. S. Reddy, Basic Structural Analysis, Tata McGraw Hill Publishers, 3rd edition, 2017
2. V. N. Vazirani and M. M. Ratwani, Analysis of Structures – Vol. I & II, Khanna Publications, New Delhi

Reference Books:

1. C. K. Wang, Intermediate Structural Analysis, McGraw Hill, 2017
2. Aslam Kassimali, Structural Analysis, Cengage Publications, 6th edition, 2020.
3. Dr. R. Vaidyanathan and Dr. P. Perumal, Structural Analysis Vol. I and II, Laxmi Publications, 3rd edition,2016.
4. B. D. Nautiyal, Introduction to Structural Analysis, New Age International Publishers, New Delhi.
5. D. S. Prakasa Rao, Structural Analysis, University Press.
6. B. C. Punmia, Strength of Materials and Mechanics of Structures, Khanna Publications, New Delhi

DEPARTMENT OF CIVIL ENGINEERING
JNTU-GV, COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA, VIZIANAGARAM
II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-II Semester	**Hydraulics and Hydraulic Machinery**	L	T	P	C
		3	0	0	3

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

Course Outcomes	
CO 1	Explain the characteristics of laminar and turbulent flows. (Understand)
CO 2	Apply knowledge of fluid mechanics to solve uniform flow problems in open channels. (Apply)
CO 3	Analyze non-uniform flow problems & the hydraulic jump phenomenon in open channel flows. (Analyze)
CO 4	Evaluate the impact of jets on plates and design Pelton wheel, Francis, and Kaplan turbines. (Evaluate)
CO 5	Describe the principles, losses, and efficiencies of centrifugal pumps. (Understand)

Unit 1

Hydraulic Similitude: Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations. Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number.

Unit 2

Uniform flow in Open Channels: Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors

Unit 3

Non-Uniform flow in Open Channels: Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

Unit 4

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

Unit 5

Pumps: Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies

Text books

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, 22nd edition, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition, 2018.

Reference Books:

1. R. K. Bansal, A Text of Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) Ltd., New Delhi, 11th edition, 2024
2. Frank M. White, Henry Xue, Fluid Mechanics, Tata McGraw Hill, 9th edition, 2022
3. C. S. P. Ojha, R. Berndtsson, P. N. Chandramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010
4. S. K. Som, Gautam Biswas, S. Chakraborty, Introduction to Fluid Mechanics & Fluid Machines, 3rd edition,2011

II Year-II Semester	**Concrete Technology Laboratory**	L	T	P	C
		0	0	3	1.5

Course Outcomes

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

Course Outcomes	
CO 1	Explain the importance of testing cement. (Understand)
CO 2	Describe the properties of cement. (Understand)
CO 3	Evaluate different properties of aggregates. (Evaluate)
CO 4	Analyze fresh concrete properties and their relevance to hardened concrete. (Analyze)
CO 5	Evaluate hardened concrete properties. (Evaluate)

List of experiments

Tests on Cement

Normal Consistency and Fineness of cement.

Initial setting time and Final setting time of cement.

Specific gravity and soundness of cement.

Compressive strength of cement.

Tests on Fine and Coarse Aggregates

Grading and fineness modulus of aggregate by sieve analysis.

Specific gravity of aggregate

Water absorption and bulking of sand.

Tests on fresh Concrete

Workability of concrete by compaction factor method

Workability of concrete by slump test

Workability of concrete by Vee-bee test.

Tests on Hardened Concrete

Compressive strength of cement concrete and Modulus of rupture

Modulus of Elasticity and Poisson's Ratio

Split tensile strength of concrete

Non-Destructive testing on concrete Rebound hammer and UPV techniques and not limited to the above (for demonstration)

DEPARTMENT OF CIVIL ENGINEERING
JNTU-GV, COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA, VIZIANAGARAM
II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-II Semester	**Building Planning and Drawing Lab**	L	T	P	C
		1	0	2	1.5

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

Course Outcomes	
CO 1	Plan various buildings according to the building by-laws. (Create)
CO 2	Analyze the relationship between the plan, elevation, and cross-section to identify the form and functions among buildings. (Analyze)
CO 3	Illustrate signs and bonds. (Apply)
CO 4	Illustrate different building units. (Apply)
CO 5	Develop the skills to draw building elements and plan buildings according to requirements. (Create)

List of experiments

1. Detailing & Drawing of Sign Conventions.
2. Detailing & Drawing of English Bond.
3. Detailing & Drawing of Flemish Bond.
4. Detailing & Drawing of Doors.
5. Detailing & Drawing of Windows.
6. Detailing & Drawing of Ventilators &Roofs.
7. Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws.
8. Drawing of Plan, Elevation & Section from line diagram for a single Storey Building.
9. Drawing of Plan, Elevation & Section for Hospital Building.
10. Drawing of Plan, Elevation & Section for Industrial Building.

Textbooks

1. Gurcharan Singh and Jagdish Singh, Planning, Designing and Scheduling.
2. M. Chakraborti, Building Planning and Drawing.
3. M. G. Shah, C. M. Kale, and S. Y. Patki, Building Drawing, Tata McGraw Hill, New Delhi.

Reference Books

1. National Building Code, 2016 (Volume I & II).
2. M. G. Shah and C. M. Kale, Principles of Building Drawing, Trinity Publications, New Delhi.

3. B. P. Verma, Civil Engineering Drawing and House Planning, Khanna Publishers, New Delhi.
4. Suraj Singh, Civil Engineering Building Practice, CBS Publications, New Delhi, and Chennai.
5. G. C. Saha and Joy Gopal Jana, Building Materials and Construction, McGraw Hill Education (P) India Ltd., New Delhi.

DEPARTMENT OF CIVIL ENGINEERING
JNTU-GV, COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA, VIZIANAGARAM
II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-II Semester	**Advanced Surveying Lab**	L	T	P	C
		0	1	2	2

SKILL ENHANCEMENT COURSE

LIST OF EXPERIMENTS

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.

2. Theodolite Survey: Finding the distance between two inaccessible points.

3. Theodolite Survey: Finding the height of far object.

4. Tacheomatric Survey: Heights and distance problems using tacheomatric principles.

5. One Exercise on Curve setting.

6. One Exercise on contours.

7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.

8. Total Station: Determination of area using total station.

9. Total Station: Traversing

10. Total Station: Contouring

11. Total Station: Determination of Remote height.

DEPARTMENT OF CIVIL ENGINEERING
JNTU-GV, COLLEGE OF ENGINEERING VIZIANAGARAM (Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA, VIZIANAGARAM
II B. TECH - CIVIL ENGINEERING - R23 REGULATIONS

II Year-II Semester	DESIGN THINKING & INNOVATION (Common to CE, EEE, ECE, CSE & IT)	L	T	P	C
		1	0	2	2

Course Objectives:
The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes:
- Define the concepts related to design thinking. (L1, L2)
- Explain the fundamentals of Design Thinking and innovation (L1, L2)
- Apply the design thinking techniques for solving problems in various sectors. (L3)
- Analyse to work in a multidisciplinary environment (L4)
- Evaluate the value of creativity (L5)
- Formulate specific problem statements of real time issues (L3, L6)

UNIT I Introduction to Design Thinking 10h
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT II Design Thinking Process 10h
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development
Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT III Innovation 10h
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.
Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT IV Product Design 8h
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies
Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT V Design Thinking in Business Processes 10h

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough. H, The Era of Open Innovation – 2013

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview