Savitribai Phule Pune University, Pune, Maharashtra, India

Faculty of Science and Technology

National Education Policy (NEP) – 2020 Compliant Curriculum

Second Year

Printing & Packaging Technology

(2024 Pattern)

(With effect from Academic Year 2025-26)

CONTENTS

ABBREVIATIONS & NOMENCLATURE

PPT	:	Printing and Packaging Technology
AEC	:	Ability Enhancement Course
AICTE	:	All India Council for Technical Education
CEP	:	Community Engagement Project
EEM	:	Entrepreneurship/Economics/Management Courses
MDM	:	Multidisciplinary Minor
MOOC	:	Massive Open Online Course
NEP	:	National Education Policy
NPTEL	:	National Programme on Technology Enhanced Learning
OE	:	Open Elective
PCC	:	Program Core Course
PEO	:	Programme Educational Objectives
PSO	:	Program Specific Outcomes
SWAYAM	:	Study Webs of Active-Learning for Young Aspiring Minds
UGC	:	University Grants Commission
VEC	:	Value Education Course
VSE	:	Vocational and Skill Enhancement
WK	:	Knowledge and Attitude Profile

PREFACE

We, the members of the Board of Studies in Printing and Packaging Technology, are pleased to present the Second Year Printing and Packaging Technology syllabus, effective from the Academic Year 2025–26. This curriculum will further progress into the Third and Final Years during the Academic Years 2026–27 and 2027–28, respectively. The printing and packaging industry continues to evolve rapidly, driven by technological innovations, sustainability demands, and advancements in digital printing, smart packaging, and material science. Recognizing the importance of staying aligned with these industry shifts, we have developed this comprehensive syllabus to equip students with both core engineering knowledge and hands-on skills essential to modern printing and packaging applications.

This syllabus has been carefully curated to provide a balanced academic experience, integrating theoretical concepts, laboratory practices, and exposure to emerging technologies. It adheres to the vision and framework of the National Education Policy (NEP) 2020 and aligns with the academic guidelines of Savitribai Phule Pune University, AICTE, UGC, and national accreditation standards. Emphasis has also been placed on interdisciplinary learning, industry relevance, and skill-based education. Students are encouraged to take advantage of self-learning opportunities through online courses, internships, minor projects, and certifications, which will complement their academic growth and enhance employability. The inclusion of value education, ethics, and sustainability also prepares them to meet the global challenges with responsibility and innovation.

We extend our sincere gratitude to the faculty members, students, alumni, industry professionals, and academic stakeholders for their valuable contributions and insights in shaping this forward-looking syllabus. We are confident that this curriculum will lay a strong foundation for students to become future-ready professionals and innovators in the printing and packaging domain.

-Prof. Dr. M. M. Bhoomkar, Chairman and Members of Board of Studies (Printing and Packaging Technology) Savitribai Phule Pune University

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

PEO 1: Evaluate and adapt to the rapidly evolving advancements in pre-press, color and design, printing, and packaging industries.

PEO 2: Design and integrate innovative business processes with a strong focus on delivering customer satisfaction in their professional roles.

PEO 3: Implement eco-friendly printing practices, emphasizing energy and resource conservation and reducing carbon footprints.

PEO 4: Contribute to research in emerging areas of printing and packaging technologies.

PEO 5: Develop and optimize systems to minimize costs and enhance productivity in commercial printing and packaging industry.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Establish sound theoretical knowledge with expertise and skill in pre-press, press, post-press of various printing processes and packaging.

PSO2: Utilization of analysis tools for problem solving and investigation of quality in printing and packaging.

PSO3: Ability to acquire managerial skills.

KNOWLEDGE AND ATTITUDE PROFILE (WK)

Code	Description
WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2	Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

PROGRAM OUTCOMES

Program Outcomes are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skill, knowledge, attitude and behavior that students acquire through the program. On successful completion of **B.E. in Printing and Packaging Technology**, graduating students/graduates will be able to

PO	Program Outcome	Mapped Knowledge Criteria (WK)
PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals, and an engineering specialization to develop solutions for complex engineering problems.	WK1 to WK4
PO2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems, reaching substantiated conclusions with consideration for sustainable development.	WK1 to WK4
PO3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems, components or processes to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society, and environment.	WK5
PO4	Conduct Investigations of Complex Problems: Use research-based knowledge including design of experiments, modeling, analysis and interpretation of data to provide valid conclusions.	WK8
PO5	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling, recognizing their limitations.	WK2 and WK6
PO6	The Engineer and the World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for their impact on sustainability, with reference to economy, health, safety, legal framework, culture, and environment.	WK1, WK5 and WK7

PO	Program Outcome	Mapped Knowledge Criteria (WK)
PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national and international laws.	WK9
PO8	Individual and Collaborative Teamwork: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.	–
PO9	Communication: Communicate effectively and inclusively within the engineering community and society at large; comprehend and write effective reports, design documentation, and make presentations considering cultural, language, and learning differences.	–
PO10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making to one's work, as a member and leader in a team, and to manage projects in multidisciplinary environments.	–
PO11	Life-Long Learning: Recognize the need for and have the ability for (i) independent and life-long learning, (ii) adaptability to new and emerging technologies, and (iii) critical thinking in the context of technological change.	WK8

GENERAL RULES AND GUIDELINES

Term	Definition
Course Outcomes (COs)	Course Outcomes are narrower statements that describe what students are expected to know and be able to do at the end of each course. These relate to the skills, knowledge, and behavior that students acquire throughout the course.
Assessment	Assessment is one or more processes, carried out by the institution, that identify, collect, and prepare data to evaluate the achievement of Program Educational Objectives (PEOs) and Program Outcomes (POs).
Evaluation	Evaluation is one or more processes, performed by the Evaluation Team, to interpret the data and evidence gathered through assessment practices. It determines how well PEOs or POs are being achieved and informs decisions for improvement.

GUIDELINES FOR EXAMINATION SCHEME

Theory Examination: The theory examination shall be conducted in two different parts Comprehensive Continuous Evaluation (CCE) and End-Semester Examination (ESE)

Assessment and Evaluation shall be conducted in two parts:
1. Comprehensive Continuous Evaluation (CCE)
2. End-Semester Examination (ESE)

Component	Description	Marks
Comprehensive Continuous Evaluation (CCE)	Conducted at institute level, covering all Units of the syllabus. The design and mark allocation follow the Continuous Assessment Sheet structure.	30
End-Semester Examination(ESE)	Conducted at university level, typically covering the entire syllabus through summative examination.	70
	Total Marks per Subject	**100**

A) Comprehensive Continuous Evaluation (CCE)

1. CCE of 30 marks based on all the Units of course syllabus to be scheduled and conducted at institute level.
2. Case studies included under each unit are intended to support applied learning and are part of Comprehensive Continuous Evaluation
3. These case studies will be assessed through internal assessment components such as presentations, assignments, or group discussions. They shall not be included in the End-Semester Theory Examination.
4. To design a Comprehensive Continuous Evaluation scheme for a theory subject of 30 marks with the specified parameters, the allocation of marks and the structure can be detailed as follows:

Comprehensive Continuous Evaluation (CCE) scheme for a theory subject of 30 marks with the specified parameters, the allocation of marks and the structure can be as per continuous assessment sheet.

Sr No	Parameters	Marks	Coverage of Units
1	Unit Test	12	Units 1 & Unit 2 (6 Marks per Unit)
2	Assignments / Case Study	12	Units 3 & Unit 4 (6 Marks per Unit)
3	Seminar Presentation / Open Book Test / Quiz	6	Unit 5

CCE of 15 marks based on all the Units of course syllabus to be scheduled and conducted at institute level. To design a Comprehensive Continuous Evaluation (CCE) scheme for a theory subject of 15 marks with the specified parameters, the allocation of marks and the structure can be detailed as follows:

Sr No	Parameters	Marks	Coverage of Units
1	Unit Test	10	Units 1 & Unit 2 (5 Marks per Unit)
3	Seminar Presentation / Open Book Test / Quiz	5	Unit 3 and 4

FORMAT AND IMPLEMENTATION OF COMPREHENSIVE CONTINUOUS EVALUATION (CCE)

- **Unit Test**

Format: Questions designed as Bloom's Taxonomy guidelines to assess various cognitive levels (Remember, Understand, Apply, Analyze, Evaluate, Create).

Implementation: Schedule the test after completing Units 1 and 2. Ensure the question paper is balanced and covers key concepts and applications.

- **Sample Question Distribution**

– Remembering (2 Marks): Define key terms related to [Topic from Units 1 and 2].
– Understanding (2 Marks): Explain the principle of [Concept] in [Context]
– Applying (2 Marks): Demonstrate how [Concept] can be used in [Scenario]
– Analyzing (3 Marks): Compare & contrast [Two related concepts] from Units 1 and 2
– Evaluating (3 Marks): Evaluate the effectiveness of [Theory/Model] in [Situation].

- **Assignments / Case Study:**

Students should submit one assignment, or one Case Study Report based on Unit 3 and one assignment or one Case Study Report based on Unit 4.

Format: Problem-solving tasks, theoretical questions, practical exercises, or case studies that require in-depth analysis and application of concepts

Implementation: Distribute the assignments or case study after covering Units 3 and 4. Provide clear guidelines and a rubric for evaluation.

- **Seminar Presentation:**

Format: Oral presentation on a topic from Unit 5, followed by a Q&A session. Deliverables: Presentation slides, a summary report in 2 to 3 pages, and performance during the presentation.

Implementation: Schedule the seminar presentations towards the end of the course. Provide students with ample time to prepare and offer guidance on presentation skills.

- **Open Book Test**:

Format: Analytical and application-based questions to assess depth of understanding

Implementation: Schedule the open book test towards the end of the course, ensuring it covers critical aspects of Unit 5.

- **Quiz**:

Format: Quizzes can help your students practice existing knowledge while stimulating interest in learning about new topics in that course. You can set your quizzes to be completed individually or in small groups.

Implementation: Online tools and software can be used to create quiz. Each quiz is made up of a variety of question types including multiple choice, missing words, true or false etc.

- **Example Timeline for conducting CCE:**

Weeks 1-4 : Cover Units 1 and 2
Week 5 : Conduct Unit Test (12 marks)
Weeks 6-8 : Cover Units 3 and 4
Week 9 : Distribute and collect Assignments / Case Study (12 marks)
Weeks 10-12 : Cover Unit 5
Week 13 : Conduct Seminar Presentations or Open Book Test or Quiz (6 marks)

- **Evaluation and Feedback:**

Unit Test: Evaluate promptly and provide constructive feedback on strengths and areas for improvement.

Assignments / Case Study: Assess the quality of submissions based on the rubric decided. Offer feedback to help students understand their performance.

Seminar Presentation: Evaluate based on content, delivery, and engagement during the Q&A session. Provide feedback on presentation skills and comprehension of the topic.

Open Book Test: Evaluate based on the depth of analysis and application of concepts. Provide feedback on critical thinking and problem-solving skills.

- **Industrial Visit**

An industrial visit should be planned in alignment with the subject's scope and should particularly address advancements in the respective field. The purpose is to provide students with exposure to actual engineering practices and systems.

Assessment of industrial visits should be carried out using any of the following tools:

Quiz (based on the visit), Interactive video or oral discussion, submission of a detailed visit report

- **Guest Lectures**

Guest lectures should be relevant to the course and highlight advanced topics or recent trends in the field. Subject experts from academia or industry may be invited.

Assessment methods for guest lectures may include:

Quiz conducted post-lecture, Attendance monitoring, Evaluation of attentiveness and participation
Rubrics can be developed, if possible, to objectively assess student involvement in guest lectures.

END-SEMESTER EXAMINATION (ESE)

End-Semester Examination (ESE) of 70 marks written theory examination based on all the unit of course syllabus scheduled by university. Question papers will be sent by the University through QPD (Question Paper Delivery). University will schedule and conduct ESE at the end of the semester.

Format and Implementation:

- **Question Paper Design:** Below structure is to be followed to design an End-Semester Examination (ESE) for a theory subject of 70 marks on all 5 units of the syllabus with questions set as per Bloom's Taxonomy guidelines and 14 marks allocated per unit.

- **Balanced Coverage**: Ensure balanced coverage of all units with questions that assess different cognitive levels of Bloom's Taxonomy: Remember, Understand, Apply, Analyze, Evaluate, and Create. The questions should be structured to cover:
    - Remembering: Basic recall of facts and concepts.
    - Understanding: Explanation of ideas or concepts.
    - Applying: Use of information in new situations.
    - Analyzing: Drawing connections among ideas.
    - Evaluating: Justifying a decision or course of action.
    - Creating: Producing new or original work (if applicable).

Detailed Scheme for 70 Marks:

Unit-Wise Allocation (14 Marks per Unit): Each unit will have a combination of questions designed to assess different cognitive levels. By following this scheme, you can ensure a comprehensive and fair assessment of students' understanding and application of the course material, adhering to Bloom's Taxonomy guidelines for cognitive skills evaluation.

Detailed Scheme for 35 Marks:

Unit-Wise Allocation (08 Marks for Unit 1, 09 Marks for Unit 2, Unit 3 and Unit 4) : Each unit will have a combination of questions designed to assess different cognitive levels. By following this scheme, you can ensure a comprehensive and fair assessment of students' understanding and application of the course material, adhering to Bloom's Taxonomy guidelines for cognitive skills evaluation.

NEP 2020 Compliant Curriculum Structure

Second Year Engineering (2024 Pattern)

Course Code	Type of Course	Course Title	Teaching Scheme (Hrs./week)			Examination Scheme and Marks						Credits			
			Theory	Tutorial	Practical	CCE*	End-Sem	Term work	Practical	Oral	Total	Theory	Tutorial	Practical	Total
Semester III															
PCC-201 PPT	Major Course 1	Introduction to Printing Processes	3			30	70				100	3			3
PCC-202PPT	Major Course 2	Material Science in Printing and Packaging	3			30	70				100	3			3
PCC-203 PPT	Major Course 3	Introduction to Packaging Concepts	3			30	70				100	3			3
PCC-204 PPT	Practical Lab 1	Printing Process Practical 1			4			25	50		75			2	2
PCC-205 PPT	Practical Lab 2	Printing Materials Practical 2			2			25	25		50			1	1
	*Open Elective 1	Open Elective - I	2			15	35				50	2			2
MDM-206 PPT	Multidisciplinary Minor	Engineering Mathematics 3	2			30	70				100	2			2
EEM-207 PPT	Entrepreneurship/ Economics/Management Course	Basics of Management and Organizational Behavior		1	2			25			25		1	1	2
VEC-208 PPT	Value Education Course	Universal Human Values	2			15	35				50	2			2
CEP-209 PPT	Community Engagement Project	Community Engagement Project			4			25		25	50			2	2
			15	**1**	**12**	**150**	**350**	**100**	**75**	**25**	**700**	**15**	**1**	**6**	**22**

CCE*: Comprehensive Continuous Evaluation

Second Year Printing & Packaging Technology (2024 Pattern)

NEP 2020 Compliant Curriculum Structure

Second Year Engineering (2024 Pattern)

Course Code	Type of Course	Course Title	Teaching Scheme (Hrs./week)			Examination Scheme and Marks						Credits			
			Theory	Tutorial	Practical	CCE*	End-Sem	Term work	Practical	Oral	Total	Theory	Tutorial	Practical	Total
Semester IV															
PCC-210 PPT	Major Course 4	Fundamentals of Prepress	3			30	70				100	3			3
PCC-211 PPT	Major Course 5	Post Press Operations	3			30	70				100	3			3
PCC-212 PPT	Major Course 6	Wood Glass and Metal based Packaging	2			30	70				100	2			2
PCC-213 PPT	Practical Lab 1	Pre-press Techniques			2			25	25		50			1	1
PCC-214 PPT	Practical Lab 2	Print Finishing Techniques			2				25		25			1	1
	*Open Elective 2	Open Elective - II	2			15	35				50	2			2
MDM-215 PPT	Multidisciplinary Minor	Printing Digital Electronics	2			30	70				100	2			2
VSCE-216 PPT	Vocational Skill Enhancement Course	Visual Arts and Communication Skills			4			25	25		50			2	2
AEC-217 PPT	Ability Enhancement Course	Modern Indian Language (Marathi/Hindi)		1	2			50			50		1	1	2
EEM-218 PPT	Entrepreneurship/Economics/Management Course	Intellectual Property Rights		1	2			25			25		1	1	2
VEC-219 PPT	Value Education Course	Environmental Studies	2			15	35				50	2			2
Total			**14**	**2**	**12**	**150**	**350**	**125**	**75**		**700**	**14**	**2**	**6**	**22**

CCE: Comprehensive Continuous Evaluation

***Note: Students can opt for Open Electives offered by different faculty like Arts, Science, Commerce, Management, Humanities or Inter-Disciplinary studies.**

- **Example – Open Elective I - Financial Accounting, Digital Finance, Digital Marketing can be opted from the Commerce and Management faculty.**
- **Elective II - Project Management, Business Analytical, Financial Management can be opted from Inter-Disciplinary studies, Commerce and Management faculty respectively.**

Savitribai Phule Pune University, Pune, Maharashtra, India

Faculty of Science and Technology

National Education Policy (NEP) Compliant Curriculum

Second Year Printing & Packaging Technology (2024 Pattern)

Semester-III

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Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
Course Code: PCC-201PPTCourse Name: Introduction to Printing Processes

Teaching Scheme	Credit	Examination Scheme
Theory: 3 Hours/Week	**03**	**CCE: 30 Marks** **End-Semester: 70 Marks**

Prerequisite Courses, if any:

- Basic Knowledge of Physics and Chemistry

Course Objectives:

1. To introduce the fundamentals and history of printing along with pre-press operations.
2. To explain the principles of printing processes and post-press finishing techniques.
3. To develop understanding of design, layout creation, and color theory.
4. To provide knowledge of screen-printing tools, mesh types, and squeeze techniques.
5. To equip students with skills in screen preparation, halftone processing, and practical printing applications.

Course Outcomes:

CO1: Describe the basic concepts, history, and pre-press workflow of printing.
CO2: Identify and differentiate various printing methods and post-press techniques.
CO3: Apply the principles of design, layout, and color theory in print media.
CO4: Select suitable screen-printing materials and explain the function of mesh and squeeze tools.
CO5: Perform screen preparation techniques and execute basic screen-printing applications.

Course Contents

Unit I	Introduction to Printing and Pre-Press	(07 Hours)

Definition of Printing Processes, History of Printing Process, Introduction of Printing Processes, □ Pre-Press, Printing Workflow, Typography – 2D and 3D Typefaces, Family, Series of Type, Legibility and Readability, Type Measurement, Type Alignment and Arrangement, Desktop Publishing (DTP) and Camera Processing, Types of Originals, Conversion to Film Output – Negative, Positive and Tracing , Computer-to-Plate (CTP) Technology

Unit II	Printing Processes and Post-Press Techniques	(07 Hours)

Principles of Printing Processes, Impact and Non-Impact Printing Processes, Binding Techniques—Hard Binding, Paperback Binding, Mechanical Loose-Leaf Binding, Finishing Techniques – Punching, Embossing, Foiling, Lamination, Varnishing.

Unit III	Design, Layout, and Color Theory	(07 Hours)

Introduction to Graphic Design, Fundamentals of Design, Principles of Design, Layout – Purpose and Advantages, Layout Styles, Layout Components, Stages in Preparing a Layout – Marking-Up, Dummy, Thumbnails, Rough Layout, Comprehensive Layout, Color – Definition of Color, Light, Electromagnetic Spectrum, Additive Color Theory, Subtractive Color Theory

Unit IV	Screen Printing Materials and Tools	(07 Hours)

Definition of Screen Printing, Important Elements Affecting the Screen Printing Process, Frames – Purpose and Requirements, Types of Materials, Types of Sections, Frame Size Selection Criteria, Squeeze – Purpose and Requirements, Types of Squeezes, Applications, Mesh – Purpose and Requirements, Types – PET, Polypropylene, Nylon, Stainless Steel, etc, Mesh Geometry – Mesh Count and Thread Diameter, Mesh Opening, Mesh Weave, Mesh Color, Role of Thread Diameter – Ink Transfer, Fabric Area, Color and Thickness, Dot Reproduction

Unit V	**Stretching and Stencil Preparation Gluing, Prepress and Halftone**	**(07 Hours)**

Stretching – Preparation for Stretching – Grinding, Cleaning, Base Coat, Types of Stretching – Mechanical, Pneumatic, Gluing – Types and Selection of Glue, Marking Screen Details, Pre-Press – Designing Text, Line, and Graphics, Halftone – Screen Angle, Dot Calculation, Separation of 4 Colors, Stencil Preparation – Workflow, Coating – Print Side and Squeeze Side, Exposing, Printing Applications – Commercial, Textile, Industrial Purposes (Advertising, Graphic Overlays, Polycarbonate, Dial Gauges, Gaskets, Automotive Products, PCB, PE),

Learning Resources

Textbooks:

[T1] Handbook of Printing Technology, (2008), ISBN: 9788186732755, EIRI
[T2] NIIR Board, Screen Printing Technology Handbook, (2017), ISBN 10: 8178330539 / ISBN 13: 9788178330532, Asia Pacific Business Press Inc.
[T3] Jane Sampson, (2017), Screen-printing, ISBN-10: 9780719810008/ ISBN-13: 978- 0719810008, ASIN: 0719810000, Crowood Press
[T4] Sardeep Singh (2014), Guide to Professional Screen

Reference Books:

[R1] H. Kipphan, (2001), Handbook of Print Media, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg
[R2] Rogue C. Parker, (1993), Looking Good in Print - A Guide to Basic Design for Desktop Publishing, 3rd edition, Ventana Pr.
[R3] Alastair Campbell, (1983), The Designers Handbook, Little Brown
[R4] N. N. Sarkar, (2013), Art and Print Production. 2nd edition, Oxford University Press, India

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
Course Code: PCC-202PPT
Course Name: Material Science in Printing and Packaging

Teaching Scheme	Credit	Examination Scheme
Lectures: 3 Hrs./ Week	03	CCE : 30 Marks End Sem : 70 Marks

Prerequisite Courses, if any:

- Applied Physics and Applied Chemistry

Course Objectives:

The objectives of the Course are:

1. Attain the basic technical knowledge of various materials used in different printing processes.
2. Know the importance of various types of printing inks and their properties required in different printing processes.
3. Identify the various grades of papers used for printing and packaging applications and their properties.
4. Explain paper and plastic as packaging material.
5. Justify use of glass, textiles, metals in the packaging industry.

Course Outcomes:

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

CO1: Apply the knowledge to use metals and polymers in printing and allied industry.
CO2: Analyze the characteristics of various raw material used in printing ink and formulate the best suitable ink for the printing application.
CO3: Analyze properties of paper for writing, printing, and packaging
CO4: Analyze the characteristics of various paper and plastic based raw materials used to manufacture packages and their properties for packaging and printing.
CO5: Apply the knowledge to use glass, textile and metals as packaging materials

Course Contents

Unit I	Image carriers used in various printing processes	(07 Hours)

Classification of metals: Ferrous and non-ferrous metals, Physical and mechanical properties of metals used in printing, Materials for image carriers: zinc, copper, aluminum, magnesium, steel, Surface treatments: coating, graining, anodizing, electroplating, Manufacturing and preparation of printing plates for: Offset (lithographic plates), Gravure (engraved cylinders), Flexography (photopolymer plates), Screen printing (metal and mesh screens), Durability, wear resistance, and corrosion behavior of image carriers, Technological advancements in plate-making materials

Unit II	Printing Inks, Properties and Testing	(07 Hours)

Composition of printing inks: pigments, resins (binders), solvents, additives, Classification of printing inks by process: offset, gravure, flexographic, screen, inkjet, digital, UV-curable inks, Ink properties:
Rheological: viscosity, tack, flow, Optical: color strength, gloss, transparency, Drying behavior:

absorption, evaporation, oxidation, polymerization, Interaction of ink with substrates Testing methods: Rub resistance, Gloss measurement, Light fastness and weather resistance, Ink adhesion test (tape test, crosshatch), Ink film thickness and density, Colorimetric evaluation using spectrophotometers, Regulatory and environmental considerations: low-VOC and sustainable inks

Unit III	Paper Manufacturing, Properties and Testing	(07 Hours)

Importance of paper and paper products in printing industry, Paper manufacturing process including Pulping, Bleaching, waste paper utilization and deinking, Stock preparation, Sizing, Different machines used for paper manufacturing, Single wire and Two wire, Pressing, Drying, Calendering, Super calendaring, Embossers etc., Different surface finishes obtained in paper, selection criteria of paper substrate for printing and converting applications Surface and Physical properties of paper such as GSM, thickness, density etc., strength properties of paper such as tensile, tearing, folding strength etc., chemical and optical properties of paper like pH, color, gloss, brightness and opacity, Importance of BIS and TAPPI standards for paper and its relation to printing industry.

Unit IV	Plastics and other packaging materials	(07 Hours)

Paper-based packaging materials: kraft paper, duplex board, solid bleached sulfate (SBS), corrugated fiberboard. Plastic packaging materials: polyethylene (LDPE, HDPE), polypropylene (PP), polyethylene terephthalate (PET), polyvinyl chloride (PVC), polystyrene (PS), biodegradable polymers (PLA, PHA), multilayer structures and films, co-extrusion, lamination, metallization of films. Metal packaging materials: aluminum foil, tinplate. Glass: inertness, recyclability, weight and fragility limitations, composite packaging materials and their applications. functional properties: moisture barrier, gas barrier, aroma barrier, puncture resistance, tensile strength, thermal sealing properties, sustainability: recyclability, biodegradability, life-cycle analysis.

Unit V	Chemicals and adhesives used in Printing industry	(07 Hours)

Printing chemicals: fountain solutions, plate cleaners, blanket washes, anti-setoff powders, drying aids, desensitizing solutions. Solutions used in gravure and flexo processes. Adhesives: water-based (starch, PVA), hot melt adhesives, pressure-sensitive adhesives (PSA), solvent-based adhesives, UV-curable adhesives, adhesive application techniques: lamination, folding cartons, label bonding, adhesion mechanisms: mechanical interlocking, surface energy, chemical bonding.

Textbooks:

[T1] L.C. Young, (1969), Printing Science, Pitman publication.
[T2] L.C. Young, (1973), Materials in Printing Processes, Focal Press publication.
[T3] D.S. Mathur, (2007), Properties of Matter, S. Chand and Co. Ltd.
[T4] Leach and Pierce, (1961), Printing Ink Manual, Springer Publication.
[T5] Dr. Nelson R. Eldred, (2001), What Printer Should Know About Ink, GATF Press, Pittsburgh
[T6] Lawrence A. Wilson, 3rd Edition, What Printer Should Know About Paper, GATF Press, Pittsburgh
[T7] E.A. Apps, 1969 edition, Printing Ink technology, Leonard Hills, London Publication.
[T8] A.J. Athaley, (2002), Plastics in Packaging, Multi-tech Publication
[T8] S. Natarajan, M. Govindarajan, B. Kumar, 2nd edition, 2014, Fundamentals of Packaging Technology, PHI Learning
[T9] Preeti Singh, Horst-Christian Langowski, 1stedition Food Packaging Materials, CRC Press

Reference Books:

[R1] R. Holman, 3 rd Edition, Technology of Printing Inks, All India PIMA Publication
[R2] C. H. Williams, (2001), Printing Ink Technology, PIRA UK Publication
[R3]K.W. Britt,(2004), Handbook of Pulp and Paper technology, CBS Publishers
[R4]P. J. Hartsuch, (1961), Chemistry of Lithography, GATF Publication
[R5] Dara.S. S., (2010), A Textbook of Engineering Chemistry, S. Chand & Company Ltd., New Delhi.
[R6]B. Sivasankar., (2008), Engineering Chemistry, TATA McGraw Hill, 2008
Kenneth G. Budinski, Michael K. Budinski., (2010), Engineering Materials: Properties and Selection, Pearson Publication
[R7] P. Kannan and A. Ravi Krishnan, 9th edition- 2009, "Engineering Chemistry", Sri Krishna Hitech Company (P) Ltd, Chennai.
[R8] Gauri Shankar Misra, (2010), Introductory Polymer Chemistry, New Age
[R9] Bauer E., Pharmaceutical Packaging Handbook, 1st Edition- 2009, CRC Press
[R10] D. Selke, S. E. M., Culter, J. D. and Hernandez, R. J., (2004) "Plastics Packaging Properties, processing, Applications and Regulation", Carl Hanser Verlag, USA
[R11] A. Soroka W., 3rd Ed 2002 "Fundamentals of Packaging Technology", IoPP
[R12] F. A. Paine, 1990, The Packaging User's Handbook, Springer

MOOC / NPTEL/YouTube Links:

https://nptel.ac.in/courses/127106237?
https://nptel.ac.in/courses/112/107/112107221/

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
Course Code: PCC-203PPT Course Name: Introduction to Packaging Concepts

Teaching Scheme	Credit	Examination Scheme
Theory:3 Hours/Week	03	CCE :30 Marks End-Semester :70 Marks

Prerequisite Courses, if any:

Basic understanding of materials science and engineering

Course Objectives:

1. To provide an in-depth understanding of the need and evolution of packaging in modern industries.
2. To familiarize students with the basic requirements and different types of packaging methods used in various sectors.
3. To teach students the significance of packaging as a marketing tool and how it influences consumer behavior.
4. To examine the relationship between product characteristics and packaging materials, and how they affect the packaging design process.
5. To introduce the importance of quality standards and testing in the packaging industry and highlight the role of sustainability in packaging practices

Course Outcomes:

CO1: Understand the various functions and evolution of packaging in modern industry, and identify packaging requirements, types, and associated hazards.

CO2: Demonstrate knowledge of graphic design elements and their significance in package design.

CO3: Evaluate the impact of packaging as a marketing tool and recognize its importance in brand loyalty and consumer decision-making.

CO4: Analyze the relationship between product characteristics and packaging, and design appropriate packaging solutions.

CO5: Apply quality standards and testing procedures to assess packaging performance and recognize the importance of sustainability in packaging practices.

Course Contents

Unit I	**Introduction to Packaging**	**(07 Hours)**

Need & Evolution of Packaging, Definitions of Packaging, Basic Functions of Packaging: Protection, Preservation, Containment, Machinability, Communication, Re-use, and Recyclability. Types of Packaging, Packaging Hazards: Storage, Transportation, Chemical, Climatic, Biological

Unit II	**Elements for Package Design**	**(07 Hours)**

Graphic Design Elements for a Package: Significance of Shape, Size, Color, Typography and Font in Packaging, Texture and Line Elements in Design, Balance & Unity, Symmetry and Harmony, Iconography, Symbols, and Imagery in Packaging Design, Branding Through Design Elements and Packaging

Unit III	**Product-Package Relationship**	**(07 Hours)**

Product Characteristics: Physical (Nature, Shape, Size, Texture, Centre of Gravity, etc.), Chemical (Acidic, Basic, Reactivity, etc.), Biological (Effect of Micro-organisms), Effect of Moisture, Oxygen, and Other Gases, Package Characteristics: Material (Plastic, Paper, Wood, etc.), Physical (Tensile, Breaking Load, Burst, Molecular/Fiber Direction, etc.), Chemical (Unreacted Chemicals Present, pH, etc.), Biological (Sensitivity to Micro-organisms), Permeability (Barrier Properties—Absorption/Diffusion of Moisture and Gases),

Unit IV	**Packaging: A Marketing Tool**	**(07 Hours)**

Packaging and Market Positioning, Understanding Consumer Behavior: Demographics, Psychographics, Role in the Retail Market , Influence on Brand Loyalty, Packaging Industry trends, Consumer Lifestyle Targeting, Material and Structural Innovations in Packaging

Unit V	**Quality Standards in Packaging**	**(07 Hours)**

Need for and Importance of Quality Control in Packaging, Significance of Specifications, Significance of Testing, Packaging Standards, Conditioning, Sampling, Package Testing, Environmental considerations and Waste Management, Packaging Scenario—World and India, Comparison, Scope, and Growth in India. Packaging Laws and Regulations,

Learning Resources

Textbooks:

[T1] Soroka W., (2002), Fundamentals of Packaging Technology, 3rd Ed, IoPP.
[T2] Paine F. A., (1991), Packaging User's Handbook, 1st Ed, Blackie Academic &Professional.
[T3] Byett J. et al., (2001), Packaging Technology, 2nd Ed, The Institute of Packaging (SA).

Reference Books:

[R1] Selke, S. E. M., Culter, J. D. and Hernandez, R. J., (2004), Plastics Packaging: Properties, Processing, Applications and Regulation, Carl Hanser Verlag, USA.
[R2] Joseph F. H, Robert J. K, Hallie F, (1998), Handbook of Package Engineering, 3rd Ed., Technomic Publishing.
[R3] Yam K. L., (2009), The Encyclopedia of Packaging Technology", 3rd Ed. Wiley

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
Course Code: PCC-204 PPT Printing Process Practical 1

Teaching Scheme	Credit	Examination Scheme
Practical: 4 Hours/Week	02	Term Work: 25 Marks Practical: 50 Marks

Course Objectives:

1. To understand the fundamentals of screen-printing processes and stencil preparation techniques.
2. To impart hands-on experience in single-color and multi-color screen printing on various substrates.
3. To explore digital design skills using CorelDRAW for print and packaging applications.
4. To develop proficiency in creating layouts, packaging designs, and prepress-ready files.
5. To integrate traditional printing methods with modern digital tools for real-world industry applications.

Course Outcomes:

CO1: Able to demonstrate screen printing processes using different stencil methods.
CO2: Apply suitable techniques for single-color and multi-color printing on paper and fabric.
CO3: Design professional packaging and print materials using CorelDRAW.
CO4: Create print-ready designs with appropriate layout, color mode, and export settings.
CO5: Integrate manual and digital printing processes to meet product packaging and branding needs.

Course Contents

Guidelines for Instructor's Manual

The instructor's manual/Lab Manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about university/program/ institute/ department / foreword/ preface), curriculum of course, conduction and Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/guidelines, references.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes

Guidelines for Laboratory/Term Work Assessment

Continuous assessment of laboratory work should be done based on overall performance and Laboratory assignments performance of student. Each Laboratory assignment assessment should be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include timely completion performance, innovation, efficient codes, punctuality and neatness.

Second Year Printing & Packaging Technology (2024 Pattern)

List of Laboratory Experiments. All experiments are to be performed in both groups.

GROUP A

1. Study of screen-printing materials and frame preparation techniques
   ~Understanding mesh types, frame selection, and screen stretching methods.
2. Screen preparation using hand-cut stencil method and single-color printing on paper
   ~Creating a basic design using manual stencil cutting and executing single-color prints.
3. Screen preparation using direct photographic method and two-color printing on paper
   ~Applying emulsion coating and UV exposure to create detailed two-color prints.
4. Screen preparation using direct-indirect photographic method for multi-color printing on paper
   ~Combining film-based and emulsion methods for accurate multi-color registration.
5. Raised (embossed) effect printing on paper using screen printing techniques
   ~Exploring specialty inks and layering techniques to achieve raised print effects.
6. Four-color process printing on paper using direct-indirect photographic method
   ~Preparation and registration for CMYK screen printing with halftone separations.
7. Single-color screen printing on fabric substrates
   ~Learning textile ink application and curing methods for fabric printing.
8. Two-color screen printing on fabric substrates
   ~Color registration and layering techniques for printing on t-shirts or cotton fabrics.
9. Dye sublimation printing on rigid substrates (e.g., ceramic tiles or mugs)
   ~Transferring full-color prints using heat press technology on ceramic surfaces.
10. Dye sublimation printing on fabric materials (e.g., polyester fabric)
    ~Creating vibrant and durable textile prints using sublimation inks and heat transfer.

GROUP B

1. Introduction to CorelDRAW interface, tools, and workspace customization
   ~Familiarization with UI elements, toolbars, document setup, and customization for design workflow efficiency.
2. Designing a professional logo using shape tools, text effects, and node editing
   ~Creating vector-based logos with custom shapes, typography, and brand-consistent aesthetics.
3. Design and layout of a visiting card with bleed and cut marks
   ~Developing standard-size business cards with aligned text, logos, and export-ready print setup.
4. Designing a product label for FMCG packaging with brand elements and compliance markings
   ~Understanding hierarchy, nutrition info placement, barcode integration, and label size adaptation.
5. Creating a die-line layout and artwork for a box package (primary or secondary)
   ~Drawing die lines using guidelines, adding safety margins, folds, and design elements within print area.
6. Designing an advertising poster for product promotion using visual hierarchy and color theory
   ~Creating high-impact posters using grids, large-format design techniques, and raster-vector integration.
7. Integrating barcode and QR code in packaging artwork

~Generating scannable barcodes and QR codes, resizing appropriately, and placing them within design as per print guidelines.

8. Brochure / leaflet design with multi-fold layouts and text/image composition
   ~Designing informative and attractive brochures using layout planning for bi-fold, trifold, or Z-fold formats.
9. Designing 2D labels for cylindrical packaging (cans, bottles, jars)
   ~Developing curved-surface label designs with correct sizing, contour fitting, and mock-up visualization.
10. Prepress workflow: Color management, bleed setup, and exporting print-ready PDF
    ~Performing design checks, setting CMYK color mode, resolution, bleed, and exporting with crop marks for commercial printing.

Reference Books

1. Botello, C. (2018). *The CorelDRAW X8 user guide*. San Diego, CA: Course Technology.
2. Ambrose, G., & Harris, P. (2011). *Packaging the brand: The relationship between packaging design and brand identity*. Lausanne, Switzerland: AVA Publishing.
3. Gavin, A. (2012). *The poster: A visual history*. London, UK: Thames & Hudson.
4. Laudon, A. C., & Laudon, J. P. (2019). *Graphic design solutions* (6th ed.). Boston, MA: Cengage Learning.
5. Kipphan, H. (2001). *Handbook of print media: Technologies and production methods*. Berlin, Germany: Springer.
6. Ruggles, A. (2009). Screen printing: A contemporary guide to the technique. New York, NY: Watson-Guptill.
7. Miles, L. (2012). Textile printing (2nd ed.). Cambridge, UK: Woodhead Publishing.
8. Ujiie, H. (2006). Digital printing of textiles. Cambridge, UK: Woodhead Publishing.
9. Scott, A. (1996). The complete printmaker: Techniques, traditions, innovations (2nd ed.). New York, NY: Free Press.

Online Courses

CorelDRAW Essential Training – LinkedIn Learning
linkedin.com/learning/coreldraw-essential-training
Graphic Design Specialization – Coursera (CalArts)
coursera.org/specializations/graphic-design
https://www.skillshare.com/classes/Screen-Printing-for-Beginners-Printing-on-Paper-and-Fabric/1447964997
https://blog.spoonflower.com/

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
PCC-205 PPT Printing Materials Practical 2

Teaching Scheme	Credit	Examination Scheme
Practical: 2 Hours/Week	01	Term Work: 25 Marks Practical: 25 Marks

Course Objectives:

1. To understand and identify various packaging materials including plastic films, paper-based substrates, and their structural properties.
2. To familiarize students with the physical and mechanical testing methods of packaging materials such as tensile, tear, and surface strength.
3. To develop hands-on skills in measuring critical surface properties like contact angle, surface tension, gloss, smoothness, and porosity.
4. To explore functional characteristics of packaging materials related to printability, moisture resistance, and substrate adhesion.
5. To introduce students to different types of adhesives used in packaging and understand their application techniques and adhesion mechanisms.

Course Outcomes:

CO1: Identify and classify different types of plastic, paper, and composite packaging materials based on structure and application.

CO2: Accurately perform material testing procedures including GSM, caliper thickness, tensile and tear strength using standard instruments.

CO3: Analyze surface properties of substrates by measuring contact angle, surface tension, gloss, smoothness, and porosity.

CO4: Evaluate functional properties of packaging substrates such as moisture barrier, opacity, and ink adhesion suitability.

CO5: Demonstrate understanding of various adhesive types, their applications, and bonding performance on different packaging materials.

Course Contents

Guidelines for Instructor's Manual

The instructor's manual/Lab Manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about university/program/ institute/ department / foreword/ preface), curriculum of course, conduction and Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/guidelines, references.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes

Guidelines for Laboratory/Term Work Assessment

Continuous assessment of laboratory work should be done based on overall performance and Laboratory assignments performance of student. Each Laboratory assignment assessment should be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include timely completion performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Experiments.

1. Identification of various types of plastic films used in packaging
2. Measurement of contact angle of liquid ink and surface energy of substrate
3. Measurement of surface tension of ink using the Du Noüy ring method
4. Determination of tensile strength of multi-layer packaging materials
5. Measurement of tear strength of paper-based and multi-layer materials
6. Measurement of viscosity of paste and liquid ink using viscometers
7. Determination of GSM (grammage) and caliper (thickness) of substrates
8. Identification of top/bottom sides and machine/cross direction of paper
9. Determination of Cobb value and measurement of paper opacity
10. Measurement of brightness and gloss of paper and film substrates
11. Measurement of smoothness and porosity of substrates
12. Study and comparison of different adhesives used in packaging applications

Reference Books

1. **Soroka, W. (2009).** *Fundamentals of packaging technology* (4th ed.). Naperville, IL: Institute of Packaging Professionals.
2. **Kipphan, H. (2001).** *Handbook of print media: Technologies and production methods.* Berlin, Germany: Springer.
3. **Ahvenainen, R. (Ed.). (2003).** *Novel food packaging techniques.* Cambridge, UK: Woodhead Publishing.
4. ***Marsh, K., & Bugusu, B. (2007).*** *Food packaging—Roles, materials, and environmental issues. Journal of Food Science, 72(3), R39–R55.*
5. **Yam, K. L. (2009).** *The Wiley encyclopedia of packaging technology* (3rd ed.). Hoboken, NJ: Wiley.

Online Courses

https://www.iopp.org/i4a/pages/index.cfm?pageid=3330
https://alison.com/course/food-packaging-materials
https://www.coursera.org/learn/sustainable-packaging
https://www.edx.org/course/introduction-to-materials-science
https://www.youtube.com/playlist?list=PLyWQOV0TFxrgCLFvPoRJZkH2AOspx8lmv

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
Course Code : MDM-206PPT Engineering Mathematics-III

Teaching Scheme	Credit	Examination Scheme
Theory :2 Hours/Week	**02**	**CCE :30 Marks** **End-Semester :70 Marks**

Prerequisite Courses, if any:

- Basics of Algebra & Geometry, Collection, Classification and representation of data and Probability.

Course Objectives:

1. To familiarize students with concepts and techniques in Numerical Methods
2. To familiarize students with Numerical solutions of nonlinear algebraic/transcendental equations,
3. To familiarize with Statistical methods, Probability theory and LPP.
4. To equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.
5. To familiarize students with different types of linear programming methods along with their applications.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1. Understand and apply different operators to derive the Newton's forward, backward & Lagrange's interpolation formulae.

CO2. Use the common numerical methods to obtain the approximate solutions for the intractable mathematical problems.

CO3. Apply Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering.

CO4. Apply probability theory in testing and quality control.

CO5. Apply the optimization methods and algorithms developed for solving various types of optimization problems.

Course Contents

Unit I	**Interpolations**	**(06 Hours)**

Difference operators, Newton's Forward, Backward and Lagrange's interpolation formulae.

Unit II	**Numerical Methods**	**(06 Hours)**

Numerical solutions of nonlinear algebraic /transcendental equations by Bisection and Newton-Raphson methods; Trapezoidal and Simpson's rule for numerical integration.

Unit III	**Statistics**	**(06 Hours)**

Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting: fitting of straight line, parabola and related curves, Correlation and Regression

Unit IV	Probability and Probability Distributions	(06 Hours)
Probability, Theorems on Probability, Bayes Theorem, Random variables, Mathematical Expectation, Probability distributions: Binomial, Poisson, Normal		
Unit V	**Linear Programming Problem**	**(06 Hours)**
Introduction; Formulation of linear programming problem (LPP); Graphical method for its solution; Standard form of LPP; Basic feasible solutions; Simplex Method for solving LPP		

Learning Resources

Textbooks:

[T1] Numerical Methods for scientific & Engineering Computation- M.K. Jain, S.R.K. Iyengar & R.K. Jain

[T2] B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi

[T3] Operations Research Principles and Practices- Ravindran, Phillips, Solberg

Reference Books:

[R1] Operations Research- H. A. Taha

[R2] Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 5e, by Elsevier Academic Press.

[R3] Peter V. O'Neil., (2011), Advanced Engineering Mathematics, 7th Ed. Cengage.

Savitribai Phule Pune University
Second Year Printing & Packaging Technology (2024 Pattern)
Course Code: EEM-207PPT
Course Name: Basics of Management and Organizational Behavior

Teaching Scheme	Credit	Examination Scheme
Tutorial:01 Hours/Week Practical: 02 Hours/Week	01 01	Term Work: 25 Marks

Course Objectives:

1) To understand basic concepts and functions of management
2) To Know various types of management
3) To understand the fundamentals of organization
4) To understand the role of personality, attitude and motivation in organizational study
5) To understand various theories of motivation and its role in the organization

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Understand the basic concepts of management and various functions of management
CO2: Know various management types along with their characteristics
CO3: Understand the basics of Organization, Types, Nature and importance
CO4: Understand the concept of personality, attitude and motivation with reference to types, characteristics and limitations
CO5: Know various other aspects involved in the organization like teams, groups, their structures, leadership, theories and design etc.

Course Contents

Unit I	**Management- Introduction**	**(05 Hours)**
Basic concepts of management, Definition. Evolution of management through Functions of management		
Unit II		**(05 Hours)**
Management Types: Characteristics, Advantages and limitations		
Unit III	**Organizational Behavior**	**(05 Hours)**
Definition, Importance, Historical background, Fundamental concepts of OB, Perception process- Nature & Importance, Social perception- Impression management		
Unit IV	**Personality, Attitude & Motivation**	**(05 Hours)**
Meaning of personality, development of personality, Nature and dimension of attitude- job satisfaction Organizational commitment, Process of learning, principles of learning, Organizational reward system, Behavioral management, Classification of Motives- Primary &secondary, Morale-definition and relationship with productivity		
Unit V	**Theories & Design**	**(05 Hours)**
Theories of work motivation, Maslow's theory of need hierarchy, Herzberg's theory of job loading Group dynamics & teams, theories of group formation, Formal & informal groups, Importance of teams, formation of teams, Organizational design- structures and effect on human behavior,		

Organizational climate, Organizational effectiveness, Leadership- definition, importance, styles, models & theories of leadership
Text Books: [T1] Organizational Behavior, by Steffen Robbinson, Pearson 2002 [T2] Organizational Culture & Leadership, by Edger H. Schein, Jossey Bass Inc Pub, 2004.
Reference Books: [R1] Organizational Behavior: Managing People and Organizations, by Ricky W. Griffin and Gregory Moorhead, Houghton Mifflin, 2006 [R2] Essentials of Organizational Behavior, by Steffen Robbins, Prentice Hall, 1999

Savitribai Phule Pune University
Second Year Printing & Packaging Technology (2024 Pattern)
Course code: VEC-208 PPT Course Name: Universal Human Values

Teaching Scheme	Credit	Examination Scheme
Theory:02 Hours/Week	02	CCE:15 Marks ESE: 35 Marks

Course Objectives:

1. To enable students to understand the need, process, and significance of value education in human life.
2. To facilitate self-exploration as a process of realizing happiness and prosperity through right understanding.
3. To develop an understanding of human relationships, harmony within the self and with the body, and promote healthy living.
4. To impart the knowledge of harmony in the family, society, and nature, and instill universal human values.
5. To prepare students for an ethical and value-based professional life through holistic perception and self-regulation.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Explain the purpose and need for value education and demonstrate self-exploration as a lifelong process.

CO2: Differentiate between the needs of the self and the body and ensure harmony between them through the right understanding**.**

CO3: Recognize and apply foundational values like trust and respect in human relationships and promote harmony in society.

CO4: Interpret the interconnectedness and mutual fulfillment in nature and understand coexistence as the essence of existence.

CO5: Apply ethical principles in personal and professional life and develop strategies for a value-based, holistic, and sustainable lifestyle.

Course Contents

Unit I		(05 Hours)

(i) Understanding Value Education (ii) Self-exploration as the Process for Value Education (iii) Continuous Happiness and Prosperity- the Basic Human Aspirations and their Fulfilment (iv) Right Understanding, Relationship and Physical Facility (v) Happiness and Prosperity- Current Scenario (vi) Method to Fulfil the Basic Human Aspirations

Unit II		(05 Hours)

(i) Understanding Human being as the Co-existence of the Self and the Body (ii) Distinguishing between the Needs of the Self and the Body (iii) The Body as an Instrument of the Self (iv) Understanding Harmony in the Self (v) Harmony of the Self with the Body (vi) Program to Ensure self-regulation and Health

Unit III		(05 Hours)
(i) Harmony in the Family- the Basic Unit of Human Interaction "Trust'- the Foundational Value in Relationship (ii) 'Respect'- as the Right Evaluation (iii) Values in Human-to-Human Relationship (iv) Understanding Harmony in the Society (v) Vision for the Universal Human Order		
Unit IV		**(05 Hours)**
(i) Understanding Harmony in Nature (ii) Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature (iii) Realizing Existence as Co-existence at All Levels (iv) The Holistic Perception of Harmony in Existence (v) Professional Ethics in the light of Right Understanding (vi) Strategies for Transition towards Value-based Life and Profession		

Text Books:

[T1] A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, GP Bagaria, 3rd revised edition, UHV Publications, 2023, ISBN: 978-81-957703-7-3 (Printed Copy), 978-81 957703-6-6 (e-book)

[T2] Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, GP Bagaria, 3rd revised edition, UHV Publications, 2023, ISBN: 978-81-957703-5-9 (Printed Copy), 978-81-957703-0-4 (e-Book)

Reference Books:

[R1] P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.

[R2] A. Nagaraj, 1999, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak

[R3] B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

[R4] A. N. Tripathy, 2003, Human Values, New Age International Publishers.

[R5] E. G. Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press

[R6] B. L. Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

[R7] M. Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics and Human Values, East ern Economy Edition, Prentice Hall of India Ltd.

[R8] M. K. Gandhi, "The Story of my Experiments with Truth", Discovery Publisher

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
Course Code: CEP-209PPT Course Name: Community Engagement Project

Teaching Scheme	Credit	Examination Scheme
Practical : 4Hours/Week	02	Term Work : 25 Marks Oral : 25 Marks

Prerequisite Courses, if any:

Course Objectives:

1. Introducing students to the concept of **community engagement** through practical projects, fostering social responsibility in the field of Printing and Packaging.
2. To encourage students to use **innovative approaches** in designing solutions for community development projects.
3. To enable students to gain **hands-on experience** by addressing real-world issues, such as health, education, and environmental awareness, through packaging and printing.
4. To develop **communication skills** in the context of community-focused initiatives.
5. **To develop problem-solving** skills.

Course Outcomes:

After successful completion of the course, learner will be able to:
CO1: Demonstrate an understanding of the **social impact** of Printing and Packaging technologies.
CO2: Exhibit proficiency in planning and executing **mini projects** that align with community service goals.
CO3: Be able to integrate **environmental** and **sustainability concerns** into packaging design.
CO4: Develop skills in **collaboration** and **teamwork** through the successful completion of community-oriented projects
CO5: Enhance **problem-solving** skills by addressing the practical needs of society through their mini projects

Course Contents

1. **Problem Identification and Community Needs Assessment:**
    1. Before starting the project, students must conduct a **needs assessment** by interacting with the target community, identifying their most pressing needs related to packaging, printing, or product distribution.
    2. Students should document these findings in a **needs analysis report**, which must be approved by the faculty before the project begins.
2. **Collaboration with Local Organizations:**
    1. Encourage students to partner with **NGOs, local businesses, or government agencies, Press owners or small-scale industries** to gain deeper insights into the community's challenges.
    2. Students should aim to establish at least **one formal partnership** for their mini-project with a recognized organization or community group.
3. **Sustainability Focus:**
    1. Projects must prioritize **environmentally friendly materials** and **sustainable practices**. This could include using recyclable packaging materials, minimizing waste, or promoting eco-friendly alternatives.

2. Students should assess the **life-cycle impact** of the Print and packaging they design and print, ensuring that it does not harm the environment or the community.

4. **Cultural Sensitivity:**
    1. Students should be mindful of the **cultural aspects** of the community they are working with. The packaging design should reflect the **cultural values** and preferences of the community to ensure it is well received.
    2. Any graphic designs, symbols, or imagery used in the project should be **culturally appropriate** and respect local traditions.
5. **Feasibility and Scalability:**
    1. The project should focus on a **practical solution** that can be scaled within the community. Students need to provide a roadmap for how their solution can be applied to a larger group or repeated in other communities.
    2. Students should outline the **resources** required (financial, technical, human) to scale their solution and make it sustainable in the long term.
6. **Involvement of All Stakeholders:**
    1. Encourage students to engage **multiple stakeholders**, including community members, industry experts, faculty, and peers, to gather feedback and insights throughout the project.
    2. Students should also seek input on the project's impact and effectiveness from these stakeholders during the evaluation phase.
7. **Data Collection and Evaluation:**
    1. Students should collect data before and after the project implementation to measure its impact on the community. This can include surveys, interviews, or observational studies.
    2. Provide a clear evaluation strategy to assess the success of the project in addressing the community's needs and the effectiveness of the packaging solution.
8. **Prototyping and Test**
    1. Students should design prototypes of the packaging solutions and conduct testing in real- life conditions, ensuring they meet functional and aesthetic requirements.
    2. Testing may involve user feedback, ensuring that the Printing packaging solutions provided are easy to handle, eco-friendly, and serves its intended purpose.
9. **Risk Mitigation:**

    1. Identify and document **potential risks** related to the project, such as material costs, community acceptance, or logistical issues, and propose **mitigation strategies**.

    2.Students should consider **contingency plans** in case the project needs adjustments midway through the execution phase.
10. **Documentation and Reporting:**

    Detailed Project Documentation: In addition to the final report, students must maintain p**roject journal** documenting their process, decisions, and key learning experiences throughout the project.

11. The final project report should include:
    1. **Introduction** (community background and problem statement)
    2. **Objectives**

3. **Methodology** (how the project was executed)
4. **Results** (data, feedback from the community, and impact analysis)
5. **Conclusions** (lessons learned and recommendations for future projects)

12. Presentation of the Final Output:

1. The final output should not just be a theoretical solution but also a **physical demonstration** (e.g., a packaging prototype, printed materials, etc.) that shows the project's real-world application.
2. Students should use **visual aids** in their presentations, such as slides, prototypes, or models, to enhance the clarity of their ideas.

13. Community Feedback and Iterative Improvement:

1. Post-project, students should seek **feedback from the community** on the effectiveness of the solution. This feedback should be incorporated into the final report and reflected in the project's assessment.
2. If feasible, students may be asked to **refine** or **improve** their solutions based on community feedback before the final assessment

Term Work

1. **Design and Execution:** Students will be tasked with designing, developing, and executing their mini projects, demonstrating technical expertise in Printing and Packaging processes.
2. **Report Submission:** A detailed report including research, design process, results, and feedback from the community is required.
3. **Presentations:** Students will present their project findings and outcomes to a panel, which includes faculty and community representatives, if applicable.

Distribution of Term Work Marks for Semesters

Heads	Marks
1. Activity Book	05
2. Project Implementation	20
4. Project Report	10
5. Project Presentation	15

Assessment Criteria of Mini Project

1. **Relevance to Community:** The mini project must directly address a real-world need or issue faced by a local community.
2. **Innovative Solution:** The project should demonstrate innovative thinking in the application of Printing and Packaging technologies.
3. **Impact on Society:** The project's outcome should have a measurable **positive impact** on the community it serves (e.g., environmental sustainability, health awareness).
4. **Technical Skill:** Students should demonstrate a high level of technical competency in printing and packaging techniques.
5. **Collaboration with Stakeholders:** The student's ability to engage with and incorporate feedback from the community will be evaluated.

Mini Project Shall Be Assessed Based on Following Points

1. **Conceptual Clarity:** Clear understanding and articulation of the community problem addressed and the project goals.
2. **Design and Execution:** Effective use of printing and packaging technology to solve a community issue (including creativity and innovation).
3. **Community Involvement:** Active participation with local community members, and incorporation of their feedback in the project design.
4. **Sustainability:** Application of environmentally friendly packaging methods and materials.
5. **Final Impact and Evaluation:** Positive changes or improvements in the community, validated by feedback from community members or stakeholders.

An internal Viva shall be conducted by a committee constituted by the principal of the college. The committee shall consist of the following members.

1. Mentor/ faculty in-charge of CEP
2. One faculty member from other departments

Savitribai Phule Pune University, Pune, Maharashtra, India

Faculty of Science and Technology

National Education Policy (NEP) Compliant Curriculum

Second Year Printing & Packaging Technology (2024 Pattern)

Semester-IV

www.unipune.ac.in

Savitribai Phule Pune University
Second Year of Engineering(2024Pattern)
Course Code: PCC-210PPT Course Name: Fundamentals of Pre-Press

Teaching Scheme	Credit	Examination Scheme
Theory : 3 Hrs./ Week	03	CCE: 30 Marks End Sem: 70 Marks

Prerequisite Courses, if any:

- Introduction to Print Processes, Print and Packaging Layout Design

Course Objectives:

The objectives of the Course are:

1. Learn and work with various types of Original
2. Draw page layouts for varying printing processes and applications.
3. Understand halftone techniques for print separation.
4. Understand the requirements for process color and spot color printing.
5. Compute densitometry functions for the evaluation of print quality.

Course Outcomes:

On successful completion of the course the student will be able to:
CO1: Analyze the requirements of typesetting to create an effective design.
CO2: Prepare page lay-outing standards to create effective design for specific job.
CO3: Apply different halftone techniques for dot reproducibility.
CO4: Apply various screening techniques, viewing and illumination conditions for print quality assessment.
CO5: Measure and calculate density, dot gain, contrast and trap for print quality evaluation.

Course Contents

Unit I	Introduction to Prepress and Text Composition	(07Hours)

Overview of prepress in the printing workflow, significance of prepress in print quality and productivity, typesetting principles and typographic rules, text formatting: alignment, kerning, tracking, leading, font management and classification, composing text using professional software (e.g., Adobe InDesign, QuarkXPress), Unicode and multilingual text handling, use of stylesheets and templates, integration of text with images and graphics.

Unit II	Page Layout and Design for Print	(07 Hours)

Basic principles of design: balance, contrast, hierarchy, repetition, alignment, proximity, use of grids and guides, page geometry: trim size, bleed, slug, margins, layout for different formats: books, brochures, packaging, magazines, imposition schemes for offset and digital printing, working with master pages and layers, file types and resolution for images, typography in layout, print-safe areas and final artwork preparation.

Unit III	Halftone Theory, Color Separation, Resolution and Image setting	(07 Hours)

Theory of halftone reproduction and tone compression, continuous tone vs halftone image conversion, halftone dot formation and growth, dot size, shape, and gain, screen ruling (LPI), resolution (DPI vs PPI) and its impact on image quality, differences between input, display, and output resolutions, tonal gradation and control in highlights and shadows, color separation theory for CMYK and duotone/tritone printing, UCR (Under Color Removal) and GCR (Gray Component Replacement), screen angles and rotation to avoid moiré patterns, conventional screening (AM), stochastic screening (FM), hybrid screening techniques, spot size and dot geometry, RIP (Raster Image Processor) role in halftone rendering, introduction to vector and raster data in prepress, film output, plate output, and exposure principles in imagesetters and CTP systems, bitmapped image files and 1-bit TIFFs, practical considerations for output quality in different printing processes.

Unit IV	Densitometry and Prepress Quality Control	(07 Hours)

Basics of densitometry and its role in print consistency, types of densitometers: reflection and transmission, measuring solid ink density, dot gain, gray balance, tone value increase (TVI), color bar reading and interpretation, use of densitometry in proofing and print calibration, tolerances and industry standards (ISO 12647), quality parameters in proofing systems, resolution and screen angles for various printing processes.

Unit V	Prepress Workflow, Preflight, and Output Preparation	(07 Hours)

Stages of prepress workflow: file creation, editing, proofing, preflighting, output, digital workflow in offset, flexo, gravure, and digital printing, preflight checks: missing fonts, incorrect links, color spaces, resolution issues, bleed and trim errors, RIP (Raster Image Processor): function, types, and output formats, file formats: PDF/X standards, TIFF, EPS, PSD, and AI, imposition software and automation tools, use of workflow systems (e.g., Enfocus, Kodak Prinergy, Esko), print-ready file delivery and archiving, collaboration and job ticketing systems in modern prepress.

Learning Resources

Textbooks:

[T1] Kimberly Elam, (April 2007) Typographic Systems: Frameworks for Type Beyond the Grid, Princeton Architectural Press

[T2] Frank Cost, (1997), Pocket Guide to Digital Printing, Delmar Publishers

[T3]Noemer, Ewad Fred, Handbook of Modern Halftone Photography, Perfect Graphic Arts, Demarset, U.S.A.

Reference Books:

[R1]H. Kipphan, (2001), Handbook of Print Media, Springer Publication.

[R2] Eric Chambers, (1977), Manual of graphic reproduction for lithography, Litho Training Services Ltd., London.

[R3] R.W.G. Hunt, (1975), The Reproduction of Color, 3rd edi., John Wiley & Sons, New York.

[R4] Phil Green, (1995), Understanding Digital Color, 2nd Edition, GATF Press.

[R5] David Bergsland, (1997), Printing in a Digital World, Delmar Publishers

MOOC / NPTEL/YouTube Links:

https://onlinecourses.nptel.ac.in/noc25_de12/preview?

Prepress 01 Introduction

Prepress Workflow for Package Printing

Savitribai Phule Pune University
Second Year of Engineering (2024Pattern)
Course Code: PCC-211PPT Course Name: Post Press Operations

Teaching Scheme	Credit	Examination Scheme
Theory : 3 Hours/Week	**03**	**CCE: 30 Marks** **End-Semester:70 Marks**

Prerequisite Courses, if any:
Introduction to Printing and Packaging

Course Objectives:
1. Develop the knowledge of book binding techniques. To impart information on infringement and trademarks.
2. Understand various imposition schemes for book binding.
3. Use Tools & Equipment and their care in the Binding department.
4. Select different Binding Material and method to suit the product requirement.
5. Produce the final finished printed product with suitable method and Estimation of finished jobs including paper, other raw material, processing charges.

Course Outcomes:
After successful completion of the course, learner will be able to:
CO1: Understand parts of the book and various binding techniques.
CO2: Apply various imposition schemes.
CO3: Evaluatea book production method and equipment as per the job requirements.
CO4: Evaluate the material for book binding as per the job requirements.
CO5: Determinecost required for book binding and finishing as per the job requirements.

Course Contents

Unit I	**Introduction to Post Press**	**(07 Hours)**
Definition and significance of post press, Difference between prepress, press, and post press, Workflow in printing production		
Unit II	**Binding and Finishing Processes**	**(07 Hours)**
Types of Binding: Saddle stitching, Perfect binding, Case binding (hardcover), Wire-o binding, Spiral binding. Folding Techniques: Parallel fold, gate fold, accordion fold, cross fold, Gathering, Collating & Inserting, Cutting & Trimming: Guillotine cutter, Three-knife trimmer, Machines & Equipment: Trimmers and guillotines, Folding machines Binding machines, Laminators and coaters and Die-cutting and embossing machines		
Unit III	**Surface Finishing Techniques**	**(07 Hours)**
Coating, Aqueous coating, Varnishing, Lamination: Hot and cold lamination. Foil Stamping, Embossing& Debossing and Spot UV		
Unit IV	**Die-Cutting & Creasing**	**(07 Hours)**

Introduction to die-cutting machines, Blanking, Creasing and scoring, Kiss cutting. Packaging Applications: Box making, Carton folding and gluing, Label finishing

Unit V	Quality Control in Post Press	(07 Hours)

Tolerances in finishing, Defects and troubleshooting (misalignment, cracking, over-trimming) Safety standards and practices. Maintenance and Troubleshooting: Preventive maintenance for post press machinery, Common faults and solutions, Safety protocols and handling
Emerging Trends: Digital finishing systems, Automation in post press, Eco-friendly materials and processes

Learning Resources

Textbooks:

[T1] B. D. Mendiratta, Binding & Finishing Printek Publication, New Delhi.
[T2] A. G. Martin, (1980), Finishing process in Printing Focal Press, London.

Reference Books:

[R1] Hassy Whetton, Practical Printing & Binding Ohams Press Ltd. London.
[R2] Ralp Lyman, (1993), Binding and Finishing, GATFPress
[R3] Arthur W. Johnson, (1986), Manual of Book Binding, Thames and Hudson.
[R4] Helmut Kipphan, (2000), Handbook of Print Media, Springer, Heidelberg.

MOOC / NPTEL/YouTube Links

https://www.piag.org/the-print-university
https://www.udemy.com/course/product-packaging-design-comprehensive-course/?couponCode=ST21MT30625G1
https://www.udemy.com/topic/bookbinding/
https://www.youtube.com/watch?v=KK2NQz2TSHw

Savitribai Phule Pune University
Third Year of Engineering (2024 Pattern)
Course Code: PCC-212PPT
Course Name: Wood, Glass and Metal Based Packaging

Teaching Scheme	Credit	Examination Scheme
Theory: 2Hours/Week	02	CCE:30 Marks End-Semester: 70 Marks

Prerequisite Courses, if any:

- Basic understanding of materials science and engineering
- Understanding of product design and manufacturing processes

Course Objectives:

1. To understand the different types of packaging materials and their properties, including wood, glass, and metal-based packaging.
2. To study the design factors and considerations involved in creating effective packaging, with a focus on materials like wood, glass, and metal.
3. To analyze the various testing protocols used to ensure the quality and safety of packaging materials and containers.
4. To explore modern trends in packaging, focusing on advancements in material technology and packaging designs.
5. To learn about the importance of packaging in industrial applications, including its use in food, automotive, and electronic goods industries.

Course Outcomes:

CO1: Understand the characteristics and applications of different packaging materials such as wood, glass, and metal.
CO2: Design packaging solutions by considering factors such as material properties, load types, and product requirements.
CO3: Apply testing protocols for packaging materials, including glass, metal, and wooden packaging.
CO4: Evaluate modern trends and advancements in packaging technologies and materials.
CO5: Analyze the use of packaging in various industrial sectors, including food, automotive, and electronics.

Course Contents

Unit I	Wood Based Packaging	(06 Hours)

Introduction, Design Factors, Quality and Classification of Timber, Effect of Moisture on Wood Properties, Physical and Mechanical Properties of Timber, Considerations of Wooden Container such as Form and Size of each component, Thickness of components, size, spacing of nails, number of planks in a shook, types of joints, style of container, etc.

Unit II	Consideration for Box Design	(06 Hours)

Types of Loads, Plywood Boxes - Battened Construction, Timber species suitable for manufacturing packing cases, wooden box styles, Crates, Selection of crate, Size and Weight, Degree of Protection, Types of Bases, Handling of crates, difference between plywood and normal wood, ISPM-15 Regulation and process, different types of wooden pallets and its construction, Wooden pallets types A, B, C, ISTA

3B testing for Wood pallets.		
Unit III	**Glass Packaging**	**(06 Hours)**
Introduction, Types of Glass, Properties, Glass Manufacturing, Applications, Advantages, Standards, Glass Containers, Parameters in Glass Containers, Modern trends in Glass Packaging.		
Unit IV	**Testing of Glass**	**(06 Hours)**
Physical Testing: Annealing Test, Thermal Shock, Pressure Test, Density Test, Gauging, Chemical Testing: USP Tests.		
Unit V	**Metal Containers and Drums**	**(06 Hours)**
Metal Containers: Manufacture of Aluminum Foil, Properties and Applications, Tin Plate Characteristics, Properties, Manufacture of Black Plate, Advantages and Disadvantages of Metal-Based Packaging, Modern Trends in Metal-Based Packaging, Tin canister packaging used in the food industry, Metals box used in Industrial packaging in the automotive sector as returnable packaging, Metal box used for Lithium-Ion packaging used in electronic goods and EV, Testing protocols for Hazmat packaging based on United Nations (UN) protocol. GI Drums, Oil Drums, Types of Drums, Manufacture of Drums, Quality Control, Closures, Types, Parts, Essential Functions, Recent Developments.		
Learning Resources		
Reference Books: [R1] Diana Twede (Author), Susan E. M. Selke (Author), Donatien-Pascal Kamdem (Author), David Shires (2015), Cartons, Crates and Corrugated Board: Handbook of Paper and Wood Packaging Technology, DEStech Publications, Inc; Second edition [R2] Walter Soroka and CPP (2009), Fundamentals of Packaging Technology, Institute of Packaging Professionals; second edition, Fourth Edition [R3] Walter Soroka and CPP (2008), Illustrated Glossary of Packaging Terminology, Institute of Packaging Professionals; second edition [R4] P. Grayhurst, Packaging Technology, British Glass, UK		
MOOC/NPTEL: **https://www.iom3.org/careers-learning/training-academy/packaging-training/glass-in-packaging.html?utm_source** **https://packagingschool.com/courses/glass-metal-packaging?utm_source**		

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
PCC-213 PPT Pre-press Techniques

Teaching Scheme	Credit	Examination Scheme
Practical: 2 Hours/Week	**01**	**Term Work: 25 Marks** **Practical: 25 Marks**

Course Objectives:

1. To understand the fundamentals of image origination, scanning, and resolution in print production.
2. To develop proficiency in using image editing and layout software for print-ready designs.
3. To introduce students to color separation, UCR/GCR techniques, and tonal correction tools.
4. To familiarize students with color measurement tools like densitometers and interpretation of print quality parameters.
5. To equip students with knowledge of industry standards (e.g., ISO) and cost estimation for different print processes.

Course Outcomes:

CO1: Identify and differentiate between various types of originals and resolutions suitable for different print processes.
CO2: Scan, edit, and prepare photographs and designs for high-quality print output.
CO3: Apply color separation techniques, tonal adjustments, UCR, and GCR using industry-standard software.
CO4: Measure and interpret color quality parameters such as density, dot gain, trapping, and contrast using densitometers.
CO5: Design print layouts conforming to ISO printing standards and perform basic costing for design and layout across printing processes.

Course Contents

Guidelines for Instructor's Manual

The instructor's manual/Lab Manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about university/program/ institute/ department / foreword/ preface), curriculum of course, conduction and Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/guidelines, references.

Guidelines for Student's Laboratory Journal

1.The laboratory assignments are to be submitted by students in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes. Students should write the journal in their own handwriting with either black or blue pen.
2.Handwriting and Figures must be neat and clean.
3.All the diagrams, workflows and figures must be drawn on a blank sheet and should be neatly labeled
4.The Journal must contain a certificate indicating the name of the institute, student, department, subject, class/ year, number of experiments completed, signature of staff, Head of the department and

the Principal.

5.The index must contain serial number, title of the experiment, page number and the signature of staff along with date. The laboratory assignments are to be submitted by students in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes

Guidelines for Laboratory/Term Work Assessment

Continuous assessment of laboratory work should be done based on overall performance and Laboratory assignments performance of student. Each Laboratory assignment assessment should be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include timely completion performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Experiments.

Note: Term-work shall consist of records of the following experiments presented in the form of journals.

1. Study various types of conventional originals, digital originals, and image resolution
2. Scanning a photograph and perform editing for further processing
3. Prepare a design for offset printing and check parameters such as overprinting, registration, and color separation
4. Prepare a design and apply UCR, GCR, and tonal gradation curves using image editing software
5. Measure density, dot gain, dot area, contrast, and trapping using a densitometer
6. Calculate mechanical and optical dot gain for at least five different substrates
7. Study elements in a control strip used for print quality control
8. Study spot color applications and perform spot color separations using different prepress software
9. Study ISO printing standards and design a layout according to ISO standards for anyone printing process
10. Perform costing of design and layout for different print processes (Offset, Digital, Flexo)
11. Preflight and export print files in PDF/X format for various print workflows

Reference Books

1. Kipphan, H. (2001). Handbook of print media: Technologies and production methods. Berlin, Germany: Springer.
2. Pockett, R. (2014). Prepress for digital and offset printing. London, UK: Focal Press.
3. Sharma, A. (2004). Understanding color management. Clifton Park, NY: Delmar Cengage Learning.
4. Helmut, K. (2010). Print production and finishing. London, UK: Pira International.
5. Teschner, R. (2016). Cost estimating for print buyers and graphic designers. New York, NY: Routledge.

Online Courses

https://www.linkedin.com/learning/prepress-and-print-production-fundamentals/
https://www.udemy.com/course/color-management-for-designers-and-photographers/
https://www.coursera.org/specializations/graphic-design
https://academy.fespa.com/
https://helpx.adobe.com/learn.html

Savitribai Phule Pune University
Second Year of Engineering (2024 Pattern)
PCC-214 PPT Print Finishing Techniques

Teaching Scheme	Credit	Examination Scheme
Practical: 2 Hours/Week	**01**	**Practical: 25 Marks**

Course Objectives:

1. To familiarize students with various folding, binding, and cutting techniques used in print finishing.
2. To provide hands-on experience in operating finishing equipment safely and efficiently.
3. To develop skills in manual and machine-based coating, die cutting, and creasing techniques.
4. To understand and execute the complete post-press workflow including packaging and carton making.
5. To identify and troubleshoot common finishing defects and implement safety measures in a production environment.

Course Outcomes:

CO1: Demonstrate different folding styles and binding methods used in finishing operations.

CO2: Operate safely cutting and binding equipment and apply standard safety protocols during post-press activities

CO3: Perform coating, die cutting, and creasing using manual or semi-automatic machines with attention to registration and pressure control.

CO4: Create and assemble finished print products such as booklets, labels, and folded cartons with professional quality.

CO5: Identify common finishing defects and propose corrective actions while maintaining print production standards.

Course Contents

Guidelines for Instructor's Manual

The instructor's manual/Lab Manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about university/program/ institute/ department / foreword/ preface), curriculum of course, conduction and Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/guidelines, references.

Guidelines for Student's Laboratory Journal

1. The laboratory assignments are to be submitted by students in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes. Students should write the journal in their own handwriting with either black or blue pen.
2. Handwriting and Figures must be neat and clean.
3. All the diagrams, workflows and figures must be drawn on a blank sheet and should be neatly labeled
4. The Journal must contain a certificate indicating the name of the institute, student, department,

subject, class/ year, number of experiments completed, signature of staff, Head of the department and the Principal.

5. The index must contain serial number, title of the experiment, page number and the signature of staff along with date.

Guidelines for Laboratory/Term Work Assessment

Continuous assessment of laboratory work should be done based on overall performance and Laboratory assignments performance of student. Each Laboratory assignment assessment should be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include timely completion performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Experiments.

Note: Term-work shall consist of records of the following experiments presented in the form of journals.

1. Prepare Different folding patterns (single fold, Z-fold, gate fold, etc.)
2. Operate guillotine cutting machines and understand Safety procedures during cutting operations
3. Prepare saddle stitch, Case Binding (Hardcover), Wire Binding/Spiral Binding: Perfect Binding booklet
4. Prepare UV and aqueous coating using manual or semi-auto machines and evaluate surface after coating
5. Creating boxes, labels, or shaped prints using Die Cutting and Creasing methods, understanding registration and pressure settings
6. Safety demonstrations (PPE, emergency stop, etc.) Understand Troubleshooting common machine problems
7. Create a finished booklet (fold, bind, trim, and laminate)
8. Package a product with custom die-cut and finished print
9. Design and produce a folded carton or label
10. Identifying common finishing defects

Reference Books

1. Kipphan, H. (2001). Handbook of print media: Technologies and production methods. Berlin, Germany: Springer.
2. Sharma, A. (2011). Printing technology. New Delhi, India: Oxford University Press.
3. Helmut, K. (2010). Print production and finishing. London, UK: Pira International.
4. Sharma, R. (2013). Binding and finishing of printed products. New Delhi, India: Radha Publications.
5. GATF (2000). Finishing handbook for the printing industry. Sewickley, PA: Graphic Arts Technical Foundation.

Online Courses

https://www.skillshare.com/classes/Intro-to-Packaging-Design-Create-Your-Own-Prototypes/1176775761

Savitribai Phule Pune University Second Year of Engineering (2024 Pattern) Course Code: MDM-215PPT Course Name: Printing Digital Electronics		
Teaching Scheme	**Credit**	**Examination Scheme**
Theory: 2Hours/Week	**02**	**CCE: 30 Marks** **ESE: 70 Marks**

Course Objectives:

1. Understand fundamentals of number systems, codes and its related conversions
2. Classify different Logic families and learn various circuit minimization techniques
3. Understand the combination logic and arithmetic circuits in digital electronics
4. Understand Sequential logic circuits and their applications in digital electronics
5. Describe ADC and DAC conversion circuits and different types of memories and advanced microprocessors

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Identify the number-based nomenclature used in digital electronics

CO2: Apply knowledge for choosing proper logic families and minimize the complex digital circuits

CO3: Demonstrate the understanding of combinational logic circuits.

CO4: Demonstrate the understanding of Sequential logic circuits and its applications in printing industry

CO5: Apply the knowledge of ADC, DAC circuits and memories for interfacing the devices used in printing industry.

Course Contents

Unit I	**Introduction of number system**	**(05Hours)**
Decimal, Binary, Octal Hexadecimal number systems and their conversations, BCD codes, 8421,Excess - 3, Gray Code, ASCII code, Concept of bar code and its application in printing		
Unit II	**Fundamentals of Digital Electronics**	**(05Hours)**
all types of gates and their truth tables, Need of minimization, Minimization techniques, K-map simplification up to 4 variables, SOP and POS forms; don't care conditions, Logic families and comparative study of TTL, ECL and CMOS		
Unit III	**Combination logic and Arithmetic**	**(05Hours)**
Combination logic and Arithmetic such as addition, subtraction, 1's complement and 2'scomplement method. Binary multiplication and division. Half adder / Half subtractor, Full Adder/Full Subtractor, BCD adder. One-bit digital comparator Concept and Application of ALU.		
Unit IV	**Sequential logic circuits and their applications in printing**	**(05Hours)**
Study of level clocked S-R, D, JK, M-SJK flip-flops (Includes logical diagrams, symbol truth-table, waveforms / timing diagrams). Study of asynchronous and synchronous counters and their applications such as paper counting. Roller speed measurement, concept of modulo `N' counter, UP/Down counter. Principle operation of Universal shift register (IC 7495 including all modes of operation - concept only) and its application in printing		
Unit V	**Digital signals and its storage and display**	**(05Hours)**

Introduction to ADC's and DAC's (includes classification and specifications in brief). Classification of Memories, study of RAM, ROM, EPROM, E PROM, NVRAM, SRAM, DRAM, concept of PLA, PAL and PLD's. Display Devices and decoders 7 segment LED display (includes basic diagrams of Common Anode and Common Cathode) study of decoder driver IC's suchasIC7447, 7448, LCD display & Display Drivers ICs such as 7106, 7107, Block diagram of Digital computer and study of advanced processors

Learning Resources:

Textbooks:

[T1] A. Anand Kumar, Fundamentals of Digital circuits, PHI learning private limited (2014)
[T2] R. P. Jain Modern Digital Electronics, Tata McGraw Hill (2009)

Reference Books:

[R1] William Gothman, Digital Electronics - An introduction to theory and practice, Prentice Hall Publication
[R2] Ronald J. Tocci, Digital systems Principles and application, Hall Publication. (2009

MOOC / NPTEL/YouTube Links:

https://www.youtube.com/watch?v=F5h3z8p9dPg
https://www.youtube.com/watch?v=MVpOKwTKVSc
https://www.youtube.com/watch?v=HicZcgdGxZY
https://onlinecourses.nptel.ac.in/noc20_ee32/preview

Savitribai Phule Pune University
Second Year of Engineering (2024Pattern)
Course Code: VSEC-216PPT
Course Name: Visual Art and Communication for Printing and Packaging

Teaching Scheme	Credit	Examination Scheme
Practical: 4 Hours/Week	**02**	**Term Work: 25 Marks** **Practical: 25 Marks**

Pre-requisite Courses, if any:

- Print & Package Layout Design, Print Production techniques

Course Objectives:

1. Understand the basics of layout planning.
2. Understand imposition for bound and unbound jobs.
3. Understand ganging of different size jobs – labels, cartons and boxes.
4. Understand basic tools, commands of Package design software.
5. Design lay-outing for cartons and corrugated boxes.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Apply basic concept of Layout planning.

CO2: Classify imposition schemes for bound and unbound jobs.

CO3: Create a layout for different sized jobs.

CO4: Implement basic tools, commands in Package Design s/w for print and packaging applications.

CO5: Apply basic concepts to design Cartons and Corrugated boxes.

Course Contents

Term Work

Term Work shall consist of records of the following experiments presented in the form of journals:

Group A

1. Overview of layout planning
2. Design 4-page brochure layout in A4 size.
3. Layout planning for optimization of sheet - Ganging
4. Layout planning & ganging of die-cut labels job
5. Layout planning & ganging of die-cut carton & boxes.
6. Introduction to Package Design software.
7. Design Straight tuck folding carton.
8. Design Reverse tuck box folding carton.
9. Design Crash lock folding carton.
10. Design Snap lock folding carton.

Group B

1. Introduction to Illustrator Interface and Basic Tools
2. Working with Typography and Text Effects
3. Logo Design Using Vector Tools
4. Designing a Product Label
5. Packaging Die-line Tracing and Design
6. Applying Gradient, Mesh, and Pattern Fills
7. Creation of Stickers and Die-Cut Artwork
8. Designing an Illustrated Mascot or Character
9. Preparation of Print-Ready Files (CMYK, Bleeds, Crop Marks)
10. Creating Packaging Mock-ups with Illustrator Designs

Reference Books:

[R1] Marianne R. Klimchuk, Sandra A. Krasovec, (2013), Packaging Design: Successful Product Branding from Concept to Shelf, 2nd Edition by

[R2] Advanced Packaging (Structural Package Design), (2010) by Pepin Press

[R3] John Silva, Steven Dupuis (2011), Package Design Workbook: The Art and Science of Successful Packaging

Guidelines for Student's Lab Journal

1. Students should write the journal in their own handwriting with either black or blue pen.
2. Handwriting and Figures must be neat and clean.
3. All the diagrams, workflows and figures must be drawn on a blank sheet and should be neatly labeled
4. The Journal must contain a certificate indicating the name of the institute, student, department, subject, class/ year, number of experiments completed, signature of staff, Head of the department and the Principal.
5. The index must contain serial number, title of the experiment, page number and the signature of staff along with date.

Guidelines for Laboratory Conduction

1. Check for the Computer, printer, scanner, LAN connectivity before the start of the practical.
2. Check and note down the set-up details of hardware and software as per the format given
3. Follow the format given for procedure and note down all the observations as per the format given.
4. Check the status of the printer while taking printout; it should be in “ready” status only.
5. Write the experiment in the journal and get it checked within a week.

Savitribai Phule Pune University
Second Year of Engineering (2024Pattern)
Course Code: AEC-217PPT Course Name: Modern Indian Language (Marathi)

Teaching Scheme	Credit	Examination Scheme
Tutorial : 1 Hours/Week **Practical : 2 Hours/Week**	**02**	**Term Work: 50 Marks**

Course Objectives :

1) प्रगत भाषिक कौशल्यांची क्षमता विकसित करणे.
2) प्रसारमाध्यमातील संज्ञापनातील स्वरूप आणि स्थान स्पष्ट करणे.
3) व्यक्तिमत्त्व विकास आणि भाषा यांच्यातील सहसंबंध स्पष्ट करणे
4) लोकशाहीतील जीवनव्यवहार आणि प्रसारमाध्यमे यांचे परस्पर संबंध स्पष्ट करणे
5) प्रसारमाध्यमांसाठी लेखनक्षमता विकसित करणे

Course Contents

Unit I & II (07 and 08 Hours)

घटक	तपशील
1	1) भाषा आणि व्यक्तिमत्त्व विकासः सहसंबंध
	2) लोकशाहीतील जीवनव्यवहार आणि प्रसारमाध्यमे
2	प्रसारमाध्यमांसाठी लेखन
	1) वृत्तपत्रासाठी बातमीलेखन आणि मुद्रितशोधन
	2) नभोवाणीसाठी भाषणाची संहितालेखन
	3) दूरचित्रवाणीसाठी माहितीपटासाठी संहितालेखन

Case Study :
Unit III & IV (07 and 08 Hours)

घटक	
1	1) भाषा, जीवन व्यवहार आणि नवमाध्यमे, समाजमाध्यमे
	2) नवमाध्यमे आणि समाजमाध्यमांचे प्रकार ः ब्लॉग, फेसबुक, द्विटर
	3) नवमाध्यमे आणि समाजमाध्यमांविषयक साक्षरता, दक्षता, वापर आणि परिणाम
2	1) वेबसाईट आणइ ब्लॉग, द्विटरसाठी लेखन
	2) व्यावसायिक पत्रव्यवहार

संदर्भग्रंथः

1) सायबर संस्कृती, डॉ. रमेश वरखेडे
2) उपयोजित मराठी, संपादक डॉ. केतकी मोडक, संतोष शेणई, सुजाता शेणई
3) ओळख माहिती तंत्रज्ञानाची, टिमोथी जे. ओ. लिअरी
4) संगणक, अच्युत गोडबोले, मौज प्रकाशन, मुंबई
5) इंंटरनेट, डॉ. प्रबोध चोबे, मनोरमा प्रकाशन, मुंबई
6) व्यावहारिक मराठी, डॉ. ल. रा. नसिराबादकर, फडके प्रकाशन, कोल्हापूर
7) आधुनिक माहिती तंत्रज्ञानाच्या विश्वात, शिक्रापूरकर दीपक, मराठे उज्ज्वल, उत्कर्ष प्रकाशन, पुणे

Savitribai Phule Pune University
Second Year of Engineering (2024Pattern)
Course Code: AEC-217PPT Course Name: Modern Indian Language (Hindi)

Teaching Scheme	Credit	Examination Scheme
Tutorial : 1 Hours/Week **Practical : 2 Hours/Week**	**02**	**Term Work: 50 Marks**

Course Objectives :

1) छात्र में हिंदी भाषा श्रवण कौशल विकसित करना |
2) छात्र में हिंदी भाषा संवाद कौशल विकसित करना |
3) छात्र में हिंदी भाषा वाचन कौशल विकसित करना |
4) छात्र में हिंदी भाषा लेखन कौशल विकसित करना |
5) हिंदी भाषा - विधि तथा भाषा-व्यवहार से अवगत करना |

Course Contents

Unit I & II (07 and 08 Hours)

इकाई	पाठ्यविषय
इकाई - 1	वर्ण विचार 1) हिंदी वर्णमाला - परिचय 2) लिपि - परिचय 3) वर्षों का उच्चारण और वर्गीकरण 4) स्वराघात 5) संधि- स्वर संधि, व्यंजन संधि, विसर्ग संधि

Case Study :
Unit III & IV (07 and 08 Hours)

इकाई - 2	1 भाषा कौशल शिक्षण - लघुकथाओं द्वारा भाषा कौशल शिक्षण (श्रवण, संवाद, वाचन, लेखन) 1) शिक्षा - ज्योति जैन 2) पानी के पेड - ज्योति जैन 3) पशुभाषा - ज्योति जैन 4) अपशगुन - ज्योति जैन

संदर्भग्रंथः

1) हिंदी भाषा शिक्षण - संपा, हिंदी अध्ययन मंडल, सावित्रीबाई फुले पुणे विश्वविद्यालय, पुणे, राजकमल प्रकाशन, नई दिल्ली |
2) हिंदी व्याकरण - पं. कामताप्रसाद गुरु, प्रकाशन संस्थान, नई दिल्ली |
3) प्रयोजनमूलक हिंदी - डॉ. माधव सोनटक्के, लोकभारती प्रकाशन, नई दिल्ली |

Savitribai Phule Pune University
Second Year of Engineering (2024Pattern)
Course Code: EEM-218PPT Intellectual Property Rights

Teaching Scheme	Credits	Examination Scheme
Tutorial: 1 Hours/Week **Practical: 2 Hours/Week**	**01** **01**	**Term Work: 25 Marks**

Course Objectives:

1. To impart knowledge regarding IPR concepts, theories, and principles.
2. To impart information on infringement and trademarks.
3. To provide knowledge about Copyrights.
4. To learn about the legal processes involved in registering, safeguarding, and upholding intellectual property rights.
5. To educate the students on their rights to have their inventions from their project work protected.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Determine the legal frameworks governing the many forms of intellectual property, including trademarks, copyrights, and patents.

CO2: Evaluatethe patent after finishing their academic assignments.

CO3: Determine IPR registration and legal protection and recognize and safeguard their own original works of art, inventions, and business concepts.

CO4: Determine the trademarks and infringement.

CO5: Determine the plagiarism in their innovations which can be questioned legally

Course Contents

Unit I	**IPR Principles**	**(05Hours)**

An Overview of Intellectual Property Rights Theories and Concept Types of Rights to Intellectual Property An economic evaluation of intellectual property rights Need for Public Interests vs. Private Rights IPR's benefits and drawbacks.

Unit II	**Trademark & Infringement**	**(05Hours)**

Types of trademarks, brands, and logos, as well as trademark infringement requirements for trademark registration, the trademark registration procedure, well-known trademarks, case studies, trademark infringement, trademark categorization, and trademark filing Copyrights and associated rights under the Madrid Convention, Section 52 of the Indian Copyright Act, the Bern Convention, copyright registration, copyright infringement, types of rights protection through case studies, plagiarism, and copyright.

Unit III	**Patent**	**(05Hours)**

Patent fundamentals, Patentability requirements for novelty, non-obviousness, and utility inventions in India that are not patentable, customary wisdom, best mode and enablement, duration of the patent, The patentee's rights information contained in a patent application, Statements, Categories of patents,

Databases of Patents		
Unit IV	**Patent application process**	**(05Hours)**
Prior art search, The Indian patent application process, varieties of patent applications, both complete and provisional specifications, Patent Cooperation Treaty (PCT), Divisional application, Convention application, and Patent of addition		
Unit V	**Licensing and royalty**	**(05Hours)**
Basic principles of licensing and royalty, technology transfer, intellectual property assignment, valuation, and management		

Learning Resources

Text Books:

[T1] D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure

[T2] Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy

Reference Books:

[R1] Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.Wadehra

[R2] IPR by P. Narayanan

[R3] Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni.

[R4] P. Narayanan (Eastern Law House), Intellectual Property Law

[R5] Brian C. Reid, A Practical Guide to Patent Law, 2nd Edition, 1993

[R6] Hilarry Pearson and Clifford Miller, Commercial Exploitation of INtellectual Property Merges,

[R7] Patent Law and Policy: Cases and Materials, 1996

MOOC / NPTEL/YouTube Links

1. **https://onlinecourses.nptel.ac.in/noc...**
2. **https://archive.nptel.ac.in/courses/109/106/109106128/**
3. **https://archive.nptel.ac.in/courses/127/105/127105008/**
4. **https://archive.nptel.ac.in/courses/110/105/110105140/**
5. **https://www.youtube.com/watch?v=QzMKDNS5S9Y**
6. **https://youtube.com/live/FjM2pj2g-MA**
7. **https://youtube.com/live/s65WosGaBLQ**
8. **https://youtube.com/live/R3fzEvfWPp0**
9. **https://youtube.com/live/L9FR0bh4tq0**
10. **https://www.youtube.com/watch?v=F9u79b7hyYM&t=2793s**
11. **https://youtube.com/live/2UmSSvL5MYU**

Savitribai Phule Pune University
Second Year of Engineering(2024Pattern)
Course Code: VEC-219PPT
Course Name: Environmental Studies

Teaching Scheme	Credit	Examination Scheme
Theory:2Hours/Week	02	CCE: 15 Marks ESE: 35 Marks

Prerequisite Courses, if any:

Basic science, Basic ecology, Biology

Course Objectives:

1. Remember & define key environmental concepts, terminology, and the scope of environmental science.
2. Understand the structure and functioning of ecosystems and explain the interrelationship between natural systems and human activities.
3. Apply environmental knowledge to assess resource usage and suggest sustainable management practices.
4. Analyze causes & consequences of environmental pollution & evaluate strategies for mitigation & control.
5. Evaluate the importance of biodiversity & assess conservation techniques at local, national & global levels.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Explain the fundamental concepts of environmental science and the importance of sustainable development.

CO2: Analyze the structure and functioning of ecosystems, and the flow of energy and materials through environmental systems.

CO3: Evaluate the use and management of natural resources and recommend sustainable practices.

CO4: Assess the causes and effects of environmental pollution and propose appropriate control and mitigation strategies.

CO5: Interpret environmental policies, laws, and ethical principles to develop solutions for real-world environmental challenges.

Course Contents

Unit I	**Introduction to Environmental Science & Ecosystems**	**(05Hours)**

Definition, scope and importance of environmental studies, Components of the environment: Atmosphere, Lithosphere, Hydrosphere, Biosphere, Concept of ecosystem: Structure and function, Energy flow in ecosystems: Food chains, food webs, ecological pyramids, Types of ecosystems: Forest, Grassland, Desert, Aquatic, Ecological succession and nutrient cycles (carbon, nitrogen)

Unit II	**Natural Resources and Management**	**(05Hours)**

Types of natural resources: Renewable vs Non-renewable, Forest resources: Deforestation, afforestation, forest conservation, Water resources: Water conservation, rainwater harvesting, watershed management, Mineral and energy resources: Fossil fuels, solar, wind, geothermal, nuclear, Sustainable resource

management and environmental impacts of over-exploitation		
Unit III	**Biodiversity and Conservation**	**(05Hours)**
Introduction to biodiversity: Genetic, species, ecosystem diversity, Biogeographical classification of India, Biodiversity hotspots and endemic species, Threats to biodiversity: Habitat loss, poaching, invasive species, Conservation methods: In-situ (national parks, sanctuaries), Ex-situ (zoos, seed banks)		
Unit IV	**Environmental Pollution and Control**	**(05Hours)**
Types of pollution: Air, Water, Soil, Noise, Causes, effects and control measures, Solid waste management: Types, collection, disposal, recycling, Case studies: Bhopal gas tragedy, Chernobyl disaster, Role of individuals in pollution control		
Unit V	**Social Issues and Environmental Protection**	**(05Hours)**
Global environmental issues: Climate change, global warming, acid rain, ozone depletion, Environmental ethics, sustainable development, and green technologies, Environmental impact assessment (EIA), Environmental laws in India: Air Act, Water Act, Environmental Protection Act, Wildlife Protection Act, Human population growth and its environmental impact		
Learning Resources		
TextBooks: [T1] Environmental Science and Engineering by C. P. Kaushik and S. P. Kaushik; New Age international Publishers, 4th Edition [T2] A textbook of environmental studies by D. K. Asthana, Meera Asthana; S. Chand Publishing, 3rd revised edition (2022)		
Reference Books: [R1] Environmental Science: A global Concern by William P. Cunnigham, Mary Cunnigham; Mc Grew Hill Education, 15th edition [R2] Environmental Biotechnology S. N. Jogdand, Himalaya Publishing House, Revised edition 2020 [R3] Environmental Studies by Suresh K. Dhameja; S. K. Katariya and Sons; Latest edition 2021		
MOOC / NPTEL/YouTube Links: https://onlinecourses.swayam2.ac.in/nos25_sc29/preview **https://onlinecourses.nptel.ac.in/noc25_ce58/preview**		