SIR C R REDDY COLLEGE OF ENGINEERING(A), ELURU

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. CR24 Regulations

B.TECH. - COURSE STRUCTURE – CR24

(Applicable from the academic year 2024-25 onwards)

B.Tech. – II Year I Semester

S.NO	Category	Title	L/D	T	P	Credits
1	BS&H	Numerical Techniques And Statistical Methods	3	0	0	3
2	BS&H	Universal human values – understanding harmony and 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	Engineering Science	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
		Total	**14**	**2**	**8**	**20**
9	Audit Course	Environmental Science	2	0	0	-

B.Tech. – II Year II Semester

S.NO	Category	Title	L/D	T	P	Credits
1	Management Course-1	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science / Basic Science	Engineering Geology	3	0	0	3
3	Professional Core	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	Engineering Geology Lab	0	0	3	1.5
8	Skill Enhancement course	Remote Sensing & Geographical Information Systems	0	1	2	2
9	BS&H	Design Thinking & Innovation	1	0	2	2
		Total	**15**	**1**	**10**	**21**
Honors/ Minor courses (The distribution hours can be 3-0-2 or 3-1-0 also)			3	1	0	4
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

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II Year – I Semester

L	T	P	C
3	0	0	3

NUMERICAL TECHNIQUES AND STATISTICAL METHODS

Course Objectives:

This course will enable Students to:

1. To elucidate the different numerical methods to solve nonlinear algebraic equations
2. To disseminate the use of different numerical techniques for carrying out numerical integration.
3. To familiarize the students with the foundations of probability and statistical methods.
4. To equip the students to solve application problems in their disciplines.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (K3)

CO2: Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (K3)

CO3: Apply discrete and continuous probability distributions (K3)

CO4: Design the components of a classical hypothesis test (K4)

CO5: Infer the statistical inferential methods based on small and large sampling tests (K4)

UNIT – I: Iterative Methods:

Introduction – Solutions of algebraic and transcendental equations: Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations)

Interpolation: Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula

UNIT – II: Numerical integration, Solution of ordinary differential equations with initial conditions:

Trapezoidal rule– Simpson's 1/3rd and 3/8th rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge- Kutta method (second and fourth order) – Milne's Predictor and Corrector Method.

UNIT – III: Probability and Distributions:

Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mean and Variance, Discrete Distributions – Binomial, Poisson, Continuous Distributions-Uniform and Normal distributions.

UNIT – IV: Sampling Theory:

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) — Maximum likelihood estimate, Maximum error of estimate – Central limit theorem (without proof), Point and Interval estimations , Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance– One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions ,Ratio of Variances.

UNIT – V: Correlation and Regression

Correlation: Correlation Coefficient, Rank Correlation. Linear Regression: Straight Line, Regression Coefficients and Properties. Curve Fitting: Principle of least squares, Fitting of straight line, Parabolic curves and Exponential curves.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.

REFERENCES:

1. **Steven C. Chapra**, Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. **M. K. Jain, S.R.K. Iyengar and R.K. Jain**, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. **Lawrence Turyn**,Advanced Engineering Mathematics, CRC Press.
4. **S. C. Gupta and V.K. Kapoor,** Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
5. **Shron L. Myers, Keying Ye, Ronald E Walpole**, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
6. **Jay l. Devore**, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.

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B.Tech. CR24 Regulations

II Year – I Semester

L	T	P	C
2	1	0	3

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Course Objectives:

This course will enable Students to:

1. 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
2. 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.
3. 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:

Upon successful completion of the course student will be able to:

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity (K1, K2)
CO2: Identify oneself, and one's surroundings (family, society nature) (K1, K2)
CO3: Apply what they have learnt to themselves in different day-to-day settings in real life (K3)
CO4: Relate human values with human relationships and human society. (K4)
CO5: Justify the need for universal human values and harmonious existence (K5)
CO6: Develop as socially and ecologically responsible engineers (K3, K6)

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
Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 4: Happiness and Prosperity – Current Scenario
Lecture 5: 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

1. 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

1. 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 analysing 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 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 Learning 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/62490385https:/onlinecourses.swayam2.ac.in/aic22_ge23/preview

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B.Tech. CR24 Regulations

II Year – I Semester

L	T	P	C
3	0	0	3

SURVEYING

Course Objectives:

This course will enable Students to:

1. Know the principle and methods of surveying and measuring of horizontal and vertical- distances and angles
2. Identification of source of errors and rectification methods
3. Know surveying principles to determine areas and volumes
4. Setting out curves and use modern surveying equipment for accurate results
5. Know the basics of Photogrammetry Surveying

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand basic concepts of surveying and obtain distances and angles with- Chain, Compass & Plan table surveying.

CO2: Apply suitable data collection methods and evaluate the area of boundaries and volumes of earthwork by various methods.

CO3: Apply theodolite to measure horizontal, vertical angles, when base is accessible and inaccessible stations and understand traversing methods.

CO4: Analyze different types of curves and importance of tachometry and modern surveying methods.

CO5: Apply modern survey methods like photogrammetry to carryout surveying.

Course Articulation Matrix:

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

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 boundaries.

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.

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.

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 Electronic Distance Measurement Instruments, Total station- advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LIDAR Survey (Light Detection and Ranging).

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.

Textbooks:

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

REFERENCES:

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

Web Resources:

1. https://nptel.ac.in/courses/105107122
2. https://archive.nptel.ac.in/courses/105/104/105104101/#

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B.Tech. CR24 Regulations

II Year – I Semester

L	T	P	C
3	0	0	3

STRENGTH OF MATERIALS

Course Objectives:

This course will enable Students to:

1. To impart Fundamental concepts of Strength of Material and Principles of Elasticity and Plasticity Stress
2. To impart concepts of shear force and bending moment on various types of beams and loading conditions
3. To impart concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
4. To the concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
5. To Impart concepts of theories of column behavior under axial loading, including Euler's and Rankine's formulas, and to interpret stress conditions using Mohr's Circle for principal stresses and shear analysis.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand the basic concepts of Simple stresses developed in a member when it is subjected to stresses along different axes.

CO2: Analyze the Shear Force and Bending Moments for determinate beams under transverse loads & construct SFD and BMD.

CO3: Analyze the shear, bending and Torsion stresses in the cross section of beams and plot shear stress & bending stress distribution across the cross section of beams

CO4: Apply the concepts of slopes and deflections in determinate beams subjected to different types of loading by different methods.

CO5: Analyze columns using Euler's and Rankine's theories, and apply Mohr's Circle to determine principal stresses, strains, and maximum shear stress.

Course Articulation Matrix:

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

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 beam sections.

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 Struts:

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.

Principal Stresses and Strains: principal planes and principal stresses, state of pure shear maximum shear stress, Mohr's circle & it's application**.**

Textbooks:

1. Strength of Materials by R. K. Bansal, Lakshmi Publications, 16th Edition, 2022.
2. Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, Universities Press 3rd Edition, 2010.
3. Strength of Materials by J.K. Gupta and S.K. Gupta, Cengage publications 2nd edition,2024.

REFERENCES:

1. Advanced Mechanics of Solids, L.S Srinath, McGraw Hill Education, 2017, 3rd Edition.
2. Strength of Materials - Fundamentals and Applications, T.D.Gunneswara Rao and Mudim by Andal, Cambridge University Press, 2018, 1st Edition
3. Mechanics of Materials, Beer and Johnston, McGraw Hill India Pvt. Ltd., 2020, 8th Edition (SI Units).
4. Mechanics of Solids — E P Popov, Prentice Hall, 2nd Edition, 2015.
5. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi 7th edition 2022.
6. Strength of Materials by S.S.Ratan Tata McGrill Publications 3rd Edition , 2016.

Online Resources:
https://onlinecourses.nptel.ac.in/noc19_ce18/preview

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II Year – I Semester

L	T	P	C
3	0	0	3

FLUID MECHANICS

Course Objectives:

This course will enable Students to:

1. To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
2. To impart ability to solve engineering problems in fluid mechanics
3. To enable the students measure quantities of fluid flowing in pipes, tanks and channels
4. To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
5. To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses and to study about Boundary Layer theory.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand the fluid properties such as densities, viscosities with temperature variations and compressibility Etc.,

CO2: Analyze the pressures in the pipes by using manometers and pressure gauges and understand buoyancy and stability of floating bodies.

CO3: Understand various types of flows their kinematics behavior and apply continuity equations in one, two and dimensional flows.

CO4: Apply Euler's, Bernoulli's equations to the various devices like venturi meter, orifice meter, pitot tube etc., and understand dimensional analysis.

CO5: Evaluate energy losses in pipes-Major/minor with Darcy-Weisbach equations and understand Equivalent lengths for pipes in parallel and series.

Course Articulation Matrix:

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

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: Venturi meter, 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. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd 2019.

REFERENCES:

1. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018.
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, 9 th 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.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/112/105/112105269/
2. https://nptel.ac.in/courses/112104118
3. https://nptel.ac.in/courses/105103192

SIR C R REDDY COLLEGE OF ENGINEERING(A), ELURU

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. CR24 Regulations

II Year – I Semester

L	T	P	C
0	0	3	1.5

SURVEYING LAB

Course Objectives:

This course will enable Students be aware of :

1. various linear and angular measuring instruments
2. Determine the area and volume by interpreting the data obtained from surveying activities.
3. modern equipment such as total stations and draft field notes from survey data.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Apply Surveying Techniques to Measure and Analyze Land Features

CO2: **apply Advanced Surveying Instruments for Measurements** of elevations, angles and heights.

CO3: Analyze Survey Data to Create Contour Maps and Site layouts.

Course Articulation Matrix:

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

List of Field Works:

1. Chain survey of road profile with offsets in case of road widening.
2. Finding the area of the given boundary using compass. (Closed traverse)
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 levelling) & rise and fall method.
5. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method
6. Theodolite survey: finding the distance between two in accessible points.
7. Theodolite survey: finding the height of far object.
8. Find out the gradient between two points and also heights and distances using Tacheometer
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.

Demo:

13. Finding out the area using DGPS.

Textbooks:

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

Evaluation Pattern of Practical Examination:

1. Internal Assessment:

Day-to-day Assessment in the Practical shall be evaluated by the concerned subject teacher for 30 marks as follows.

- Observation: 5 marks
- Record: 10 marks
- Internal test : 15 marks

2. End Practical Assessment:

The End Practical Examination shall be evaluated by 70 marks by the subject teacher concerned along with a senior faculty who is expert in that subject from the same department and the distribution of marks are as follows.

- Procedure :20 marks
- Experimental work & Results: 30 marks
- Viva voce : 20 marks

SIR C R REDDY COLLEGE OF ENGINEERING(A), ELURU

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B.Tech. CR24 Regulations

II Year – I Semester

L	T	P	C
0	0	3	1.5

STRENGTH OF MATERIALS LAB

Course Objectives:

This course will enable Students to:

1. To determine the tensile strength and yield parameters of mild steel
2. To find out flexural strengths of Steel/Wood specimens and measure deflections
3. To determine the torsion parameters of mild steel bar
4. To determine the hardness numbers, impact and shear strengths of metals
5. To determine the load-deflection parameters for springs

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Analyze the tensile and compressive strength of a specimen for applying in a practical design-based project work.

CO2: Analyze the hardness, impact strength, fatigue strength to analyze the application of a specific material for a given design requirements for different loading conditions of structures or machines.

CO3: Evaluate the capacity of a material to withstand torsional stress for a safe and sustainable design of machine elements.

Course Articulation Matrix:

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

LIST OF EXPERIMENTS:

1. Tension test.
2. Torsion test.
3. Brinell Hardness test.
4. Rockwell Hardness test.
5. Compression test on Open coiled springs.
6. Tension test on Closely coiled springs.
7. Compression test on wood.
8. Izod Impact test on metals
9. Charpy Impact test on metals
10. Double Shear test on metals
11. Bending test on simply supported beam.

12. Continuous beam – deflection test.

REFERENCES:

1. Advanced Mechanics of Solids, L.S Srinath, McGraw Hill Education, 2017, 3rd Edition.
2. Strength of Materials - Fundamentals and Applications, T.D.Gunneswara Rao and Mudim by Andal, Cambridge University Press, 2018, 1st Edition
3. Mechanics of Materials, Beer and Johnston, McGraw Hill India Pvt. Ltd., 2020, 8th Edition (SI Units).
4. Mechanics of Solids — E P Popov, Prentice Hall, 2nd Edition, 2015.
5. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi 7th edition 2022.
6. Strength of Materials by S.S.Ratan Tata McGrill Publications 3rd Edition , 2016.

Evaluation Pattern of Practical Examination:

1. Internal Assessment:

Day-to-day Assessment in the Practical shall be evaluated by the concerned subject teacher for 30 marks as follows.

- Observation: 5 marks
- Record: 10 marks
- Internal test : 15 marks

2. End Practical Assessment:

The End Practical Examination shall be evaluated by 70 marks by the subject teacher concerned along with a senior faculty who is expert in that subject from the same department and the distribution of marks are as follows.

- Procedure :20 marks
- Experimental work & Results: 30 marks
- Viva voce : 20 marks

SIR C R REDDY COLLEGE OF ENGINEERING(A), ELURU

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. CR24 Regulations

II Year – I Semester

L	T	P	C
0	1	2	2

BUILDING PLANNING AND DRAWING

Course Objectives:

This course will enable Students to:

1. Introducing students to building bye-laws and regulations.
2. Impart knowledge on planning aspects of residential and public buildings.
3. Train students in various sign conventions and bonds.
4. Provide practical exposure to building units and their planning.
5. Develop skills in manual and AutoCAD-based drawing techniques.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand and apply building bye-laws.
CO2: Apply standard notations for signs and bonds.
CO3: Analyze the requirements for various buildings and develop plans, cross-section and elevation.
CO4: Apply AutoCAD drawing techniques to develop building plans.
CO5: Create detailed drawings based on function, building byelaws (NBC) - building & components.

Course Articulation Matrix:

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

UNIT - I : Building Bye Laws and Regulations:

Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws as per National Building Code - classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

UNIT II: Sign Conventions and Bonds:

Brick, Stone, Plaster, Sand Filling, Concrete, Glass, Steel, Cast Iron, Copper Alloys, Aluminium Alloys etc., Lead, Zinc, Tin etc., Earth, Rock, Timber and Marbles.

English Bond and Flemish Bond - Odd and Even Courses for One, One and Half Brick Walls in Thickness at the Junction of a Corner.

Practice.1 Detailing & Drawing of Sign Conventions.

Practice.2 Detailing & Drawing of English Bond.
Practice.3 Detailing & Drawing of Flemish Bond.

UNIT III: Doors, Windows, Ventilators and Roofs:
Paneled door paneled and glazed door, glazed windows, paneled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof and buildings: drawing plans, Elevations and Cross Sections of given sloped and flat roof buildings

Practice.4 Detailing & Drawing of Doors.
Practice.5 Detailing & Drawing of Windows.
Practice.6 Detailing & Drawing of Ventilators & Roofs.

UNIT IV: RESIDENTIAL BUILDINGS
Introduction - Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions
Practice.7 Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws.
Practice.8 Drawing of Plan, Elevation & Section from line diagram for a Single Storey Building.

UNIT V: PUBLIC BUILDINGS:
Introduction - Functions of Educational institutions, dispensaries, office buildings, banks, industrial buildings, hotels, buildings for recreation.
Practice.9 Drawing of Plan, Elevation & Section for Hospital Building.
Practice.10 Drawing of Plan, Elevation & Section for Industrial Building.

NOTE: QUESTION DISTRIBUTION FOR THE END EXAMINATION

A) Internal Examination: 30 (Thirty) Marks

- ✓ Descriptive/Subjective : 10 Marks
- ✓ Drawing Assignments: 20 Marks

B) External Examination: 70 (Seventy) Marks

The End Examination Paper Consists of PART- A and PART-B.

- ✓ PART- A, consists of 5 (five) questions from THEORY, out of which 3 (three) questions are to be answered and the weightage for part- A is 60%.
- ✓ PART- B, consists of 2 (two) questions from drawing part, out of which 1(one) has to be answered on drawing sheet and the weightage for part- B is 40%.

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.

Reference Books:

1. National Building Code 2016 (Volume- I & II).
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House Planning, B. P. Verma, Khanna publishers, New Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McGraw Hill Education (P) India Ltd. New Delhi.

SIR C R REDDY COLLEGE OF ENGINEERING(A), ELURU

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B.Tech. CR24 Regulations

II Year – I Semester

L	T	P	C
2	0	0	-

ENVIRONMENTAL SCIENCE

Course Objectives:

This course will enable Students to:

1. To make the students to get awareness on environment
2. 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
3. To save earth from inventions by the engineers.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1:	Understand multi-disciplinary nature of environmental studies and various renewable and non-renewable resources.
CO2:	Understand flow and bio-geo- chemical cycles and ecological pyramids.
CO3:	Evaluate various causes of pollution and solid waste management and related preventive measures.
CO4:	Apply the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
CO5:	Evaluate the causes of population explosion, value education and welfare programmes.

Course Articulation Matrix:

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

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 and 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. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

REFERENCES:

1. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
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, 1/e, Prentice Hall of India Private limited, 1991.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://www.edx.org/learn/environmental-science
3. https://www.youtube.com/watch?v=5QxxaVfgQ3k

SIR C R REDDY COLLEGE OF ENGINEERING(A), ELURU

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. CR24 Regulations

II Year – II Semester

L	T	P	C
3	0	0	3

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

This course will enable Students to:

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

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: **Understand** the fundamental concepts of Economics, estimating the Demand elasticity and Demand forecasting methods.

CO2: **Apply** the basic concepts of production, cost & break-even analysis.

CO3: **Have Knowledge** on forms of Business organization & conditions of different market structure & pricing policies.

CO4: **Utilize** the knowledge on Accounting & Financing Analysis for preparation and interpretation of Financial Statements.

CO5: **Make use** of the concepts related to Capital & Capital Budgeting.

Course Articulation Matrix:

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

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.

UNIT – II

Production and Cost Analysis: Introduction – Nature, meaning, significance, functions and advantages. Production Function- Isoquants and Isocosts, - Laws of Returns - Internal and

External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behaviour-Break-Even Analysis(BEA) –Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT - III

Business Organizations and Markets: Introduction–Nature, meaning, significance, functions and advantages. 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

Introduction to Financial Accounting & Analysis: Introduction to Double Entry System – Accounting Cycle- Journal, Ledger. Trail balance – Preparation of Financial Statements Account- Profit & Loss Account and Balance Sheet- Ratio Analysis (Simple Problems) Trading

UNIT - V

Capital and Capital Budgeting: Meaning of Capital and Capital Budgeting – Need for Capital Budgeting- Capital budgeting process-Techniques of Capital Budgeting Traditional and Modern Methods.

Textbooks:

1. R.L.Varshney & K.L.Maheswari – Managerial Economics Publisher : Sultan Chand & Sons,2014, ISBN: 81-8054-914-4
2. A.R.Aryasri, Third Edition-Managerial Economics & Financial Analysis ,3/e, Tata MC-Graw-hill Publishing Company Limited, 7 West Patel Nagar,New Delhi-110008, Copy rights: 2008

REFERENCES:

1. **Salvatore, D. (2012).** *Managerial Economics: Principles and Worldwide Applications*. Oxford University Press, USA.
2. Ahuja HI - Managerial Economics Schand, 9th Edition, 2007, Schand publishing.
3. S.A.Siddiqui & A.S.Siddiqui- Managerial Economics and Financial Analysis, New Age International, 2006.
4. Domnick Salvatore : Managerial Economics in a Global Economy Cengage, 1993, New York MC Grew Hill.

Online Learning Resources:

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016

3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

SIR C R REDDY COLLEGE OF ENGINEERING(A), ELURU

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. CR24 Regulations

II Year – II Semester

L	T	P	C
3	0	0	3

ENGINEERING GEOLOGY

Course Objectives:

This course will enable Students to:

1. To understand the importance of Engineering Geology in the field of Civil Engineering.
2. To learn about the formation, classification, and identification of minerals and rocks.
3. To explore the role of Engineering Geology in the design and construction of civil engineering structures.
4. To recognize the practical applications of geological knowledge in civil engineering projects.
5. To understand the fundamentals of groundwater and the geophysical methods used in its study.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand the impact of geological agents on the Earth's surface and their relevance to Civil Engineering.

CO2: Identify minerals and rocks and analyse their physical and engineering properties.

CO3: Understand groundwater behaviour and apply geophysical methods for its exploration.

CO4: Analyse the earthquake-prone zones, landslides, and land subsidence for effective hazard zonation.

CO5: Evaluate site investigations and evaluate locations for large-scale Civil Engineering projects such as dams, reservoirs, and tunnels.

Course Articulation Matrix:

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

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, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite 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.

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.

Textbooks:

1. Engineering Geology by N. Chenna Kesavulu, Laxmi Publications. 2nd Edn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8th 2023.

REFERENCES:

1. Engineering Geology by Subinoy Gangopadhay Oxford University press 1st edition, 2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2ndEdn , 2017,
3. Geology for Engineers and Environmental Society' Alan E Kehew, 3rd edn., 2013) Pearson publications.
4. 'Environmental Geology' (2013) K.S.Valdiya, 2nd ed., McGraw Hill Publications.

Online Learning Resources:

1. http://nptel.iitm.ac.in/video.php?subjectId=105105106
2. http://nptel.iitm.ac.in/video.php?courseId=1055&p=1
3. http://nptel.iitm.ac.in/video.php?courseId=1055&p=3
4. http://nptel.iitm.ac.in/video.php?courseId=1055&p=4

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L	T	P	C
3	0	0	3

CONCRETE TECHNOLOGY

Course Objectives:

This course will enable Students to:

1. Learn materials and their properties used in the production of concrete
2. Learn the behavior of concrete at fresh stage
3. Learn the behavior of concrete at hardened stage
4. Learn the influence of elasticity, creep and shrinkage on concrete
5. Learn the mix design methodology and special concretes

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand the composition and characteristic of Portland cement admixtures, and aggregate.

CO2: Understand the production of green concrete and its quality.

CO3: Apply laboratory test to evaluate the quality of hardened concrete.

CO4: Analyze the hardened concrete for its performance.

CO5: Evaluate the need of mix design and characteristic special concretes.

Course Articulation Matrix:

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

UNIT - I

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 – II

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 - III

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 & 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. Properties of Concrete by A.M. Neville – PEARSON – 4th edition
2. Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5th edition 2013.
3. Concrete Technology by Job Thomas, Cengagae Publications, 1st edition, 2015

REFERENCES:

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4th edition 2014
2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi

Online Resources:

https://archive.nptel.ac.in/courses/105/102/105102012/

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3	0	0	3

STRUCTURAL ANLAYSIS

Course Objectives:

This course will enable Students to:

1. Learn energy theorems.
2. Learn the analysis of indeterminate structures and fixed beams.
3. Learn about slope-deflection methods.
4. Learn about Moment – distribution method.
5. Learn about Matrix method of analysis.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1:	Apply energy theorems to calculate deflections of simple beams & pin joined trusses.
CO2:	Apply theorems to analyze indeterminate structures and Evaluate S.F.D & B.M.D of fixed beams for various loading conditions
CO3:	Analyze continuous beams and frames with slope deflection method under given loading conditions.
CO4:	Analyze continuous beams and frames with moment distribution method under given loading conditions.
CO5:	Analyze continuous beams using the system approach through flexibility and stiffness matrix methods.

Course Articulation Matrix:

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

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

ANALYSIS OF 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.

FIXED BEAMS: Introduction to Fixed 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 – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT - III

SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations-application to continuous beams with and without settlement of supports - Analysis of single bay portal frames with and without sway.

UNIT - IV

MOMENT DISTRIBUTION METHOD: Introduction to moment distribution method- Application to continuous beams with and without settlement of supports-Analysis of single bay storey portal frames with and without sway.

UNIT - V

MATRIX METHODS OF ANALYSIS: Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods –Shear force and bending moment diagrams.

Textbooks:

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

REFERENCES:

1. Structural analysis by Aslam Kassimali Cengage publications 6th edition 2020.
2. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3rd 2016
3. Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
4. Structural Analysis – D.S.Prakasarao -Univeristy press.
5. Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications,

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HYDRAULICS AND HYRAULIC MACHINERY

Pre-requisite: Fluid Mechanics

Course Objectives:

This course will enable Students to:

1. To Introduce concepts of laminar and turbulent flows.
2. To teach principles of uniform flows through open channel.
3. To teach principles of non-uniform flows through open channel.
4. To impart knowledge on design of turbines.
5. To impart knowledge on design of pumps

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand fundamental concepts of laminar and turbulent flow and transition criteria using Reynolds' experiment.

CO2: Evaluate open channel flow and design efficient sections.

CO3: Analyze non-uniform flow, compute critical parameters, and evaluate hydraulic jumps and energy dissipation.

CO4: Evaluate the impact of jets on plates and design Pelton wheel, Francis and Kaplan turbine.

CO5: Understand the principles, losses and their efficiencies of centrifugal pumps.

Course Articulation Matrix:

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

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. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd 2019.

REFERENCES:

1. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
4. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011.

Online Learning Resources:

1. https://nptel.ac.in/courses/105105203
2. https://archive.nptel.ac.in/courses/112/106/112106300/
3. https://archive.nptel.ac.in/courses/112/103/112103249/

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CONCRETE TECHNOLOGY LABORATORY

Course Objectives:

This course will enable Students to:

To test basic properties of ingredients of concrete fresh and hardened concrete properties

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand the basic tests on cement, fine aggregate, course aggregate, green concrete and harden concrete.

CO2: Analyze the Engineering properties of Cement.

CO3: Analyze the Mechanical properties of fine & course Aggregate.

CO4: Analyze the Mechanical properties of green concrete and harden concrete.

Course Articulation Matrix:

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

Detailed Syllabus:

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 Aggregates
   a) Grading and fineness modulus of Fine aggregate by sieve analysis.
   b) Specific gravity of fine aggregate
   c) Water absorption and Bulking of sand.

3. Tests on Coarse Aggregates
   a) Grading of Coarse aggregate by sieve analysis.
   b) Specific gravity of coarse aggregate
   c) Water absorption of Coarse aggregates

4. 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.

5. Tests on Hardened Concrete
d) Compressive strength of cement concrete.
e) Split tensile strength of concrete.
f) Non-Destructive testing on concrete (for demonstration)

Textbooks:

1. Properties of Concrete by A.M. Neville – PEARSON – 4th edition
2. Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5th edition 2013.
3. Concrete Technology by Job Thomas, Cengagae Publications, 1st edition, 2015

REFERENCES:

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2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi

e- REFERENCES:

https://archive.nptel.ac.in/courses/105/102/105102012/

Evaluation Pattern of Practical Examination:

1. Internal Assessment:

Day-to-day Assessment in the Practical shall be evaluated by the concerned subject teacher for 30 marks as follows.

- Observation: 5 marks
- Record: 10 marks
- Internal test : 15 marks

2. End Practical Assessment:

The End Practical Examination shall be evaluated by 70 marks by the subject teacher concerned along with a senior faculty who is expert in that subject from the same department and the distribution of marks are as follows.

- Procedure :20 marks
- Experimental work & Results: 30 marks
- Viva voce : 20 marks

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0	0	3	1.5

ENGINEERING GEOLOGY LABORATORY

Course Objectives:

This course will enable Students to:

1. To develop the ability to identify megascopic types of ore minerals and rock-forming minerals.
2. To recognize and classify megascopic types of igneous, sedimentary, and metamorphic rocks.
3. To assess site topography and make informed decisions on material selection based on geological conditions.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understanding the megascopic minerals along with their physical properties.
CO2: Evaluate the megascopic rocks based on their visible characteristics.
CO3: Analyze topographic features such as contour, slope, and aspect to understand site conditions

Course Articulation Matrix:

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

LIST OF EXPERIMENTS

1. Physical properties of minerals: Megascopic identification of
   a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc.…
   b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc.…
2. Megascopic description and identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sandstone, Ferrugineous sandstone, Limestone, Shale, Laterite, Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc.
3. Interpretation and drawing of sections from 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.

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.

REFERENCES:

1. Applied Engineering Geology Practicals by M T Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009.

Evaluation Pattern of Practical Examination:

1. Internal Assessment:

Day-to-day Assessment in the Practical shall be evaluated by the concerned subject teacher for 30 marks as follows.

- ✓ Observation: 5 marks
- ✓ Record : 10 marks
- ✓ Internal test : 15 marks

2. End Practical Assessment:

The End Practical Examination shall be evaluated for 70 marks by the concerned subject teacher along with a senior faculty who is expert in that subject from the same department and the distribution of marks are as follows.

- ✓ Procedure :20 marks
- ✓ Experimental work & Results: 30 marks
- ✓ Viva voce : 20 marks

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0	1	2	2

REMOTE SENSING AND GIS

Course Objectives:

This course will enable Students to:

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

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Understand basic concepts of remote sensing, sensors and their characteristics
CO2: Analyse data to produce raster and vector models.
CO3: Create and digitize thematic maps and extract important features to calculate geometry.
CO4: Analyse data on over Contour maps to develop digital elevation model.
CO5: Apply GIS software to perform simple analysis in water resources and transportation engineering.

Course Articulation Matrix:

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

SYLLABUS:

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.

Textbooks:

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.

Online Learning Resources:

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

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DESIGN THINKING & INNOVATION

Course Objectives:

This course will enable Students to:

1. Bring awareness on innovative design and new product development.
2. Explain the basics of design thinking
3. Familiarize the role of reverse engineering in product development.
4. Train how to identify the needs of society and convert into demand
5. Introduce product planning and product development process.

Course Outcomes:

Upon successful completion of the course student will be able to:

CO1: Define the concepts related to design thinking.
CO2: Explain the fundamentals of Design Thinking and Innovation.
CO3: Apply design thinking techniques for solving problems in various sectors.
CO4: Analyze work in a multidisciplinary environment.
CO5: Evaluate the value of creativity.

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.

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 modeling, 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, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCES:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview
4. https://onlinecourses.nptel.ac.in/noc22_de16/preview