JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM

VIZIANAGARAM – 535 003 Andhra Pradesh (India)

(Established by Andhra Pradesh Act No.22 of 2021)

Department Of CIVIL Engineering

COURSE STRUCTURE
(Applicable from the academic year 2023-24 onwards)
B. Tech.–II Year I Semester

S.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	Building Planning and Drawing	0	1	2	2
9.	Audit Course	Environmental Science	2	0	0	-
	Total		**16**	**2**	**8**	**20**

B. Tech. II Year II Semester

S.No.	Category	Title	L	T	P	Credits
1.	Management Elective-I	Managerial Economics and Financial Analysis Business Environment Organizational Behavior	2	0	0	2
2.	Engineering Science	Engineering Geology	3	0	0	3
3.	Professional Core	Building Materials and Concrete Technology	3	0	0	3
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	0	0	3	1.5
8.	Skill Enhancement course	Remote Sensing & Geographical Information Systems	0	1	2	2
9.	Engineering Science	Design Thinking & Innovation	1	0	2	2
	Total		**15**	**1**	**10**	**21**

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation

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NUMERICAL AND STATISTICAL METHODS

Course Outcomes:

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

- Apply numerical methods to solve algebraic and transcendental equations.
- Derive interpolating polynomials using interpolation formulae.
- Solve differential and integral equations numerically.
- To identify real life problems into Mathematical Models.
- To apply the probability theory and testing of hypothesis in the field of civil engineering Applications.

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

UNIT I: Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method System of Algebraic equations: Gauss Elimination, Jacoby and Gauss Siedal method.

UNIT II: Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares.

UNIT III: Solution of Initial value problems to Ordinary differential equations

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

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

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi2$ - test for goodness of fit, $\chi2$ - test for independence of attributes.

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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 ScienceInternational 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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UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

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.

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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

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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 Beautiful - 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

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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%202023.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

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SURVEYING

Course Outcomes

- At the end of the course, the learners will be able to
- Utilize the principles & methods of surveying to measure horizontal & vertical distances and angles
- Diagnose sources of errors and implement rectification methods
- Employ surveying principles to calculate areas and volumes
- Set out curves and operate modern surveying equipment
- Apply the fundamentals of photogrammetry surveying in the field

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying.

Linear distances- 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 - II

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 - III

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 - IV

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 LiDARSurvey(Light Detection And Ranging).

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UNIT - V

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.

Text Books:

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.

Web Resources:

https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse_itemnumber=23066

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STRENGTH OF MATERIALS

Course Outcomes

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

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

Unit I:
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 in composite bars.

Unit II:
Shear Force and Bending Moment: Definition of beam — Types of beams — Concept of shear force and bending moment — 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 III:
Flexural and Shear Stresses: Flexural Stresses: Theory of simple bending — Assumptions — Derivation of bending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular and circular 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 IV:
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 V:
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 – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

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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.

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FLUID MECHANICS

Course Outcomes:

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

- Explain the principles of fluid statics, kinematics, and dynamics.
- Apply the laws of fluid statics and concepts of buoyancy.
- Describe the fundamentals of fluid kinematics and differentiate between types of fluid flows.
- Apply the principle of conservation of energy for flow measurement.
- Analyze the losses in pipes and discharge through pipe networks.

Unit I:
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

Unit II:
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 and inclined surfaces. Buoyancy and stability of floating bodies

Unit III:
Fluid kinematics: Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; 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 IV:
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; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

Unit V:
Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

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

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SURVEYING LABORATORY

Course Outcomes:

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

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

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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STRENGTH OF MATERIALS LABORATORY

Course Outcomes

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

- Conduct tensile strength tests and illustrate stress-strain diagrams for ductile metals. (Apply)

- Perform bending tests and determine load-deflection curves for steel/wood. (Analyze)

- Conduct torsion tests and calculate torsion parameters. (Apply)

- Perform hardness, impact, and shear strength tests, and compute hardness numbers, impact, and shear strengths. (Evaluate)

- 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
5. Hardness test
6. Compression test on Open coiled springs
7. Tension test on Closely coiled springs
8. Compression test on wood
9. Izod / Charpy Impact test on metals
10. Shear test on metals
11. Continuous beam – deflection test

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BUILDING PLANNING AND DRAWING

Course Objectives:

1. Initiating the student to different building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings and public buildings.
3. Giving training exercises on various signs and bonds.
4. Giving training exercises on different building units.
5. Imparting the skills and methods of planning of various buildings.

Course Outcomes:

Upon successful completion of this course the students will be able to:
1. Plan various buildings as per the building by-laws.
2. Distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.
3. Draw signs and bonds
4. Draw different building units
5. Learn the skills of drawing building elements and plan the buildings as per requirements.

Syllabus:
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.

Text Books:
1. Planning, designing and Scheduling, Gurcharan Singh and Jagdish Singh
2. Building planning and drawing by M. Chakraborti.
3. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.

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Reference Books:

1. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
2. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, NewDelhi.
3. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai
4. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McGrawHill Education (P)India Ltd. New Delhi.

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ENVIRONMENTAL SCIENCE

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

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 – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function 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 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

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

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V

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.

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

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

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

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

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

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

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

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ENGINEERING GEOLOGY

Course Outcomes:

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

- Explain the significance of geological agents on the Earth's surface and their importance in civil engineering. (Understand)
- Identify and understand the properties of megascopic minerals and rocks. (Understand)
- 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
- Classify earthquake-prone areas, landslides, and subsidence zones, and measure these hazards to practice hazard zonation. (Analyze)
- 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 I:

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 II:

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, Khond alite and Slate.

Unit III:

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 IV:

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.

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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 V:

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.

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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 on 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.

3.Alan E. Kehew, Geology for Engineers and Environmental Society, Pearson Publications, 3rd edition, 2013.

4.K. S. Valdiya, Environmental Geology, McGraw Hill Publications, 2nd edition, 2013.

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BUILDING MATERIALS AND CONCRETE TECHNOLOGY

Course Outcomes:

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

- Know various engineering properties of building construction materials and suggest their suitability (Understand)
- Describe the basic ingredients of concrete and their role in its production and behavior in the field and Test the properties of fresh and hardened concrete. (Apply)
- Explain the basic concepts of concrete. (Understand)
- Design the concrete mix using the BIS method. (Apply)
- Evaluate the ingredients of concrete through lab test results and recognize the importance of concrete quality. (Evaluate)

Unit I:

Stones: Classification of Stones – Properties of stones in structural requirements. Bricks: Composition of good brick earth, Various methods of manufacturing of bricks. Tiles: Characteristics of good tile – Manufacturing methods, Types of tiles. Wood: Structure – Properties – Seasoning of timber – Classification of various types of woods used in buildings – Defects in timber. Paints: White washing and distempering, Constituents of paint – Types of paints – Painting of new and old wood – Varnish

Unit II:

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 and silica fume. Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Maximum aggregate size- Quality of mixing water.

Unit III:

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.

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Nature of strength of concrete –Maturity concept – 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 IV:

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 V:

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. 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, 2015

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.

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STRUCTURAL ANALYSIS

Course Outcomes:

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

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

Unit I:

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 jointed trusses.

Unit II:

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 III:

Fixed and Continuous Beams: Fixed beams: Analysis, SF and BM and calculations of deflections, effect of sinking 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 IV

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 V

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

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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

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HYDRAULICS AND HYDRAULIC MACHINERY

Course Outcomes:

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

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

Unit I:

Laminar & Turbulent flow in pipes: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody's diagram – Introduction to boundary layer theory.

Unit II:

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 III:

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 IV:

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 V:

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

Textbooks:

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

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CONCRETE TECHNOLOGY LABORATORY

Course Outcomes:

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

- Explain the importance of testing cement. (Understand)
- Describe the properties of cement. (Understand)
- Evaluate different properties of aggregates. (Evaluate)
- Analyze fresh concrete properties and their relevance to hardened concrete. (Analyze)
- Evaluate hardened concrete properties. (Evaluate)

List of experiments

1. **Tests on Cement**

A. Normal Consistency and Fineness of cement.

B. Initial setting time and Final setting time of cement.

C. Specific gravity and soundness of cement.

D. Compressive strength of cement.

2. **Tests on Fine and Coarse Aggregates**

A. Grading and fineness modulus of aggregate by sieve analysis.

B. Specific gravity of aggregate

C. Water absorption and bulking of sand.

3. **Tests on fresh Concrete**

A. Workability of concrete by compaction factor method

B. Workability of concrete by slump test

C. Workability of concrete by Vee-bee test.

4. **Tests on Hardened Concrete**

A. Compressive strength of cement concrete

B. Split tensile strength of concrete.

C. Modulus of rupture

D. Modulus of Elasticity and Poisson's Ratio

Non-Destructive testing on concrete Rebound hammer and UPV techniques and

not limited to the above (for demonstration)

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BUILDING PLANNING AND DRAWING

Course Outcomes

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

- Plan various buildings according to the building by-laws. (Create)
- Analyze the relationship between the plan, elevation, and cross-section to identify the form and functions among buildings. (Analyze)
- Illustrate signs and bonds. (Apply)
- Illustrate different building units. (Apply)
- 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 National Building Code, 2016 (Volume I & II).

Reference Books:

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

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -
VIZIANAGARAM**

VIZIANAGARAM – 535 003 Andhra Pradesh (India)

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REMOTE SENSING AND GIS

Course Learning Objectives:

The course is designed to

- Introduce the basic principles of Remote Sensing and GIS techniques and its application to Civil Engineering.
- Learn various types of sensors and platforms and understand the principles of spatial analysis techniques in GIS.
- Introduce GIS software to understand the process of digitization, creation of thematic map from toposheets and maps.

Course outcomes

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

1. Acquire knowledge about concepts of remote sensing, sensors and their characteristics.
2. familiarize with data models and data structures to introduce various Raster and Vector Analysis capabilities in GIS.
3. digitize and create thematic map and extract important features to calculate geometry.
4. perform surface analysis over Contour to develop digital elevation model.
5. use GIS software to perform simple analysis in water resources and transportation engineering.

UNIT – I

Introduction to Remote sensing: History of Remote Sensing, Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interaction with Atmosphere, Energy Interaction with the Earth Surfaces - Characteristics of Remote Sensing Systems, Sensor Resolutions, Advantages & Limitations - Platforms: Types of Sensors, Airborne Remote Sensing, Spaceborne Remote Sensing - IRS, LANDSAT, SPOT & Recent satellite.

UNIT – II

Digital Image analysis: Digital Image Characteristics, Digital Image Data Formats, Band Interleaved by Pixel (BIP), Band Interleaved by Line (BIL), Band Sequential (BSQ) - Visual Interpretation Elements, Preprocessing, Enhancement, Classification, Supervised classification, Unsupervised classification.

UNIT – III

Introduction to Geographic Information System: Principles, Components and Applications of GIS - Map projections, Spatial Data Structures, Raster and Vector Data Formats, Data Inputs, Data Manipulation, Data Retrieval, Data Analysis - Spatial data analysis: Overlay Function-Vector Overlay Operations, Raster Overlay Operations, Arithmetic Operators, Comparison and Logical Operators, Conditional Expressions - Network Analysis: Components of network, Transportation network - Optimum path analysis.

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Text Books:

1. BasudebBhatta (2021). 'Remote sensing and GIS', 3rdedn., Oxford University Press.
2. S. Kumar, (2016) 'Basics of Remote sensing & GIS', Laxmi Publications.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2022) 'Remote Sensing and Image Interpretation', 7thedn., Wiley India Pvt. Ltd.
4. Demers, M.N, (2013) 'Fundamentals of Geographic Information Systems', 4thedn., Wiley India Pvt. Ltd.

List of Experiments:

Expt. 1: Georeferencing a Toposheet or Map
Expt. 2 : Digitization and Attribute table creation.
Expt. 3 : Creation of Thematic Map
Expt. 4 : Calculation of Feature geometry – Length, Area & Perimeter.
Expt. 5 : Contour map – developing TIN & DEM from Contour.
Expt. 6 : Stream network – Stream ordering map.
Expt. 7 : Watershed - calculate Hydro-geomorphological parameters.
Expt. 8 : Transportation Network Map – Route analysis.

GIS SOFTWARE: QGIS / ArcGIS

Textbook for Practical:

1. QGIS User Guide
2. ArcGIS User Manual by ESRI

References:

1. Schowengerdt, R. A (2006) 'Remote Sensing', Elsevier publishers.
2. Burrough P A and R.A. McDonnell, (1998) 'Principals of Geographical Information Systems', Oxford University Press.
3. George Joseph (2013) 'Fundamentals of Remote Sensing', Universities Press.

Web references:

1. https://nptel.ac.in/courses/10510319

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DESIGN THINKING & INNOVATION

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

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

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

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.

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Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT IV

Product Design

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

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