COURSE INFORMATION SHEET (CIS)

1. Course Information

Course Code	Course Name	Description	Year–Semester
XXXXX	Properties and Strength of Materials	Introduction to engineering materials, their properties, testing, stress–strain behavior, columns, joints, and dams.	II Year – II Semester

2. Course Outcomes (COs)

CO No.	Course Outcome Statement	BT Level
CO1	Understand basic properties, classification, and testing of engineering materials.	Level 2 – Understanding
CO2	Explain the properties and applications of concrete, paints, distempers, polymers, metals, and alloys.	Level 2 – Understanding
CO3	Analyze stresses, strains, elastic constants, thermal stresses, and Mohr's circle.	Level 4 – Analyzing
CO4	Apply Euler's and Rankine's formulas to analyze columns with different end conditions.	Level 3 – Applying
CO5	Design riveted and welded joints and analyze stresses in dams.	Level 4 – Analyzing

3. Course Articulation Matrix (CO–PO–PSO Mapping)

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	0	0	1	0	1	0	1	2	1
CO2	3	2	1	1	1	0	0	1	0	1	0	1	2	1
CO3	3	3	2	2	1	0	0	1	0	1	0	1	2	1
CO4	2	3	2	2	1	0	0	1	0	1	0	1	2	1
CO5	2	3	3	2	1	0	0	1	0	1	0	1	2	2

(Note: 3 = High, 2 = Medium, 1 = Low, 0 = No mapping)

4. Justification of CO–PO Mapping

CO	PO	Level	Justification
CO1	PO1	3	Requires strong understanding of material science fundamentals.
CO1	PO2	2	Involves interpretation of material behavior and testing results.
CO1	PO4	1	Basic experimentation understanding is needed.
CO2	PO1	3	Requires fundamental knowledge of material properties.
CO2	PO2	2	Involves comparison and evaluation of materials.
CO3	PO1	3	Requires fundamental engineering principles.
CO3	PO2	3	Involves problem solving and mathematical modelling.
CO3	PO3	2	Analytical skills applied in stress analysis.
CO4	PO2	3	Involves solving column stability problems.
CO4	PO3	2	Application of Euler's and Rankine's formulae.
CO5	PO3	3	Requires design calculations for joints and dams.
CO5	PO2	3	Requires analytical evaluation of stability.

5. Justification for CO–PSO Mapping

CO	PSO	Level	Justification
CO1	PSO1	2	Provides foundational knowledge relevant to engineering materials.
CO2	PSO1	2	Enhances understanding of specialized materials used in engineering systems.
CO3	PSO1	2	Applies mechanics concepts relevant to structural and agricultural engineering.
CO4	PSO1	2	Useful in analyzing slender members used in machinery and structures.
CO5	PSO2	2	Develops design ability in joints and dams relevant to field applications.

6. Justification for Average CO–PO Mapping

Mapping	Level	Justification
CO–PO Average	1–3	Shows that the course moderately to strongly contributes to fundamental knowledge, problem-solving, and design skills required for engineering applications.

7. Topics Beyond Syllabus (TBS)

7.1 Topics Beyond Syllabus – Proposed Actions

S.No.	Description	Proposed Actions
1	Introduction to Non-Destructive Testing (NDT) of Materials	Expert lecture / Demo session
2	Advanced Composite Materials used in Farm Machinery	Seminar / Assignment
3	Finite Element Analysis (FEA) Basics for Stress Analysis	Workshop / Software demonstration
4	Modern Welding Techniques (TIG, MIG, Friction Welding)	Industry visit / Lab demo
5	Sustainability and Eco-friendly Construction Materials	Assignment / Mini project

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7.2 Topic Beyond Syllabus: Mapping with PO & PSO

Topic Beyond Syllabus (TBS)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
NDT Methods	3	2	2	1	1	0	0	1	0	1	0	1	2	1
Composite Materials	3	2	1	1	1	0	0	1	0	1	0	1	2	2
Basics of FEA	3	3	2	2	1	0	0	1	0	1	0	1	2	1
Modern Welding	2	2	3	2	1	0	0	1	0	1	0	1	2	2
Sustainable Materials	2	2	1	2	1	1	1	2	1	1	0	2	1	1

7.3 Justification for Topic Beyond Syllabus (TBS) – PO Mapping

Mapping (TBS–PO)	Level	Justification
NDT Methods – PO1	3	Strong scientific foundation needed to understand non-destructive evaluation techniques.
NDT Methods – PO2	2	Requires analytical skills to interpret test results.
Composite Materials – PO1	3	Involves understanding material properties and selection criteria.
Basics of FEA – PO2	3	Requires computational and analytical problem-solving skills.
Basics of FEA – PO3	2	Supports engineering design and stress analysis.
Modern Welding – PO3	3	Enhances design and fabrication understanding.

Sustainable Materials – PO7	1	Supports environmental and sustainability-based engineering practices.

7.4 Justification for TBS–PSO Mapping

Mapping (TBS–PSO)	Level	Justification
NDT Methods – PSO1	2	Helps in understanding material integrity required in engineering applications.
Composite Materials – PSO2	2	Useful in advanced equipment design and performance improvement.
FEA Basics – PSO1	2	Supports structural analysis skills relevant to engineering.
Welding Technologies – PSO2	2	Related to fabrication and manufacturing in farm equipment.
Sustainable Materials – PSO1	1	Encourages material selection aligned with environmental considerations.

8. Web Source References

1. https://nptel.ac.in/courses/112105128 (Strength of Materials – IITs)
2. https://theconstructor.org (Construction materials & testing)
3. https://engineeringtoolbox.com (Material properties & stress data)
4. https://efunda.com (Engineering fundamentals & material properties)
5. https://asminternational.org (Metals, alloys & heat treatment reference)

9. Syllabus / Lesson Plan

S.No	Unit	Topic	No. of Periods	Text Book / Reference	Teaching Aid / Methodology	Hours
1	Unit I	Properties of Stones, Bricks, Tiles, Lime, Cement, Mortar	8	T1, T2	Chalk & Talk, PPT, Models	8
2	Unit II	Concrete, Sand, Paints, Varnishes, Distempers, Glass, Rubber, Plastics, Metals, Alloys, Timber, Heat Treatment	10	T1, R1, R2	PPT, Videos, Samples, Demonstration	10
3	Unit III	Stress–Strain Concepts, Elastic Constants, Thermal Stresses, Mohr’s Circle	10	T2, R5	Chalk & Talk, Numerical Problems, PPT	10

4	Unit IV	Euler's Theory, Rankine's Formula, Columns with Different End Conditions	8	T2, R5	PPT, Solved Problems, Assignment	8
5	Unit V	Riveted & Welded Joints, Dams, Stability & Stress Analysis	9	T2, R5	Chalk & Talk, Diagrams, Case Study	9

Topic Beyond Syllabus Planning

S.No	Topic Beyond Syllabus	Periods	Methodology	Textbook / References / Web Sources
1	Introduction to Non-Destructive Testing (NDT)	2	Seminar / Assignment	NDT Handbook, NPTEL, asminternational.org
2	Basics of Finite Element Analysis (FEA)	3	Seminar / Assignment	FEA Basics Texts, engineeringtoolbox.com
3	Advanced Composite Materials	2	Seminar / Assignment	Composite Materials Handbook, theconstructor.org
4	Modern Welding Techniques (MIG/TIG/Friction Weld)	2	Seminar / Assignment	Welding Technology by O.P. Khanna, YouTube Edu
5	Sustainable & Eco-friendly Construction Materials	2	Seminar / Assignment	Sustainability journals, NPTEL, research articles

Note: Bloom's Taxonomy Levels

BTL1-Remember	**BTL2 – Understand**	**BTL3 –Apply**
BTL4-Analyze	**BTL5 –Evaluate**	**BTL6–Create**

Text Books (T) / Reference Books (R) / Additional Books (A)

T / R / A	Book Title / Author / Publication
T1	*Strength of Materials* – R.K. Bansal, Laxmi Publications
T2	*Strength of Materials* – S.S. Bhavikatti, New Age International
R1	*Mechanics of Materials* – Ferdinand P. Beer & E. Russell Johnston, McGraw Hill
R2	*Strength of Materials* – S. Ramamrutham, Dhanpat Rai Publications
R3	*Strength of Materials* – Andrew Pytel & J.L. Singer, Harper Collins
A1	*Engineering Materials* – William D. Callister, Wiley

T / R / A	Book Title / Author / Publication
A2	NPTEL Course: *Strength of Materials / Mechanics of Materials* – IIT Madras / IIT Kanpur
A3	*Materials Science and Engineering* – V. Raghavan, PHI Learning

ASSESSMENT METHODOLOGIES-DIRECT

☑ASSIGNMENTS	☑ STUD. SEMINARS	☑TESTS/MODEL EXAMS	☑UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☑ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☑ STUDENT FEEDBACK ON FACULTY (TWICE)
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by **Approved by**