



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**  
**CIVIL ENGINEERING (R23- II<sup>nd</sup> YEAR COURSE STRUCTURE & SYLLABUS)**

**B.Tech II Year I Semester**

S.No.	Category	Title	L	T	P	Credits
1	BS	Numerical Techniques And Statistical Methods	3	0	0	3
2	HSMC	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	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
<b>Total</b>			<b>14</b>	<b>2</b>	<b>8</b>	<b>20</b>
9	Audit Course	Environmental Science	2	0	0	-

**B.Tech II Year II Semester**

S.No.	Category	Title	L	T	P	Credits
1	Management Course-I	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 Geologylab	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
<b>Total</b>			<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>
10	Mandatory course	Building materials and Construction	3	0	0	-
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:**

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

**Course Outcomes:**

1. 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 (L3)
2. 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 (L3)
3. Apply discrete and continuous probability distributions (L3)
4. Design the components of a classical hypothesis test (L6)
5. Infer the statistical inferential methods based on small and large sampling tests (L4)

**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 1/3<sup>rd</sup> and 3/8<sup>th</sup> 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 – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.



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**UNIT – IV: Sampling Theory:**

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Point and Interval estimations – Maximum error of estimate – Central limit theorem (without proof) – Estimation using  $t$ ,  $\chi^2$  and F-distributions.

**UNIT – V: Tests of Hypothesis:**

Introduction – 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 – Student's t- test, F-test,  $\chi^2$  -test.

**Textbooks:**

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

**Reference Books:**

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, 8<sup>th</sup> Edition, Pearson 2007.
6. **Jay I. Devore**, Probability and Statistics for Engineering and the Sciences, 8<sup>th</sup> Edition, Cengage.



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II Year I Semester

L	T	P	C
2	1	0	3

### 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.

**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



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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



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### CIVIL ENGINEERING (R23- II<sup>nd</sup> COURSE STRUCTURE & SYLLABUS)

Lecture 28: Strategies for Transition towards Value-based Life and Profession  
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

- PS1 Sharing about Oneself
- PS2 Exploring Human Consciousness
- PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

- PS4 Exploring the difference of Needs of self and body
- PS5 Exploring Sources of Imagination in the self
- PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

- PS7 Exploring the Feeling of Trust
- PS8 Exploring the Feeling of Respect
- PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

- PS10 Exploring the Four Orders of Nature
- PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

- PS12 Exploring Ethical Human Conduct
- PS13 Exploring Humanistic Models in Education
- PS14 Exploring Steps of Transition towards Universal Human Order

#### READINGS:

##### Textbook and Teachers Manual

###### a. The Textbook

R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

###### b. The Teacher's Manual

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

#### Reference Books

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





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10. *Hind Swaraj or Indian Home Rule* - by Mohandas K. Gandhi
11. *India Wins Freedom* - Maulana Abdul Kalam Azad
12. *Vivekananda* - Romain Rolland (English)
13. *Gandhi* - Romain Rolland (English)

#### Mode of Conduct:

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

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

#### Online Resources:

1. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
4. <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%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>



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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>  
[https://onlinecourses.swayam2.ac.in/aic22\\_ge23/preview](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)





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**II Year – I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SURVEYING**

**Course Objectives:**

The objective of this course are 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 equipments for accurate results
5. Know the basics of Photogrammetry Surveying

**Course Outcomes:**

Course will enable the student to:

CO	Statement	Blooms level
CO 1	Apply the principle and methods of surveying and measuring of horizontal and vertical- distances and angles	L2
CO 2	Identify the source of errors and rectification methods	L3
CO 3	Apply surveying principles to determine areas and volumes	L2
CO 4	Setting out curves and using modern surveying equipments	L3
CO 5	Apply the basics of Photogrammetry Surveying in field	L4

**Course Articulation Matrix:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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

**Syllabus:**

**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.



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#### 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).

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

##### **Reference Books:**

1. Surveying (Vol – 1), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi, 18<sup>th</sup> edition 2024.
2. Surveying (Vol – 2), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi 17<sup>th</sup> 2022.
3. Surveying (Vol – 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi 16<sup>th</sup> 2023.
4. Plane Surveying and Higher Surveying by Chandra A M, New age International



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- Pvt. Ltd., Publishers, New Delhi, 3<sup>rd</sup> Edition, 2015.
5. Surveying and Levelling by N.Basak Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4<sup>th</sup> edition, 2014.
  6. Surveying (Vol 1, 2 & 3), by Arora K R, Standard Book House, Delhi. Edition: 12th, 2015.

**Web Resources:**

[https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse\\_itemnumber=23066](https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse_itemnumber=23066)



**II Year – I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**STRENGTH OF MATERIALS**

**Course Learning Objectives:**

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 classify cylinders and columns based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure

**Course Outcomes:**

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

CO	Statement	Blooms level
CO 1	To understand the basic materials behavior under the influence of different external loading conditions and the support conditions.	<b>L2</b>
CO 2	To draw the diagrams indicating the variation of the key performance features like axial forces, bending moment and shear forces in structural members.	<b>L3</b>
CO 3	To acquire knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams	<b>L2</b>
CO 4	To analyze the deflections due to various loading conditions.	<b>L3</b>
CO 5	To assess stresses across section of the thin, thick cylinders and columns to arrive at optimum sections to withstand the internal pressure using Lamé's equation	<b>L4</b>

**Course Articulation Matrix:**

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

**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



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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:

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.

**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. Strength of Materials by R. K. Bansal, Lakshmi Publications, 16<sup>th</sup> Edition, 2022.
2. Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, Universities Press 3<sup>rd</sup> Edition, 2010
3. Strength of Materials by J.K. Gupta and S.K. Gupta, Cengage publications 2<sup>nd</sup> 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 MudimbyAndal, Cambridge University Press, 2018, 1st Edition



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

**KAKINADA – 533 003, Andhra Pradesh, India**

**CIVIL ENGINEERING (R23- II<sup>nd</sup> COURSE STRUCTURE & SYLLABUS)**

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, 2<sup>nd</sup> Edition, 2015.
5. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi 7<sup>th</sup> edition 2022.
6. Strength of Materials by S.S.Ratan Tata McGrill Publications 3<sup>rd</sup> Edition , 2016.



**II Year – I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**FLUID MECHANICS**

**Pre-requisite:**

**Course Objectives:**

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.

**Course Outcomes:**

**On Completion of the course, the students will be able to**

<b>COs</b>	<b>STATEMENTS</b>	<b>Blooms level</b>
<b>CO1</b>	Understand the principles of fluid statics, kinematics and dynamics	<b>L2</b>
<b>CO2</b>	Apply the laws of fluid statics and concepts of buoyancy	<b>L3</b>
<b>CO3</b>	Understand the fundamentals of fluid kinematics and differentiate types of fluid flows	<b>L2</b>
<b>CO4</b>	Apply the Principle of conservation of energy for flow measurement.	<b>L3</b>
<b>CO5</b>	Analyse the losses in pipes and discharge through pipe network.	<b>L4</b>

**Course Articulation Matrix:**

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

**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 22<sup>nd</sup>, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2<sup>nd</sup> edition 2018

#### **Reference Books:**

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11<sup>th</sup> 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, 9<sup>th</sup> 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, 3<sup>rd</sup> edition 2011

#### **Online Learning Resources:**

<https://archive.nptel.ac.in/courses/112/105/112105269/>

<https://nptel.ac.in/courses/112104118>

<https://nptel.ac.in/courses/105103192>



**II Year I Semester**

**SURVEYING LAB**

L	T	P	C
0	0	3	1.5

**Course Objectives:**

**By the end of this course student will be able to**

1. Know about various linear and angular measuring instruments
2. Take Measurements in the linear and angular view
3. Determine the area and volume by interpreting the data obtained from surveying activities
4. Know modern equipment such as total station
5. Draft field notes from survey data

**Course Outcomes:**

**Upon the successful completion of this course, the students will able to:**

1. Handle various linear and angular measuring instruments
2. Measure the linear and angular measurements
3. Calculate the area and volume by interpreting the data obtained from surveying activities
4. Handle modern equipment such as total station
5. Prepare field notes from survey data

**Course Articulation Matrix:**

C	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	2	2	-	2	1	-	-	-	3	2	2	2	2	-
CO 2	2	2	-	2	1	-	-	-	3	3	3	2	2	-
CO 3	2	2	-	2	1	-	-	-	3	2	2	2	2	-
CO 4	1	2			3				3	2	2	1	1	
CO 5	2	1			-				3	2	2	1	1	

**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



**II Year I Semester**

L	T	P	C
0	0	3	1.5

**STRENGTH OF MATERIALS LAB**

**Course objectives:** By the end of this course student will be able 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
6. To determine the load-deflection parameters for springs

**Course Outcomes:**

1. Conduct tensile strength test and draw stress-strain diagrams for ductile metals
2. Perform bending test and determine load-deflection curve of steel/wood
3. Able to conduct torsion test and determine torsion parameters
4. Perform hardness, impact and shear strength tests and calculate hardness numbers, impact and shear strengths
5. Able to conduct tests on closely coiled and open coiled springs and calculate deflections

**LIST OF EXPERIMENTS :**

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
6. Hardness test.
7. Compression test on Open coiled springs
8. Tension test on Closely coiled springs
9. Compression test on wood/ concrete
10. Izod / Charpy Impact test on metals
11. Shear test on metals
12. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.



**II Year I Semester**

L	T	P	C
0	0	3	1.5

**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.

**Course Articulation Matrix:**

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

**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.



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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, NewDelhi.
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, McGrawHill Education (P)India Ltd. New Delhi.



II Year I Semester

L	T	P	C
2	0	0	--

**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 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-spots 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.

**Reference Books:**

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, 2018.
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:**

- [https://onlinecourses.nptel.ac.in/noc23\\_hs155/preview](https://onlinecourses.nptel.ac.in/noc23_hs155/preview)
- <https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2->





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[d84c-4773-8388-](https://www.youtube.com/watch?v=d84c-4773-8388-1b2f8f6a75f2)

[1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product\\_category=course&placement\\_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science](https://www.youtube.com/watch?v=d84c-4773-8388-1b2f8f6a75f2)

- <http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf>
- <https://www.youtube.com/watch?v=5QxxaVfgQ3k>

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources.	L2
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	L2
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	L2
CO4	Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	L2
CO5	Illustrate the causes of population explosion, value education and welfare programmes.	L3



**II Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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 HI 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>



**II Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**ENGINEERING GEOLOGY**

**Course Learning Objectives:**

The objective of this course is:

1. To know the importance of Engineering Geology to the Civil Engineering.
2. To enable the students understand what minerals and rocks are and their formation and identification.
3. To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures.
4. To enable the student realize its importance and applications of Engineering Geology in Civil Engineering constructions.
5. concepts of Groundwater and its geophysical methods.

**Course Outcomes:**

Upon the successful completion of this course, the students will be able to:

1. Understand the significance of geological agents on Earth surface and its significance in Civil Engineering.
2. Identify and understand the properties of Minerals and Rocks.
3. Understand the concepts of Groundwater and its geophysical methods.
4. Classify and measure the Earthquake prone areas, Landslides and subsidence to practice the hazard zonation.
5. Investigate the project site for mega/mini civil engineering projects and site selection for mega engineering projects like Dams, Reservoirs and Tunnels.

**Course Articulation Matrix:**

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

**SYLLABUS:**

**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, Sand Stone, 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.

### **TEXT BOOKS:**

1. Engineering Geology by N. ChennaKesavulu, Laxmi Publications . 2<sup>nd</sup>Edn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8<sup>th</sup> 2023

### **REFERENCES:**

1. Engineering Geology by SubinoyGangopadhy Oxford University press 1<sup>st</sup> edition, 2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2<sup>nd</sup>Edn, 2017,



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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.

**Web Materials:**

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



**II Year II Semester**

L	T	P	C
3	0	0	3

**CONCRETE TECHNOLOGY**

**Course Learning Objectives**

**Upon successful completion of this course, the student will be able 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:** At the end of the course, the student will be able to

- CO1 Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
- CO2 Test the fresh concrete properties and the hardened concrete properties. Understand the basic concepts of concrete. Design the concrete mix by BIS method.
- CO3 Evaluate the ingredients of concrete through lab test results. realise the importance of quality of concrete
- CO4 Understand the behaviour of concrete in various environments.
- CO5 Familiarize the basic concepts of special concrete and their production and applications.

**Detailed Syllabus:**

**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

#### **TEXT BOOKS**

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 5<sup>th</sup> edition 2013.
3. Concrete Technology by Job Thomas, Cengage Publications, 1<sup>st</sup> edition, 2015

#### **References**

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4<sup>th</sup> 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



**II Year – II Semester**

L	T	P	C
3	0	0	3

**STRUCTURAL ANALYSIS**

**Course Learning Objectives**

**Upon successful completion of this course, the student will be able to**

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

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

1. Apply energy theorems to analyze trusses
2. analyze indeterminate structures by using Castigliano's-II theorem
3. Analysis of fixed and continuous beams
4. Analyze continuous beams and portal frames by using slope-deflection method
5. Analyze continuous beams and portal frames by using Moment – distribution method

**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.

**UNIT - III**

**FIXED BEAMS & CONTINUOUS BEAMS :** Introduction to statically indeterminate 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 - IV**

**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 without sway.

**UNIT - V**

**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 without sway.



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**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. 3<sup>rd</sup> edition 2017.

**Reference Books:**

1. Structural analysis by Aslam Kassimali Cengage publications 6<sup>th</sup> edition 2020.
2. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3<sup>rd</sup> 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, New Delhi.



**II Year II Semester**

L	T	P	C
3	0	0	3

**HYDRAULICS AND HYRAULIC MACHINERY**

**Pre-requisite: Fluid Mechanics**

**Course Objectives:**

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:**

**On Completion of the course, the students will be able to:**

COs	STATEMENTS	Blooms level
CO1	Understand the characteristics of laminar and turbulent flows.	L2
CO2	Apply the knowledge of fluid mechanics to address the uniform flow problems in open channels.	L3
CO3	Solve non-uniform flow problems and hydraulic jump phenomenon in open channel flows.	L3
CO4	Evaluate the performance of impact of jets on plates and design Pelton wheel, Francis and Kaplan turbine	L5
CO5	Understand the principles, losses and its efficiencies of centrifugal pumps	L2

Course Articulation Matrix:

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

**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

### **TEXT BOOKS: -**

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

### **Reference Books:**

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11<sup>th</sup> edition, 2024.
2. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9<sup>th</sup> edition , 2022.
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 3<sup>rd</sup> edition 2011

### **Online Learning Resources:**

<https://nptel.ac.in/courses/105105203>

<https://archive.nptel.ac.in/courses/112/106/112106300/>

<https://archive.nptel.ac.in/courses/112/103/112103249/>



**II Year II Semester**

L	T	P	C
0	0	3	1.5

### **CONCRETE TECHNOLOGY LABORATORY**

#### **Course Learning Objectives**

**Upon successful completion of this course, the student will be able to**

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

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

- CO1 Outline importance of testing cement and its properties
- CO2 Assess different properties of Aggregates
- CO3 Assess fresh concrete properties and their relevance to hardened concrete
- CO4 Assess hardened concrete properties

#### **Detailed Syllabus:**

##### **1. Tests on Cement**

Normal Consistency and Fineness of cement.  
Initial setting time and Final setting time of cement.  
Specific gravity and soundness of cement.  
Compressive strength of cement.

##### **2. Tests on Fine Aggregates**

Grading and fineness modulus of Fine aggregate by sieve analysis.  
Specific gravity of fine aggregate  
Water absorption and Bulking of sand.

##### **3. Tests on Coarse Aggregates**

Grading of Coarse aggregate by sieve analysis.  
Specific gravity of coarse aggregate  
Water absorption of Coarse aggregates

##### **4. Tests on fresh Concrete**

Workability of concrete by compaction factor method  
Workability of concrete by slump test  
Workability of concrete by Vee-bee test.

##### **5. Tests on Hardened Concrete**

Compressive strength of cement concrete and Modulus of rupture  
Young's Modulus and Poisson's Ratio  
Split tensile strength of concrete.  
Non-Destructive testing on concrete (for demonstration)



**II Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**ENGINEERING GEOLOGY LABORATORY**

**Course Learning Objectives:**

The objective of this course is:

- To identify the Megascopic types of Ore minerals & Rock forming minerals.
- To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection

**Course Outcomes:**

Upon the successful completion of this course, the students will be able to:

1. Identify Megascopic minerals & their properties.
2. Identify Megascopic rocks & their properties.
3. Identify the site parameters such as contour, slope & aspect for topography.
4. Know the occurrence of materials using the strike & dip problems.

**Course Articulation Matrix:**

	Program Outcomes												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
<b>CO1</b>	1	1	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO2</b>	1	1	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO3</b>	1	1	1	-	-	-	-	-	-	1	1	-	1	1
<b>CO4</b>	1	-	-	-	-	-	-	-	-	-	-	-	-	-

**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, 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 – Sand stone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
  - c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc.



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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.

**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, 2<sup>nd</sup> Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3<sup>rd</sup> edition, 2009.





**II Year II Semester**

L	T	P	C
3	0	0	3

**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.

**Course Articulation Matrix:**

	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O 3
<b>CO. 1</b>	2		1	1			2					2	1		1
<b>CO. 2</b>	2		1	1			2					2	1		1
<b>CO. 3</b>	1	2	2	1	2	2	3		2	2	1	3	1		2
<b>CO. 4</b>	1	2	2	1	2	2	3		2	2	1	3	2		2
<b>CO. 5</b>	1	2	2	1	2	2	3		2	2	1	3	2		2

1- Slightly; 2- Moderately; 3- Substantially

**SYLLABUS:**

**UNIT – I**

**Introduction to Remote sensing:** History of Remote Sensing, Electromagnetic Radiation,



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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.

**TEXT BOOKS:**

1. BasudebBhatta (2021). 'Remote sensing and GIS', 3<sup>rd</sup>edn., 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', 7<sup>th</sup>edn., Wiley India Pvt. Ltd.
4. Demers, M.N, (2013) 'Fundamentals of Geographic Information Systems', 4<sup>th</sup>edn., 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:**



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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>



**II Year II Semester**

L	T	P	C
1	0	2	2

**DESIGN THINKING & INNOVATION**

**Course Objectives:** The objectives of the course are to

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

**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.

**Reference Books:**



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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:**

- <https://nptel.ac.in/courses/110/106/110106124/>
- <https://nptel.ac.in/courses/109/104/109104109/>
- [https://swayam.gov.in/ndl\\_noc19\\_mg60/preview](https://swayam.gov.in/ndl_noc19_mg60/preview)
- [https://onlinecourses.nptel.ac.in/noc22\\_de16/preview](https://onlinecourses.nptel.ac.in/noc22_de16/preview)

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Define the concepts related to design thinking.	L1
CO2	Explain the fundamentals of Design Thinking and innovation.	L2
CO3	Apply the design thinking techniques for solving problems in various sectors.	L3
CO4	Analyse to work in a multidisciplinary environment.	L4
CO5	Evaluate the value of creativity.	L5