DEPARTMENT OF TECHNICAL EDUCATION (DIPLOMA SECTOR)
UTTAR PRADESH

CURRICULUM FOR DIPLOMA PROGRAMME IN TEXTILE ENGINEERING

(3rd to 4th Semester)

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Semester System

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YEAR 2025-2026

Prepared By:

INSTITUTE OF RESEARCH DEVELOPMENT & TRAINING, U.P., KANPUR

UPDATED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P. LUCKNOW IN C.D.C MEETING HELD ON 16.07.2026

CONTENT

PREFACE

An important issue generally debated amongst the planners and educator's world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization have created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma Programs. The curricula for diploma Programs have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma Program.

The real success of the diploma Program depends upon its effective implementation. However, best the curriculum document is designed, if it is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much-needed dynamism in the system.

F K Khan
Director
Institute of Research Development & Training, U. P. Kanpur

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1. ACKNOWLEDGEMENT

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1. Sh. Narendra Kumar Bhushan, IAS Additional Chief Secretary, Technical Education Govt. of U.P. for his exemplary vision & approach.

2. Sh. F. R. Khan Director I.R.D.T. Kanpur continually motivating, guiding and taking keen interest in the review of the curriculum.

3. All the participants from Polytechnics and other technical institutions for their professional input during curriculum workshops.

4. CDC Officer and others concerning staff of IRDT for their support and assistance in conducting curriculum workshops.

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2. SALIENT FEATURES

1. Name of the Programme	➢ Diploma in Textile Engineering
2. Duration of the Programme	➢ Three years (Six Semesters)
3. Entry Qualification	➢ Matriculation or equivalent NEP-2020/ NSQF Level 5 as Prescribed by State Board of Technical Education, UP.
4. Pattern of the Programme	➢ Semester System
5. Ratio between theory and Practice	➢ 40% (Theory) / 60% (Practical)

1) <u>Industrial Training/Internship:</u>

Four and six weeks of industrial training is made mandatory after the II and IV semesters during summer vacation. Total marks allotted to industrial training will be respectively 50 & 100.

In the last (6^{th} Semester) we have made the one semester Industrial training/Internship as optional along with usual classroom training.

2) <u>Audit & Pathways</u>:

As per AICTE and NEP-2020 directives, Essence of Indian Knowledge & Tradition, Indian Constitution, Entrepreneurship & Startup, subjects on Environmental Studies have been incorporated in the curriculum.

3) <u>Student Centered Activities</u>:

A provision of 4-8 hrs. per week has been made for organizing Student Centered Activities for overall personality development of students. Such activities will comprise co– curricular activities such as expert lectures, classroom seminars, games, hobby club like photography, painting, singing etc. declamation contests, field visits, NCC, NSS and other cultural activities, etc.

4) <u>Project work:</u>

Micro/Mini/Major project work has been included in the curriculum to enable the student to get familiarized with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

3. EMPLOYMENT OPPORTUNITIES OF DIPLOMA HOLDERS IN TEXTILE ENGINEERING

Major clusters for textile production spread all over in India from north to south and east to west such as in Gujarat places like Ahmedabad, Bharuch etc, in Rajasthan places like Bhilwada etc.in Punjab places like Barnala, Ludhiana, in Madhya Pradesh places Budani, Chindwada etc.in west Bengal places like rishraetc There are very few colleges in India that are providing diploma engineering course in 'Textile Engineering'. Industry always required trained diploma engineers for smooth functioning and further development. The students completing this diploma course should get employment opportunities in following work profiles in different textile producing clusters on India -

1. In textile manufacturing industry primarily in private sector and textile Clusters.
2. In textile allied industries.
3. May become an entrepreneur with his/her own start up.
4. Merchandising and marketing and after sales service of textiles.
5. As quality engineers in textile industries.
6. As designer in textile industry or freelance designer.
7. As textile Engineer in textile manufacturing industries.
8. Various other opportunities in textile industry.

4. (A) PROGRAM OUTCOMES (POS)

PO1: Basics and Discipline specific Knowledge
Assimilate knowledge of basic mathematics, science, engineering fundamentals, and Textile Engineering.

PO2: Problem's Analysis and solution
Identify, analyze and solve problems using standard methods and established techniques.

PO3: Design and Development
Design solutions for technical problems.
Assist in designing components, systems, or processes to meet specific requirements.

PO4: Engineering Tools, Experimentation, and Testing

Use modern engineering tools and appropriate techniques to conduct experiments as per BIS standard.

PO5: Socio/ Economic /Environmental impact assessment/remedy.

Apply relevant technologies while considering societal needs, environmental impact keeping in view sustainable and ethical responsibilities.

PO6: Project Management and Communication
Apply engineering management principles, work effectively as an individual or in a team, and communicate clearly on activities.

PO7: Lifelong Learning
Recognize the importance of continuous learning and actively pursue self-improvement to keep pace with technological developments.

4. (B) LEARNING OUTCOMES OF THE PROGRAM

1. The learning outcome of a Diploma Programme in Textile Engineering typically includes a comprehensive understanding of various aspects of textile manufacturing, technology, and management. Here are some key learning outcomes you can expect from such a program:

2. Technical Knowledge: Graduates of the program will have a strong foundation in textile engineering principles, including knowledge of textile fibers, yarn production, fabric manufacturing processes, textile testing, and quality control.

3. Textile Design and Development: Students will learn about textile design techniques, including pattern making, fabric selection, dyeing, printing, and finishing. They will acquire skills to develop innovative textile products and understand the factors that influence design decisions.

4. Manufacturing Processes: The program will cover different textile manufacturing processes, such as weaving, knitting, nonwoven production, and garment manufacturing. Students will

gain knowledge of the machinery and equipment used in these processes and learn how to optimize production efficiency.

5. Technical Skills: Graduates will acquire hands-on skills in operating and maintaining textile machinery, conducting textile testing and analysis, and troubleshooting manufacturing issues. They will also learn about computer-aided design (CAD) software and other relevant technologies.

6. Sustainability and Environmental Considerations: The program will emphasize the importance of sustainable practices in the textile industry. Students will learn about eco-friendly manufacturing processes, waste management, recycling, and reducing the environmental impact of textile production.

7. Quality Assurance and Control: Students will understand the principles and techniques of quality control in textile manufacturing. They will learn how to conduct tests and inspections to ensure product quality and compliance with industry standards.

8. Project Management: The program may include courses on project management, where students will learn how to plan, execute, and monitor textile engineering projects effectively. This includes resource allocation, cost estimation, risk assessment, and timeline management.

9. Professional Skills: Students will develop skills in communication, teamwork, problem-solving, and critical thinking. They will learn how to collaborate with colleagues, present their ideas, and adapt to the dynamic nature of the textile industry.

10. Industry Knowledge: The program may provide insights into the textile industry, its market trends, global trade, and regulatory frameworks. Students will gain an understanding of the challenges and opportunities in the industry and develop strategies for success.

11. Ethical Considerations: Students will be introduced to ethical issues related to the textile industry, such as fair trade, labour rights, and responsible sourcing. They will learn about corporate social responsibility and the importance of ethical practices in the industry.

These learning outcomes will equip graduates of the Diploma Programme in Textile Engineering with the necessary knowledge, skills, and abilities to pursue careers in textile manufacturing, research and development, quality assurance, technical consultancy, and management positions within the textile industry.

5. ABSTRACT OF CURRICULUM AREAS

a) PROGRAM CORE COURSES

Textile Fibres (Theory)
Yarn Technology – I (Theory)
Fabric Technology – I (Theory)
Textile Fibres (Lab)
Yarn Technology - I (Lab)
Fabric Technology -I (Lab)
Advance Skill Development (Open Elective – I)
Textile Testing
Yarn Technology- II (Theory)
Fabric Technology –II (Theory)
Fabric Structure & Design
Yarn Technology II (Lab)
Advance Skill Development (Open Elective –II)
Fabric Technology II (Lab)
Principle and Design of Spinning Machine
Principle and Design of Weaving Machine
Computer Aided Design
Technical Textiles
Entrepreneurship and Start-Up

b) PROGRAM ELECTIVE COURSE

(Program Elective-1)

1. Textile Chemical Processing
2. Principal Of Design And Color

c) PROJECT WORK, SEMINAR & INTERNSHIP IN INDUSTRY

In-House Project Or
Internship Or
Industrial Training

e) AUDIT COURSES

1. Essence of Indian Knowledge and Tradition

6. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN TEXTILE ENGINEERING (365)

THIRD SEMESTER

SR. NO.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME Periods /Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	TEXTILE FIBRES	PROGRAM CORE (THEORY)	03	-	-	3	40	-	40	60	3	-	-	60	100
3.2	YARN TECHNOLOGY - I	PROGRAM CORE (THEORY)	04	-	-	4	40	-	40	60	3	-	-	60	100
3.3	FABRIC TECHNOLOGY - I	PROGRAM CORE (THEORY)	03	-		3	40	-	40	60	3	-	-	60	100
3.4	TEXTILE FIBRES (LAB)	PROGRAM CORE (PRACTICAL)	-	-	04	2	-	60	60	-	-	40	3	40	100
3.5	YARN TECHNOLOGY – I (LAB)	PROGRAM CORE (PRACTICAL)	-	-	04	2	-	60	60	-	-	40	3	40	100
3.6	FABRIC TECHNOLOGY –I (LAB)	PROGRAM CORE (PRACTICAL)	-	-	04	2	-	60	60	-	-	40	3	40	100
3.7	ADVANCE SKILL DEVELOPMENT	(Q) OPEN ELECTIVE-1 ((THEORY)	02	-	-	2	50	-	-	-	-	-	-	-	N/A
		(Q)OPEN ELECTIVE-1 (Certification Course)					-	-	-	-	-	-	-	-	N/A
3.8	SUMMER INTERNSHIP** (4 WEEKS)		-	-	-	2	-	50	50	-	-	-	-	-	50
	#STUDENT CENTERED ACTIVITIES		-	-	12	-	-	50	50	-	-	-	-	-	50
Total			**12**		**24**	**20**	**120**	**280**	**400**	**180**		**120**		**300**	**700**

Q) It is compulsory to appear and to pass the examination, but marks will not be included for percentage and division of obtained marks.
Advance skill development mention at the table provides the scope of selecting the course as per choice from the elective list provided in the syllabus conducted by various agencies of repute of duration not less than 20 Hrs (Offline/Online).
Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. Photography etc., Seminars, Declamation Contests, voluntary contribution in physical activities, Educational Field Visits, NCC, NSS, Cultural Activities and Self-Study.
** Students will present a seminar on their summer internship along with certificate, project and report.

TEXTILE ENGINEERING (365)

FOURTH SEMESTER

Sr. No.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME Periods/ Week			Credits	MARKSIN EVALUATION SCHEME								Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	TEXTILE TESTING	PROGRAM CORE (PRACTICUM)	02	-	02	3	40	-	40	60	3	-	-	60	100
4.2	YARN TECHNOLOGY II	PROGRAM CORE (THEORY)	03	-	-	3	40	-	40	60	3	-	-	60	100
4.3	FABRIC TECHNOLOGY II	PROGRAM CORE (THEORY)	03	-	-	3	40	-	40	60	3	-	-	60	100
4.4	FABRIC STRUCTURE & DESIGN	PROGRAM CORE (PRACTICUM)	02	-	02	3	40	-	40	60	3	-	-	60	100
4.5	PROGRAM ELECTIVE -I	PROGRAM CORE (THEORY)	02	-	-	2	40	-	40	60	3			60	100
4.6	YARN TECHNOLOGY- II (LAB)	PROGRAM CORE (PRACTICAL)	-	-	04	2	-	60	60	-	-	40	3	40	100
4.7	FABRIC TECHNOLOGY- II (LAB)	PROGRAM CORE (PRACTICAL)	-	-	04	2	-	60	60	-	-	40	3	40	100
4.8	ADVANCE SKILL DEVELOPMENT	(Q)OPEN ELECTIVE-2 (THEORY)	02	-	-	2	50	-	-	-	-	-	-	-	N/A
		(Q)OPEN ELECTIVE- (Certification Course)						-	-	-	-	-	-	-	N/A
4.9	(Q) ESSENCE OF INDIAN KNOWLEDGE AND TRADITION	AUDIT COURSE	02	-	-	-	50	-	50	-	-	-	-	-	N/A
#STUDENT CENTERED ACTIVITIES			-	-	08	-	-	50	50	-	-	-	-	-	50
Total			**16**		**20**	**20**	**200**	**170**	**370**	**300**		**80**		**380**	**750**

Q) It is compulsory to appear and to pass the examination, but marks will not be included for percentage and division of obtained marks.

Advance skill development mention at the table provides the scope of selecting the course as per choice from the elective list provided in the syllabus conducted by various agencies of repute of duration not less than 20 Hrs (Offline/Online).

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. Photography etc., Seminars, Declamation Contests, voluntary contribution in physical activities, Educational Field Visits, NCC, NSS, Cultural Activities and Self-Study.

OPEN ELECTIVE-1

SR.NO.	(Q) THEORY COURSES NAME
1.	ECONOMIC POLICIES IN INDIA (Course offered by Polytechnic Institute)
2.	PROJECT MANAGEMENT (Course offered by Polytechnic Institute)
SR.NO.	**CERTIFICATES COURSES**
1.	COURSES CONDUCTED BY CENTRE OF EXCELLENCE (ESTABLISHED BY THIRD PARTY AS: - TATA TECHNOLOGIES. etc) (ANNEXURE-1)
2.	ANY COURSE OF MINIMUM 02 CREDIT FROM NPTEL
3.	MOOCS THROUGH SWAYAM
4.	AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES
5.	C-DAC
6.	CERTIFICATIONS CONDUCTED BY THE INSTITUTE OF NATIONAL IMPORTANCE (IIT,NIT,IIIT ETC.)
7.	ISRO E-LEARNING
8.	OTHER RELEVANT GOVERNMENT, INTERNATIONAL/NATIONAL PLATFORMS OF REPUTE
9.	NEILIT/BITRA/NITRA/SITRA/ATIRA/SASMIRA CERTIFICATE PROGRAMME

OPEN ELECTIVE -2

SR.NO.	(Q) THEORY COURSES NAME
1.	RENEWABLE ENERGY TECHNOLOGIES (Course offered by Polytechnic Institute)
2.	ENERGY EFFICIENCY AND AUDIT (Course offered by Polytechnic Institute)
SR.NO.	**CERTIFICATES COURSES**
1	COURSES CONDUCTED BY CENTRE OF EXCELLENCE (ESTABLISHED BY THIRD PARTY AS: - TATA TECHNOLOGIES. etc) (ANNEXURE-1)
2	ANY COURSE OF MINIMUM 02 CREDIT FROM NPTEL
3	MOOCS THROUGH SWAYAM
4	AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES
5	C-DAC
6	CERTIFICATIONS CONDUCTED BY THE INSTITUTE OF NATIONAL IMPORTANCE (IIT,NIT,IIIT ETC.)
7	ISRO E-LEARNING
8	OTHER RELEVANT GOVERNMENT, INTERNATIONAL/NATIONAL PLATFORMS OF REPUTE
9	NEILIT/BITRA/NITRA/SITRA/ATIRA/SASMIRA CERTIFICATE PROGRAMME

ANNEXURE-1

LIST OF COURSES CONDUCTED BY TATA TECHNOLOGIES

1. Fundamentals of Innovation and Design Thinking
2. Product Design and Development
3. Product Verification and Analysis
4. Advanced Automobile
5. Electric Vehicle
6. Internet of Things
7. Advanced Manufacturing
8. Advanced Welding & Painting using Simulator
9. Industrial Automation and MES
10. Industrial Robotics
11. Inspection and Quality Control
12. Advanced Plumbing
13. AI and ML

PROGRAME ELECTIVE-1

SR.NO.	SUBJECT NAME
1.	TEXTILE CHEMICAL PROCESSING
2.	PRINCIPAL OF DESIGN AND COLOR

DETAILED CONTENTS OF VARIOUS SUBJETS

THEORY	3.1 TEXTILE FIBRE	L	T	P
		3	-	-

COURSE OBJECTIVE:

Textile fibers are essential components of the textile industry, and any education in textiles would be incomplete without knowledge of textile fibers. This subject aims to provide students with a comprehensive understanding of textile fibers, including their properties, classification, and uses. Whether students become textile technologists or textile chemists, knowledge of textile fibers is crucial in their field.

COURSE OUTCOME(CO):

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following.

Students will be able to

CO1: Explain the classification, structure, and essential properties of natural, regenerated, and synthetic textile fibres along with basic polymer concepts.

CO2: Describe the cultivation, structure, properties, and applications of cotton and jute fibres, including other bast fibres.

CO3: Analyze the types, structure, properties, and end uses of wool and silk fibres.

CO4: Explain the manufacturing processes, properties, and applications of synthetic fibres such as polyester and polyamide.

CO5: Describe the production methods, properties, and applications of acrylic and regenerated fibres such as viscose rayon.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	-	-	1	-	2	*	*
CO2	3	1	-	-	2	-	2	*	*
CO3	3	2	-	-	1	-	2	*	*
CO4	3	2	-	-	2	-	2	*	*
CO5	3	1	-	-	2	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

UNIT-1 Introduction of Natural and various Synthetic Fibre (06 Periods)

Definitions related to textile fibers. Classification of textile fibers, Definition of regenerated and synthetic fibres. Difference between staple and filament fibers. Essential and desirable properties of textile fibers. Advantages and disadvantages of natural fibers.Concepts of molecular weight, Degree of Polymerization, Orientation, and Crystallinity. Characteristics of fibre-forming polymers.

UNIT-2 Cotton Fibre & Jute Fibre: (10 Periods)

Cotton cultivation and harvesting. Development of cotton fibers in the seed. Cotton varieties and grading, Morphological structure of cotton fibres Physical and chemical properties of cotton fibers, Applications of cotton fibers.

Jute cultivation,Retting and extraction process. Structure of jute fibers. Physical and chemical properties of jute fibers. Applications of jute fibers. Introduction to other natural bast fibers (flax, hemp) and their applications.

UNIT-3 Wool Fibre & Silk Fibre (08 Periods)

Types of wool and grading. morphological structure of wool fibers. Chemical composition of wool fibers.Physical and chemical properties of wool fibers. Varieties of wool fibers and their applications.

Types of silk and its production. Chemical composition and morphological structure of silk. Physical and chemical properties of silk fibers. applications of silk fibers.

UNIT-4 Polyester Fibre & Polyamide Fibre (10 Periods)

Introduction to methods of fibre formation, Melt spinning. Manufacturing process of polyester fibres. Physical and chemical properties of polyester fibres. Applications of polyester fibres.

Manufacturing process of Nylon-6 and Nylon-66. Physical and chemical properties of Nylon-6 and Nylon-66. Applications of Polyamide fibres.

UNIT-5 Acrylic Fibre & Regenerated Fibres (08 Periods)

Manufacturing process of acrylic fibre. Dry spinning, Physical and chemical properties of acrylic fibres. Applications of acrylic fibres.

Introduction to regenerated fibres, Wet Spinning, Raw materials for viscose rayon, Manufacturing sequence of viscose fibres.

INSTRUCTIONAL STRATEGY

The instructional strategy for this carpet manufacturing curriculum combines interactive lectures, visual aids, hands-on activities, and discussions to enhance understanding and engagement. Each unit uses specific methods—such as concept mapping for terminology, group classification tasks for design origins, guest lectures or videos for the Indian carpet sector, and fiber identification activities—to align with the learning outcomes. Real-world examples, cultural context, and physical samples are integrated throughout to make learning relevant and practical, while formative assessments like quizzes, worksheets, and reflections help monitor student progress effectively.

MEANS OF ASSESSMENT

Assessment will be carried out through a combination of formative and summative methods. Formative assessments will include quizzes, class discussions, group activities, worksheets, and short reflective writing to evaluate on going understanding. Summative assessments will consist of written tests, classification charts, group presentations, and practical evaluations (e.g., fiber identification). These varied assessment tools will help measure students' knowledge, analytical skills, and application of concepts in real-world contexts.

RECOMMENDED BOOKS -

1. वस्त्ररेशे–उत्पादन विशेषताएँ एवं उपयोग–DR. D.B. Shakyawar&Dr. M.K. Singh, abhishek Publication Chandigarh/ New Delhi.
2. Textile Fibre by Ghol and Valanslk`
3. S. P. Mishra, A textbook of Fibres Science and technology, New Age International (p) Ltd 2000.
4. H V S Murthy, Textile Fibres- Textile Association Publication 1995.
5. Textile Fibres –I By Dr. V.A. Shenai

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	14
2	10	24
3	08	20
4	10	24
5	08	18
Total	**42**	**100**

THEORY	3.2 YARN TECHNOLOGY-I	L	T	P
		4	-	-

COURSE OBJECTIVE:

This course aims to provide comprehensive knowledge of preparatory spinning processes from ginning to roving. It enables students to understand the construction, working principles, and functions of blow room, carding, drawing, combing, and roving machines, analyze material flow and waste control, and perform essential production, draft, efficiency, and waste calculations used in spinning operations.

COURSE OUTCOME(CO):

CO1: Explain the objectives, processes, and machinery involved in ginning, mixing, and blow room operations, including opening, cleaning, and lap formation.
CO2: Describe the construction, carding actions, clothing systems, and calculations related to carding and drawing machines.
CO3: Analyze drawing processes, drafting systems, auto levellers, defects, and production calculations in draw frames.
CO4: Explain the principles, operation, and production calculations of combing processes and machines.
CO5: Describe the construction, working, and motions of roving (speed frame) machines, including drafting, twisting, winding, and building mechanisms.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	-	-	2	-	2	*	*
CO2	3	2	-	-	1	-	2	*	*
CO3	3	2	-	-	1	-	2	*	*
CO4	3	1	-	-	1	-	2	*	*
CO5	3	1	-	-	1	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

Unit – 1: Ginning, Mixing and Blow Room (12 Periods)

Ginning & Mixing: Object and Classification of Ginning and Baling. Mixing and its importance, method of mixing. Advantages and disadvantages. Description and working of auto mixer and other modern blenders.

Blow Room: Objects of Blow room. Importance of opening and cleaning.
Study of opening and cleaning machines e.g. Blending bale opener, hopper feeders, Step cleaner, Shirley opener, Whitin axiflow machine, Air stream cleaner, Three bladed beater and Kirschner beater. Nature of waste extracted in various openers and beaters E. R. M. cleaner and Mono cylinder beaters. Construction & Working of Bale Plucker. Lap forming mechanism, Object and mechanism of Calendar Roller and their weightings.

Unit – 2: Carding (10 Periods)

Objects of carding, passage of material through the card, cards parts and their functions e.g. Feeding system Licker-in, mote knives, Back plate front plate, Cylinder, Flats, Doffer, Under casing etc. Theory of carding actions in a revolving flat card. Flexible and metallic card clothing. Types of clothing wires and its geometry.
Calculation of speeds, drafts and productions of card and drawing machines. Calculations of production, efficiency, draft and waste percentage.

Unit – 3: Drawing (10 Periods)

Objects of drawing, Construction of draw frame, its parts and their functions and passage of material through drawing frame. Drawing rollers, Top and Bottom drafting rollers and their construction. Principles of doubling and drafting. Importance of stop motions, study of electrical stop motions. Study of different drafting systems e.g. 2/2, 2/3, 3/5, 4/4 and 4/5 drafting systems. Importance and study of Autolevellors Special features of high-speed draw frame, their names and different models. Defects and remedies in drafting operating. Calculations based on draft & production in draw frame.

Unit – 4: Combing (10 Periods)

Brief idea of combing and combing operation.
Detail description of Halmann & Nasmbith comber.
Calculation of Noil% and production of comber.

Unit – 5: Roving (14 Periods)

Objects of roving study and construction and functions of various parts of speed frame/ simplex and passage of material through them. Drafting mechanism, drive of drafting rollers, pressure on drafting rollers Basic principles of Cone drum. Twisting mechanic, study of motions required for twisting flyer and its functions. Winding: Principle of winding, bobbin leading and flyer leading winding, drive of winding mechanism. Traverse motion given to bobbins, building motion and its functions. Differential motion, its objects and working principles.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student-centered activities in classroom and actively participate in listening exercises

MEANSOFASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making and viva- voce

RECOMMENDED BOOKS:

1. Technology of Sort Staple Spinning by W.Klein
2. Principle of Spinning by A.R. Khare

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
I	12	24
II	10	19
III	10	19
IV	10	19
V	14	19
Total	**56**	**100**

THEORY	3.3 FABRIC TECHNOLOGY-I	L	T	P
		3	-	-

COURSE OBJECTIVE:

This course aims to provide fundamental and practical knowledge of weaving preparatory processes and loom motions. It enables students to understand the working principles of winding, warping, and sizing machines, analyse primary and secondary loom motions, and perform essential calculations related to yarn, fabric, and weaving parameters required for efficient fabric production.

COURSE OUTCOME (CO):

CO1: Explain the objectives, principles, and machinery involved in winding processes, including package formation and automatic winding systems.
CO2: Describe warping methods, creel systems, stop motions, tension control devices, and common warping faults with remedies.
CO3: Explain the objectives, methods, machines, and sizing materials used in warp sizing, including drawing-in and denting processes.
CO4: Analyse primary and secondary weaving motions such as shedding, picking, beat-up, take-up, and let-off mechanisms used in looms.
CO5: Perform calculations related to yarn counts, moisture content, crimp percentage, and fabric weight parameters in weaving processes.

3. SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	-	-	1	-	2	*	*
CO2	3	2	-	-	1	-	2	*	*
CO3	3	1	-	-	1	-	2	*	*
CO4	3	2	-	-	1	-	2	*	*
CO5	3	2	-	-	1	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

Unit – 1: Winding **(08 Periods)**

1. Objective of winding. Types of packages,
2. Details working principle, passage of materials of drum and precision winding.
3. Traversing mechanisms (Rotary, Reciprocating)
4. High speed and super high-speed warp winding machines- Scholahorst auto coner, Murata winding machine.
5. Study of various types of slub catchers, tensioning devices,
6. Features of automatic pirn winding machines.
7. Bunch building mechanisms.

Unit – 2: Warping **(08 Periods)**

1. Introduction to various ways of warping.
2. Types of creels and their description.
3. Study the Direct Warping and Sectional warping machine.
4. Stop motions and tensioning devices.
5. Commonly occurring faults in warping and their causes and remedies.

Unit – 3: Sizing **(08 Periods)**

1. Object of warp sizing.
2. Introduction to various methods of sizing.
3. Detail Study of slasher sizing machine and multi cylinder sizing machine
4. Various kinds of sizing ingredients used for cotton, polyester, viscose and their blends.
5. Manual methods of drawing-in and denting of warp.

Unit – 4: Different Types of Motion in Weaving **(14 Periods)**

Primary motion, Secondary motion.

Primary Motion:

A. Shedding:

1. Objective of Shedding Mechanism
1. Different types of healds ,
2. Tappet shedding mechanism
3 Introduction to various types of tappets.
4. Designing of negative shedding tappets.
5. Heald reversing Mechanism.

B. Picking and Beat-Up

i) Objective of Picking Motion, classification

(ii) Mechanism of over pick and under pick motions their merits and demerits - Methods of varying the intensity of picking in each case. Velocity of shuttle.

(v) Beating up motion: Mechanism of beating motion. Eccentricity of sley.

Secondary motion

1. TAKE-UP MOTIONS AND LET OFF MOTIONS

(i) Various types of take up motions.

(ii) Study of five and seven wheel intermittent positive take up motion and calculations.

(iv) Negative take up motion.

(v) Let off motions: Various types of let off motions. Study of negative let off motions. Study of semi-positive & positive let off motion

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Unit – 5: Calculation **(04 Periods)**

(i) Calculation pertaining to resultant count, average count, moisture content, tape length. Crimp%

(ii) Calculation of wt- of warp, weight of weft, wt/sq. yard etc.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student-centered activities in classroom and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making and viva- voce

RECOMMENDED BOOKS:

1. Industrial Practices in weaving preparatory by Dr. Mukesh kr. Singh
2. Weaving Preparation technology by Dr. N. Gokarneshan
3. Principal of woven fabric manufacturing by Abjit Majumdar CRC press

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
I	08	20
II	08	20
III	08	20
IV	14	30
V	04	10
Total	**42**	**100**

PRACTICAL	3.4 TEXTILE FIBRE	L	T	P
		-	-	4

COURSE OBJECTIVE:

This course aims to develop practical skills in identification and analysis of natural, synthetic, and regenerated textile fibres. It enables students to determine moisture regain, examine fibre morphology using microscopy, perform physical and chemical tests for fibre identification, and carry out quantitative analysis of fibre blends.

COURSE OUTCOME (CO):

CO1: Determine moisture regain of natural and synthetic textile fibres using standard conditioning methods.
CO2: Identify natural fibres such as cotton, jute, wool, and silk through microscopic examination and physical tests.
CO3: Identify synthetic fibres such as polyester, polyamide, and acrylic using microscopic, physical, and chemical tests.
CO4: Identify regenerated fibres such as viscose rayon using microscopic and chemical methods.
CO5: Perform quantitative estimation of fibres in blended textile materials.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	2	1	-	2	1	-	2	*	*
CO2	3	2	-	2	1	-	2	*	*
CO3	3	2	-	2	1	-	2	*	*
CO4	3	1	-	2	1	-	2	*	*
CO5	2	2	-	2	1	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

LIST OF PRACTICALS

1. Checking moisture regain of different natural textile fibres using a reputable brand conditioning oven.
2. Checking moisture regain of different synthetic textile fibres using a reputable brand conditioning oven.
3. Identifying of cotton fibers under a microscope and drawing their longitudinal and cross- sectional views.
4. Identifying of cotton fibers by chemical, physical test.
5. Identifying of jute fibers under a microscope and drawing their longitudinal and cross- sectional views.
6. Identifying of jute fibers by chemical, physical test.
7. Identifying of wool fibers under a microscope and drawing their longitudinal and cross- sectional views.
8. Identifying of wool fibers by chemical, physical test.
9. Identifying of silk fibers under a microscope and drawing their longitudinal and cross- sectional views.
10. Identifying of silk fibers by chemical, physical test.
11. Identifying of polyester fibers under a microscope and drawing their longitudinal and cross-sectional views.
12. Identifying of polyester fibers by chemical, Physical test.
13. Identifying of polyamide fibres under a microscope and drawing their longitudinal and cross-sectional views.
14. Identifying of polyamide fibres by chemical, physical test.
15. Identifying of acrylic fibers under a microscope and drawing their longitudinal and cross- sectional views.
16. Identifying of acrylic fibers by chemical, Physical test.
17. Identifying of viscose fibers under a microscope and drawing their longitudinal and cross- sectional views.
18. Identifying of viscose fibers by chemical, physical test.
19. To do quantitative estimation of fibres in a blend

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PRACTICAL	3.5 YARN TECHNOLOGY -I	L	T	P
		-	-	4

COURSE OBJECTIVES:

This course aims to develop hands-on skills in operating, setting, and gauging preparatory spinning machines such as blow room, card, comber, and draw frame. It enables students to perform speed, draft, production, and waste calculations, analyze machine performance, and produce uniform sliver through proper machine settings and process control.

COURSE OUTCOME(CO):

CO1: Operate, set, and gauge blow room machines including bale openers and cleaners, and calculate speeds of moving parts.
CO2: Operate and set card machines, practice lap and sliver piecing, and perform calculations related to speeds, drafts, and production.
CO3: Analyze carding performance through calculation of drafts, lap consumption, and machine efficiency.
CO4: Operate, set, and gauge combers, calculate noil percentage, and evaluate combing efficiency.
CO5: Perform speed and production calculations for draw frame machines and analyze their operational performance.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	2	1	-	2	1	-	2	*	*
CO2	3	2	-	2	1	-	2	*	*
CO3	3	2	-	1	1	-	2	*	*
CO4	3	1		2	1	-	2	*	*
CO5	2	2	-	2	1	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

LIST OF PRACTICALS (To perform any Ten practical)

1. Operation, Setting and Gauging of blending bale opener (hopper feeder) and to measure the dimension of various important parts of the machine.

2. To calculate the speed of different moving parts of blending bale opener (hopper feeder).

3. Operate and gauge the step cleaner and other opening machines available in the lab and also calculate speeds of different moving parts.

4. Adjustments of the weight per yard of the lap and its length.

5. Operate the card machine and produce sliver and to practice piecing lap and sliver.

6. To set and gauge different part of card machine.

7. Calculate the speeds of cylinder, flats, doffer and licker-in and other moving parts of card machine.

8. To calculate all tension drafts, all intermediate drafts, total drafts and draft constants of a card machine.

9. To calculate number of laps consumed per shift of eight hours.

10. To operate and set timing of comber and prepare sliver.

11. Set and gauge various parts of comber.

12. To calculate and analyse the comber waste percentage practically and evaluate the combing efficiency.

13. To calculate the speed of different moving parts of a draw frame machine

14. To calculate the production on draw frame per delivery per machine per shift of eight hours

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PRACTICAL	3.6 FABRIC TECHNOLOGY- I	L	T	P
		-	-	4

COURSE OBJECTIVE:

This course aims to develop practical skills in weaving preparatory processes and loom mechanisms. It enables students to prepare yarn packages, warps, and sized beams; perform drafting and denting; study and sketch weaving machines and motions; and analyze take-up and let-off mechanisms through gearing diagrams and calculations required for efficient weaving.

COURSE OUTCOME (CO):

CO1: Prepare cones, cheeses, pirns, and warp beams using winding and warping machines.
CO2: Operate sectional and high-speed warping machines and prepare warps as per given warp plans.
CO3: Prepare size paste, operate sizing equipment, and perform drafting and denting operations.
CO4: Study, sketch, and analyze the construction and material passage of winding, warping, and loom mechanisms.
CO5: Draw and analyze gearing diagrams of take-up and let-off motions and prepare negative cams for different weaves.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	2	1	-	2	1	-	2	*	*
CO2	3	2	-	2	1	-	2	*	*
CO3	3	1	-	2	1	-	2	*	*
CO4	3	2	-	2	1	-	2	*	*
CO5	2	2	-	2	1	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

LIST OF PRACTICALS (To perform any Ten practical)

1. Practice in preparing cones, cheeses and pirns from hanks or ring bobbins.
2. Practice in creeling and preparation of warp on sectional/mill warping machine of required number of ends and width.
3. Practice in creeling and preparation n of warpers beam on High-Speed warping machine of required warp plan.
4. Practice in operating sizing machine (if working model of sizing plant available).
5. Practice of size paste preparation in laboratory.
6. Practice of making weaver's knot in laboratory.
7. Practice in drafting and denting for different design draft.
8. Study and sketch the important parts of pirn winding machine.
9. Study and sketch the important parts of warp winding machine.
10. Study and sketch the important parts of sectional warping machine.
11. Prepare Negative cam of different weaves.
12. Study and sketch the passage of Warp sheet through different loom parts.
13. Draw the gearing diagram of 5 wheel take up motion and make calculations
14. Draw the gearing diagram of 7 wheel take up motion and make calculations
15. Study and sketch the working of Let-off Mechanism.

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THEORY	3.7 ECONOMIC POLICIES IN INDIA (OE-1)	L	T	P
		2	-	-

COURSE OBJECTIVES:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

COURSE OUTCOMES:

CO1: Explain the basic features of the Indian economy, including demographic trends, and analyze major economic problems like poverty, unemployment, and inflation.
CO2: Discuss the role of the agricultural sector, the impact of land reforms and the Green Revolution, and evaluate current agricultural policies.
CO3: Describe the industrial development pattern, the significance of small-scale industries, and the growth of the service sector in India.
CO4: Analyze the framework of economic planning (Planning Commission vs. NITI Aayog), and the impact of Monetary, Fiscal, and LPG policies.
CO5: Interpret India's external sector performance, including foreign trade composition, Balance of Payments, and the impact of Globalization and WTO.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Engineering Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PS O1	PSO2
CO1	1	2	-	-	2	1	2	*	*
CO2	1	2	-	-	2	1	1	*	*
CO3	1	1	-	-	2	2	2	*	*
CO4	1	2	-	-	3	3	2	*	*
CO5	1	2	-	-	2	2	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

Unit-1: **(6 Periods)**

Basic features and problems of Indian Economy: Economic History of India; Nature of Indian Economy, demographic features and Human Development Index, Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

Unit-2: **(5 Periods)**

Sectoral composition of Indian Economy: Issues in Agriculture sector in India, land reforms Green Revolution and agriculture policies of India,

Unit-3: **(5 Periods)**

Industrial development, small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.

Unit-4: **(7 Periods)**

Economic Policies: Economic Planning in India, Planning commission v/s NITI Aayog, Five Year Plans, monetary policy in India, Fiscal Policy in India, Centre state Finance Relations, Finance commission in India. LPG policy in India

Unit-5: **(5 Periods)**

External sector in India: - India's foreign trade value composition and direction, India Balance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

INSTRUCTIONAL STRATEGY

- Teachers should focus on conceptual clarity.
- An industrial visit can be organized in relevant industries. Audio-visuals aids should be used to teach.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Seminar, Presentation, Viva-voce.

RECOMMENDED BOOKS:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy. S Chand & Co. Ltd. New Delhi.
2. Mishra S.K & V.K Puri (2017). Indian Economy and –Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, New Delhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India, Oxford University Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
1	06	20
2	05	20
3	05	17
4	07	23
5	05	20
Total	**28**	**100**

THEORY	3.7 PROJECT MANAGEMENT (OE-1)	L	T	P
		2	-	-

COURSE OBJECTIVES:

The aim of this course is to help the students to develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.

COURSE OUTCOMES:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

CO1: Explain the fundamental concepts of project management, including the project life cycle and priorities, and construct a Work Breakdown Structure (WBS) for a given project.
CO2: Apply the capital budgeting process to generate and screen project ideas and analyze market feasibility using demand forecasting techniques.
CO3: Estimate project costs, working capital requirements, and prepare projected financial statements including Cash Flow and Break-Even analysis.
CO4: Evaluate the financial viability of projects using discounting (NPV, IRR) and non-discounting (Payback, ARR) capital budgeting techniques and social cost-benefit analysis.
CO5: Develop project schedules using Network Planning techniques (CPM/PERT) to analyze time-cost trade-offs and determine the least cost duration.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Engineering Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	2	1	1	-	-	3	1	*	*
CO2	2	2	-	-	1	3	2	*	*
CO3	2	2	-	-	-	3	1	*	*
CO4	2	2	-	-	2	3	2	*	*
CO5	2	3	1	2	-	3	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

Unit-1: (5 Periods)

Concept of a project: Classification of projects- importance of project management- The project life cycle- establishing project priorities (scope-cost-time)project priority matrix- work break down structure.

Unit-2: (6 Periods)

Capital budgeting process: Planning- Analysis-Selection-Financing-Implementation-Review. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques. Market planning and marketing research process- Technical analysis

Unit-3: (5 Periods)

Financial estimates and projections: Cost of projects-means of financing-estimates of sales and production-cost of production-working capital requirement and its financing-profitability projected cash flow statement and balance sheet. Break even analysis.

Unit-4: (6 Periods)

Basic techniques in capital budgeting: Non discounting and discounting methods- payback period-Accounting rate of return-net present value-Benefit cost ratio-internal rate of return.
Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects**.**

Unit-5: (6 Periods)

Project administration: progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off.
Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management softwares.

INSTRUCTIONAL STRATEGY

- Teachers should focus on conceptual clarity.
- An industrial visit can be organized in relevant industries. Audio-visuals aids should be used to teach.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Seminar, Presentation, Viva-voce.

RECOMMENDED BOOKS:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson – McGraw Hill
3. Project management - David I Cleland - Mcgraw Hill International Edition, 1999
4. Project Management – Gopala Krishnan – Mcmillan India Ltd.
5. Project Management- Harry-Maylor-Peason Publication

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SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
1	05	14
2	06	14
3	05	24
4	06	24
5	06	24
Total	**28**	**100**

PRACTICUM	4.1 TEXTILE TESTING	L	T	P
		2	-	2

COURSE OBJECTIVE:

As the name implies this paper aims to develop in the incumbent the capability of testing the products and its components for desired results. Without it a product can never be claimed for any standard.

COURSE OUTCOME(CO):

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

CO1 : Apply textile testing, quality control, and statistical tools to evaluate yarn properties.
CO2: Apply standard instruments and methods to measure fibre length, fineness, maturity, strength, and moisture characteristics under controlled humidity conditions.
CO3: Apply yarn count, twist, strength, diameter, and evenness testing methods to analyze yarn quality and irregularities using standard instruments.
CO4: Apply standard fabric testing methods to evaluate strength, tear, bursting, abrasion, crimp, air permeability, crease recovery, and pilling properties of textiles.
CO5: Analyze fibre blend composition and evaluate colour fastness, absorbency, and finishing quality of textiles using standard testing methods.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	3	2	-	-	2	*	*
CO2	3	-	-	3	2	-	2	*	*
CO3	3	2	-	3	-	2	2	*	*
CO4	3	2	2	3	-	-	2	*	*
CO5	3	2	-	3	2	2	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

UNIT-1 Importance of Textile Testing: (05 Periods)

Introduction to textile testing, properties of fibres, yarns and fabrics and their relevance in assessing the performance, of textiles during and after manufacture. Brief introduction of ISO.,
Definition of sample, sample size, sampling Technique, Introduction to quality control, Accuracy of measurement, presentation and analysis of data, SQC charts analysis of defects, difference between average and correlation. Standard deviation and coefficient of variation.

PRACTICAL

1. To Calculate the count/Denier/Tex of the different types of yarn

UNIT-2 Fibre Testing: (06 Periods)

Fibre Length (mean length, effective length and staple length. Fiber Length Measurement - Use of Baer sorter, Fibrograph, Uster-stapler, their principles of operation, Fibre Fineness Measurement - By cutting and weighing method, Shefield micronaire, Aerlometer, Maturity of cotton by caustic soda method and by airflow methods, Role of Humidity-Absolute Humidity, Relative Humidity, moisture Regain, Moisture content.
Introduction to H.V.I. (High Volume Instruments)
Fiber strength testing by stelometer

PRACTICAL

1. Find the staple length of fiber by Bare Sorter.
2. Find out fibre length by analytical digital fibrograph.
3. Measure fibre fineness by flowing air through a sample of fibre by micronaire.
4. Fiber Strength Testing by Stelometer

UNIT-3 Yarn Testing: (07 Periods)

Concept of count, its measurement by different methods. Concepts of S & Z twist, relation between tpi, twist multiplier and count., Measurement of yarn twist by Rock bank twist tester, continuous twist tester and by twist and untwist methods Measurement of yarn diameter by microscope.
Yarn strength testing, types of testing machines, single yarn strength testing and Lea strength testing.
Nature of irregularities – short term, medium term and long-term variations, periodic and non-periodic irregularities. Analysis of classmate and classifaults

PRACTICAL

1. To find the count of yarn by any one
   (i) by physical balance
   (ii) by yarn quadrants balance.
   (iii) by Beasley yarn balance.

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2.Determine the twist of yarn per inch/per meter in double yarn and its individual components by continuous twist tester and twist and untwist tester.

3.Find out lea strength of cotton yarn by lea strength tester (Power driven) and CSP.

4. Test evenness of the yarn by evenness tester.

UNIT-4 Fabric Testing: (06 Periods)

1.Fabric strength testing by cut strip, grab strip and revealed strip methods.

2.Fabric tear testing by tongue tear, trapezoid tear test.

3.Bursting strength testing by hydraulic strength tester.

PRACTICAL

1. Examine the bursting strength of a fabric by bursting strength tester.
2. Find out the relative abrasion properties of fabrics by Martindale abrasion tester.
3. Find the breaking strength of different textile fabrics by means of cloth strength tester (power driven).
4. Measure crimp by Shirley crimp meter.
5. Find out air permeability of fabric by air permeability tester.
6. Measure crease recovery of fabric by crease recovery tester.
7. Test of pilling of fabrics by computerized pilling tester.

UNIT-5 Textile Chemical Testing: (04 Periods)

1. Estimation of blend composition (Nylon, Polyester, Acrylic, Polyethylene, Cotton, wool, silk).

2. Colour fastness

i. Colour fastness to light
ii. Colour fastness to washing
iii. Colour fastness to rubbing
iv. Colour fastness to perspiration
v. Colour fastness to chlorine
vi. Water absorbency test

PRACTICAL

1. Estimation of final pH value of finished fabric.
2. Light fastness test
3. Washing fastness test
4. Rubbing fastness test
5. Perspiration fastness test
6. Absorbency test

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests

RECOMMENDED BOOKS

1. Textile Testing- J.E.Booth
2. Physical testing of textile by B P Saville

WEBSITES FOR REFERENCE:

https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks allotted (%)
1	05	18
2	06	22
3	07	30
4	06	20
5	04	10
Total	**28**	**100**

THEORY	4.2 YARN TECHNOLOGY- II	L	T	P
		3	-	-

COURSE OBJECTIVE:

This course aims to impart fundamental and practical knowledge of spinning technology with emphasis on ring spinning, ring frame calculations, doubling processes, and process control. It enables students to understand the construction, working, and limitations of ring frame machinery, perform essential spinning calculations, analyze yarn quality and productivity, and apply process control techniques. The course also introduces advanced spinning systems such as open-end, rotor, air-jet, vortex, friction, and electrostatic spinning, preparing students to understand modern spinning practices and yarn characteristics.

COURSE OUTCOME(CO):

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

CO1: Apply ring spinning principles to understand machine components, drafting and twisting mechanisms, yarn formation, faults, limitations, and recent developments in ring spinning.

CO2: Apply spinning calculations to determine draft, twist, production, efficiency, machine balancing, traveller speed, and spin planning for different yarn counts.

CO3: Apply principles of Two-for-One twisting and fancy doubling to analyze machine operation, production, efficiency, and calculations of folded and specialty yarns.

CO4: Apply process control and statistical analysis techniques to monitor productivity, waste, yarn quality, breakages, and efficiency in spinning operations.

CO5: Analyze advanced open-end spinning systems and their yarn properties, defects, and performance characteristics.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	3	3	-	-	2	*	*
CO2	3	2	3	3	-	-	2	*	*
CO3	3	2	2	3	-	-	2	*	*
CO4	3	3	2	3	2	-	2	*	*
CO5	3	2	-	3	-	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is option.

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COURSE CONTENTS

Unit – 1: Ring Frame (08 Periods)

Objects of ring frame, construction and functions of various parts of ring frames Viz Rings, Spindles, Balloon Control Rings, Spacer, Aprons, Cots, Spindle tape, Rising and Falling Lappets. Traveller, Function of Traveller, Traveller type, size and No.

Passage of material through ring frames. Twisting of Yarn, Effect of Twist, Twist terminology, Concept of twist multiplier, Factors affecting twist in spinning. Principles of Roller drafting and Drafting systems, Pneumatic drafting and their advantages, break draft and its effect. Building motion, its objects construction and working. Causes of end breaks in ring frame. Limitation of Ring Spinning. Yarn faults and their remedies. Recent developments in Ring Spinning.

Unit – 2: Ring Frame Calculation (08 Periods)

Calculation of Draft twist, Production and efficiency for different counts of Yarns. Calculation of balancing machines used in spinning processes for various counts- Spin Plan. Concept of average mill count and 40's conversion. Traveller speed, traveller lag calculation.

Unit– 3: Doubling (08 Periods)

Two for One Twister - Basic principles, Machine geometry, Different types of T.F.O. twister. Production and efficiency calculation and Advantages over ring doubling. Fancy doubling Yarns, their objects and their production Viz. Ply Yarn, Tape Yarn, Core Yarn and Sewing Threads. Calculation of folded yarns.

Unit– 4: Process Control in Spinning (08 Periods)

Control of mixing quality and cost, waste and cleaning in blow room and carding, comber waste yarn realisation. Measurements and analysis of productivity, of different M/c. Control of yarn count, strength, evenness and imperfections, statistical interpretation of data. Breakage and efficiency studies and their analysis.

Unit– 5: Advance Spinning (10 Periods)

Open end spinning: Different styles of open end spinning such as Rotor spinning, Air jet spinning, Friction spinning, Air vortex spinning, Electrostatic spinning, Properties of open-end spinning yarns defects of Open-end spinning yarns.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva voce.

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RECOMMENDED BOOKS:

1. Technology of Sort Staple Spinning by W.Klein
2. Principle of Spinning by A.R. Khare
3. Spun Yarn Technology by Carl A. Lawrence
4. Cotton Spinning Calculation and Yarn Cost by James Winter bottom

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks allotted (%)
I	08	24
II	08	19
III	08	19
IV	08	19
V	10	19
Total	**42**	**100**

THEORY	4.3 FABRIC TECHNOLOGY II	L	T	P
		3	-	-

COURSE OBJECTIVES:

This course aims to provide students with a clear understanding of dobby, multiple box, jacquard, and automatic weaving mechanisms used in modern weaving. It focuses on the classification, construction, and working principles of dobby and jacquard systems, multiple box motions, and warp protection devices. The course also introduces automatic and shuttle-less weaving technologies, selvedge formation, and advanced weft insertion systems, enabling students to analyze fabric patterning and contemporary weaving practices.

COURSE OUTCOME:

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

CO1 Apply dobby loom principles to classify dobbies, study their mechanisms, and prepare dobby lattices and pattern cards for woven designs.

CO2 Apply multiple box motion principles to study their types, mechanisms, safety devices, and prepare chain arrangements for weft pattern selection

CO3 Apply figure weaving and jacquard loom principles to analyse jacquard types, mechanisms, harness ties, and card cutting operations for patterned fabrics.

CO4 Apply loom auxiliary motion principles to study weft changing mechanisms warp protection devices, and mechanical and electrical warp stop motions.

CO5 Analyse advanced weaving systems by comparing shuttle less looms, weft insertion methods, selvedge formation, and principles of multi-phase weaving.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	2	3	-	-	2	*	*
CO2	3	2	2	3	-	-	2	*	*
CO3	3	2	2	3	-	-	2	*	*
CO4	3	2	-	3	-	-	2	*	*
CO5	3	2	-	3	-	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

COURSE CONTENTS

Unit – 1: Dobbies **(08 Periods)**

(i) Classification of dobbies.
(ii) Study of single lift dobby -Keighley and Climaxdobbies.
(iii) Positive dobbies (any two dobbies)
(iv) Method of preparing dobby lattice and Pattern cards
(v) Cross border dobby.
(vi) R. H. and L. H. dobby,

Unit – 2: Multiple Box Motion **(08 Periods)**

(i) Introduction to multiple box motions.
(ii) Kinds of multiple box motions.
(iii) Study of Cow burn and Peck's box motion its card saving device, safety devices.
(iv) Study of Knowles's box motion.
(v) Study of pick at will box arrangement.
(vi) Preparation of chain for given pattern of weft

Unit– 3: Jacquard **(08 Periods)**

(i) Introduction to figure weaving.
(ii) Kinds of jacquard.
(iii) Single lift single cylinder jacquard
(iv) Double lift single cylinder jacquard.
(v) Double lift double cylinder jacquard.
(vi) Cross border jacquard.
(vii) Harness ties.
(viii) Card cutting, Piano card cutting machine and lacing of cards

Unit– 4: Automatic Weaving **(08 Periods)**

(i) Pirn changing mechanism.
(ii) Shuttle changing mechanism.
(iii) Study of side weft fork motions.
(iv) Study of center weft fork motions.
(v) Study of loose reed motion.(Warp Protector)
(vi) Study of fast reed motion. (Warp Protector)
(vii) Mechanical and Electrical type warp stop motion

Unit– 5: Advance Weaving **(10 Periods)**

(i) Principle of operation for shuttle less looms comparative study of new systems of weft insertions, Weft storage unit.
(ii) Types of Selvedge and their formation.
(iii) Working and detailed description of Projectile, Rapier, Air jet and Water Jet Weaving machine,
(iv) Principle of multi-phase weaving.

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INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva voce.

RECOMMENDED BOOKS:

1. Weaving: Machine, mechanism and Management by M.K. Talukdar
2. Principle Of Weaving by Mark& Rabinson
3. Weaving Technolgy-II by NCUTE

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
I	08	20
II	08	20
III	08	20
IV	08	20
V	10	20
Total	**42**	**100**

PRACTICUM	4.4 FABRIC STRUCTURE & DESIGN	L	T	P
		2	-	2

COURSE OBJECTIVE:

This course aims to develop a fundamental understanding of woven fabric structures and their construction. It enables students to identify warp and weft, analyze fabric designs, drafts, peg plans, and denting orders, and construct basic to advanced weaves such as plain, twill, satin, sateen, backed fabrics, piques, bedford cords, and double cloths. Through practical loom work, the course builds skills in fabric analysis, weave drafting, and manufacturing of woven structures used in commercial textiles.

COURSE OUTCOME(CO):

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes

Students will be able to

CO1 Apply fabric structure concepts to identify woven and other fabric types and construct plain weave and its derivatives using design, draft, and peg plan principles.
CO2 Analyze fabric structure and apply twill weave principles to identify weaving particulars and manufacture twill and its derivative fabrics on a desk loom.
CO3 Apply decorative and complex weave principles to construct satin, sateen, honeycomb, huck a back, mock-leno, hopsack, and stripe/check fabrics using appropriate drafts and loom settings.
CO4 Apply pique, welt, and Bedford cord weave principles to analyze their structures, characteristics, and methods of construction.
CO5 Apply principles of backed fabrics and extra warp/weft figuring to analyze fabric construction, drafting, and methods of disposing surplus threads.
CO6 Apply double and multiple cloth construction principles to design, draft, peg, and analyze various double fabric structures and stitching methods.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	2	3	-	-	2	*	*
CO2	3	2	3	3	-	-	2	*	*
CO3	3	2	3	3	-	-	2	*	*
CO4	3	2	2	3	-	-	2	*	*
CO5	3	2	2	3	-	-	2	*	*
CO6	3	2	3	3	-	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

UNIT-1 Introduction and Plain Weave: (05 Periods)

Introduction to fabric structure. Explanation of woven structure and other fabric structures. e.g. Knitted, Non-woven, Bonded etc.

i. Definition of Warp and Weft, Ends and Picks. Determination of warp and wept in a given fabric. Design, Repeat of a design, Draft, Lifting or Peg plan and Denting order, Types of drafts used in the manufacture of the fabrics.

ii. Construction of plain weaves on point or graph paper. Relation of draft, design and peg plan.

iii. Construction of plain weave and its derivates in the form of simple Matt or Hopsack and Ribbed Structures.

PRACTICAL

1. Manufacturing of Plain weave and their derivatives on Desk Loom**.**

UNIT-2 Twill Weaves: (05 Periods)

Continuous regular twills, pointed twills, Combined twills, Rearranged twills, Broken twills, Fancy twills, Herring bone twills.

PRACTICAL

1. Analysis of a fabric and its objects. Confirmation of warp and weft and determination of weaving particulars from the given sample of a fabric.

2. Manufacturing of Twill weave and their derivatives on Desk Loom**.**

Unit-3 Satin and Sateen Weave, Miscellaneous Weave : (05 Periods)

Characteristics and uses of satin and sateen weaves. Construction of regular and irregular satin and sateen, Diamond and Diaper weaves on pointed draft, Simple Honeycomb, Brighton Honeycomb, Huck-a back, weaves, Mock-leno weaves, Sponge weaves, Devon huck, Barley Corn, Stitched hop-sack, Twilled hop-sack, Stripe and Check Weave

PRACTICAL

1. Manufacturing of SATIN AND SATEEN WEAVE on Desk Loom.

Unit-4 Welts and Piques, Bed Ford Cords: (04 Periods)

Varieties and characteristics of piques and welts, methods of embellishing pique fabrics, their structure, plain pique, backed pique, fast backed welts and waved pique.

Plain faced bed ford, wadded bed ford cord, bed ford cord arranged with alternate picks and cords containing odd number of ends. twill-faced bed ford cord.

Unit 5 Backed Fabrics (Warp and Weft), Extra Warp and Weft: (05 Periods)

Backed fabrics, wadded warp and weft backed fabrics, their beaming and drafting procedure. Principles of figuring with extra warp and weft one and one i.e. pick and pick wefting, two and two wefting. Methods of disposing of extra threads on the back of the fabric. Spot figures with extra warp and extra weft arranged in a particular order.

Unit-6 Double Cloth: (04 Periods)

Construction of double and multiple cloths on design paper, their beaming, drafting and pegging. Double Cloth according to types of stitching. Types of double structures viz.
Tubular Fabrics. Double-faced Fabrics., With wadded thread in both warp and weft direction.

Fabrics opening to double the width. Centre stitched double cloth., Centre Warp Stitched, Centre Weft Stitched

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Fabric Structure and Design by N. Gokarveshan
2. Watson's textile design &colour by Z. J. Grosicki.
3. Woven fabric structure design and product planning by Dr. J. Hayavadana
4. Mastering weaves structure- Sharon Alderman-Inter weave Press

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	05	15
2	05	15
3	05	15
4	04	15
5	05	10
6	04	15
Total	**28**	**100**

THEORY	4.5 TEXTILE CHEMICAL PROCESSING (PE-1)	L	T	P
		2	-	-

COURSE OBJECTIVE:

This course aims to provide basic knowledge of textile wet processing, including preparatory processes, mercerization, dyeing, printing, and finishing. It enables students to understand the purpose, principles, and effects of various chemical treatments on different fibers, apply suitable dyes and printing methods, and appreciate the role of finishing processes in improving fabric appearance, performance, and end-use properties.

COURSE OUTCOME (CO):

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

CO1: Apply textile pretreatment principles to understand impurities removal and key processes such as singeing, desizing, scouring, bleaching, carbonization, and degumming.

CO2: Apply mercerization principles to analyze its objectives, processes for yarn and fabric, and resulting physical changes in fibres.

CO3: Apply dye classification and dyeing principles to select suitable dyes and processes for cotton, wool, silk, polyester, acrylics, and dope-dyed fibres.

CO4: Apply textile printing principles to classify printing methods and styles and understand block, screen, spray, direct, resist, and discharge printing.

CO5: Apply finishing principles to understand the objectives and basic processes of crease-resistant, water-repellent, antimicrobial, and soil-repellent textile finishes.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	2	2	-	2	*	*
CO2	3	2	2	2	-	-	2	*	*
CO3	3	2	2	2	2	-	2	*	*
CO4	3	2	-	2	-	-	2	*	*
CO5	3	2	-	2	2	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

Unit – I: Preparatory Process (08 Periods)

General Introduction of following:

1. Impurities in raw cotton, jute, wool and silk, their removal.,
2. Cropping, Shearing and Gas Singeing
3. Desizing.,
4. Scouring of cotton, Wool.
5. Bleaching of cotton with Sodium Hypochlorite and Hydrogen peroxide.,
7. Carbonization of wool.,
8. Degumming of silk.,

Unit – II: Mercerization (03 Periods)

1. Mercerization Object.
2. Mercerization process for yarn and cloth.
3. Physical changes in fibers after mercerization.

Unit– III: Dyeing (08 Periods)

1. Classification of dyes according to their mode of application.
2. Dyeing of cotton with direct, Sulphur, Vat, reactive.
3. Dyeing of wool and silk with Acid dyes.
4. Dyeing of Polyester with disperse dyes.
5. Dyeing of acrylics with modified basic dyes.
6. Basic idea about dope dyeing.

Unit– IV: Printing (05 Periods)

1. Object of Printing & classification.
2. Methods of printing: Block, screen and spray printing.
3. Styles of printing: Elementary knowledge of direct. resists, discharge styles of printing.

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Unit– V: Finishing (04 Periods)

Object of Finishing - Elementary knowledge of different types of finishing processes e.g. Crease-Resistant Finish, Watre repellent Finish, Antimicrobial Finish, Soil repellant finish

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva voce.

RECOMMENDED BOOKS:

1. Basics of Textile Chemical Processing
2. Textile Chemical Processing (Central Board of Secondary Education in Collaboration with NIFT)
3. Bleaching, Mercerizing & Dyeing of cotton materials by R.S. Prayag

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
I	08	25
II	03	10
III	08	30
IV	05	20
V	04	15
Total	**28**	**100**

THEORY	4.5 PRINCIPLE OF DESIGN AND COLOR (PE-2)	L	T	P
		2	-	-

COURSE OBJECTIVE:

This course aims to develop fundamental skills in textile drawing, sketching, and pattern development, along with a clear understanding of colour theories and their application in textiles. It enables students to apply light and pigment colour principles, create colour harmony and contrast, and study colour–weave interactions. The course also focuses on developing textile patterns using suitable repeats and transferring designs onto graph paper for fabric development.

COURSE OUTCOME(CO):

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

CO1 Apply textile design principles to draw, modify, and assemble floral, geometric, and patterned motifs for fabric design

CO2 Apply colour theory principles to understand light, spectra, and relationships among primary, secondary, and complementary colours in textiles.

CO3 Apply pigment colour theory to classify, modify, and harmonize colours using colour wheel, contrasts, tints, shades, and hues in textile design.

CO4 Analyze colour effects produced by simple and compound weaves in textile fabrics.

CO5 Apply pattern development principles to create textile designs using various repeat systems and transfer motifs onto graph paper according to fabric structure.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	3	2	-	-	2	*	*
CO2	3	2	-	2	-	-	2	*	*
CO3	3	2	2	2	-	-	2	*	*
CO4	3	2	2	-	-	-	2	*	*
CO5	3	2	3	2	-	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

Unit – 1: Drawing and Sketching (06 Periods)

1. Drawing, tracing, enlarging reducing and transferring of simple and elaborate figures.
2. Sketching of flowers, buds, leaves, geometrical figures and their assembly to obtain an all over effect in fabric.
3. Preparation of sketches for stripped, check, spotted geometric and diaper patterns, suitable for fabrics.

Unit – 2: Light Theory of colours (04 Periods)

1. Fundamentals of Light Theory of colours.
2. Spectrum of colors i.e. Visible Spectrum, Absorption spectrum and Emission Spectrum.
3. Primary Colors, Secondary colors, Complementary Colors, Chromatic Circle.
4.

Unit– 3: Pigment Theory of Colors (06 Periods)

1. Fundamentals of Pigment theory of colour.
2. Classification of colours, Primary, Secondary and Tertiary colours.
3. Modification of colours. Color Wheel
4. Colour contrast, Monochromatic Contrast, Polychromatic Contrast, Simultaneous Contrast, Successive Contrast, contrast of Hue, Contrast of Tone
5. Colour harmony, Harmony of Analogy , Harmony of Contrast.
6. tints, shades and broken hues.

Unit– 4: Application of colour and weave effect. (06 Periods)

1. Simple Weave and color effect
2. Compound Weave and color effect

Unit– 5: Development of Textile Pattern (06 Periods)

1. Development of textile patterns on different basis such as drop, turn over, drop reverse etc. Unit and repeat compared.
2. Transfer of design of motives on graph paper and pilling of weaves according to structure/texture.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva voce.

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RECOMMENDED BOOKS:

1. Principle of Design- Watson

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
I	06	10
II	04	20
III	06	30
IV	06	20
V	06	20
Total	**28**	**100**

PRACTICAL	4.6 YARN TECHNOLOGY-II	L	T	P
		-	-	4

COURSE OBJECTIVE:

This course aims to develop practical skills in operating, setting, and maintaining ring frame and doubling machines. It enables students to produce folded yarn, perform essential spinning calculations related to spindle speed, twist, TPI, draft, and production, and carry out machine gauging and maintenance. The course also focuses on spin planning, breakage and efficiency studies, traveller performance analysis, and practical adjustments of drafting and twisting components in ring spinning operations.

COURSE OUTCOME (CO):

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

CO1: Operate spinning machines to produce yarn and calculate twist, draft, spindle speed, and production parameters.

CO2: Perform spindle and lappet gauging, carry out ring frame maintenance, and calculate spindle speed, twist constant, TPI, and production of ring doubling machines.

CO3: Apply spin planning, machine setting, breakage analysis, labour allocation, and maintenance practices for efficient ring frame operation.

CO4: Calculate ring doubler parameters, analyze traveller speed and doff weight, and study breakages to assess ring frame performance.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	3	-	-	2	*	*
CO2	3	2	-	3	-	-	2	*	*
CO3	3	3	2	3	-	2	2	*	*
CO4	3	2	-	3	-	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

LIST OF PRACTICALS (To perform any ten practical)

1. Operate the doubling machine and produce folded yarn and to calculate twist constant, TPI, Spindle speed and production.

2. To Calculation twist constant and draft constant and production from machine particulars of ring frame.

3. Operate the machine and produce yarn.

4. Gauge the Spindle and Lappets.

5. Carryout the maintenance of ring frame practically.

6. To calculate spindle speed , Twist Constt, TPI & Production of ring doubler.

7. To learn about making spin plan, taking breaking study, snap study of idle spindles, labour allocation in Ring frame dept on assumption basis.

8. To learn the changing the draft change pinion and twist wheel, traveller and ratchet wheel at ring frames and mount the spindle tape and set it for 'S' and 'Z' twist.

9. Carry out the maintenance of ring frame practically.

10. To calculate spindle speed , Twist Constant, TPI & Production of ring doubler.

11. To study traveler speed & doff weight of Ring frame.

12. To Study The Ring Frame Breakges.

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PRACTICAL	4.7 FABRIC TECHNOLOGY-II	L	T	P
		-	-	4

COURSE OBJECTIVE:

This course aims to develop hands-on skills in setting, operating, and maintaining looms fitted with dobby, drop box, and jacquard mechanisms. It enables students to perform beam gaiting, loom tuning, dobby dismantling and timing, lattice and chain preparation, fault identification and rectification, and weaving of defect-free fabric. The course also provides practical exposure to jacquard card punching and sketching of weaving mechanisms for better technical understanding.

COURSE OUTCOMES:

The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

CO1 Apply loom setting and tuning practices including beam gaiting, drop box fixing, and fault rectification for efficient weaving.

CO2 Operate, dismantle, adjust, and reset dobby mechanisms, including timing, barrel setting, and lattice preparation for dobby weaving.

CO3 Apply practical skills in operating dobby and drop box looms, mending broken ends, and producing defect-free woven fabric.

CO4 Analyze and sketch dobby, drop box, and jacquard mechanisms and prepare punched cards using piano card punching machines.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	3	-	-	2	*	*
CO2	3	2	2	3	-	-	2	*	*
CO3	3	2	-	3	-	-	2	*	*
CO4	3	2	3	2	-	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

LIST OF PRACTICALS (To perform any Ten practical)

1. Practice of beam gaiting.
2. Practice of fixing and tuning the whole loom to run for perfect weaving.
3. Dismantling of various parts of dobby, their sketching and resetting.
4. Timing and adjustment of dobby for giving connection of T lever, Arm and Eccentric provided on the shaft. Barrel setting.
5. Practice of preparing dobby lattice.
6. Practice of operating loom fitted with dobby and weaving of cloth.
7. Practice of mending broken ends after levelling the healds.
8. Finding and removing faults in dobby weaving.
9. Fixing and tuning of drop box motion.
10. Chain preparation for different weft plans for drop box loom.
11. Sketching of various parts of drop box motion.
12. Sketching various parts of SLSC, DLSC and DLDC Jacquard
13. Practicing the Piano Card Punching Machine for preparation of punched card.

UPDATED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P. LUCKNOW IN C.D.C MEETING HELD ON 16.07.2026

THEORY	4.8 RENEWABLE ENERGY TECHNOLOGIES (OE 2)	L	T	P
		2	-	-

COURSE OBJECTIVE

The objectives of this course are to:

- Provide a comprehensive understanding of the **current and future global energy scenario**.
- Introduce students to **renewable and non-conventional energy sources** as alternatives to fossil fuels.
- Enable understanding of **solar, wind, and bio-energy systems** and their working principles.
- Develop the ability to **evaluate suitable renewable energy options** for a given location.
- Familiarize students with **economic, environmental, and sustainability aspects** of renewable energy technologies.

COURSE OUTCOMES (CO):

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

CO1: Explain the global energy scenario, energy resources, and the need for renewable energy with economic and environmental perspectives.
CO2: Describe principles, components, and applications of solar energy systems including solar thermal and solar PV technologies.
CO3: Explain wind energy fundamentals, types of wind energy systems, site selection, and performance aspects.
CO4: Evaluate bio-energy generation methods such as biomass combustion, biogas, biofuels, and cogeneration systems.
CO5: Identify and compare alternative renewable energy sources such as tidal, wave, hydro, geothermal, hydrogen, fuel cells, and hybrid systems for suitable applications.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

Course Outcomes (COs)	PO1 Basics & Discipline Knowledge	PO2 Problem Analysis	PO3 Design & Development	PO4 Tools, Experimentation & Testing	PO5 Socio-Economic/ Environmental	PO6 Project Mgmt & Communication	PO7 Lifelong Learning	PSO1	PSO2
CO1	3	1	–	–	2	–	2	*	*
CO2	3	2	2	1	1	1	1	*	*
CO3	2	2	2	–	1	1	1	*	*
CO4	2	2	1	1	2	1	1	*	*
CO5	2	3	1	1	3	1	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENT

Unit-1: (6 Periods)

Introduction: World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achievements / Applications; Economics of renewable energy systems.

Unit-2: (6 Periods)

Solar energy: Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.

Unit-3: (5 Periods)

Wind Energy: Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance. Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.

Unit-4: (5 Periods)

Bioenergy: Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.

Unit-5: (6 Periods)

Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

INSTRUCTIONAL STRATEGY

- Teachers should focus on conceptual clarity.
- An industrial visit can be organized in relevant industries. Audio-visuals aids should be used to teach.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Seminar, Presentation, Viva-voce.

REFERENCE BOOKS:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B

Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	06	20
2.	06	20
3.	05	20
4.	05	20
5.	06	20
Total	28	100

THEORY	4.8 ENERGY EFFICIENCY AND AUDIT (OE-2)	L	T	P
		2	-	-

COURSE OBJECTIVE

The objectives of this course are to:

- Develop competency to **identify and implement energy efficiency measures** in industrial facilities.
- Enable understanding of **energy-efficient equipment and systems** such as pumps, compressors, lighting, and electrical machines.
- Introduce **energy conservation principles, standards, and regulatory framework** applicable in India.
- Train students to **conduct basic energy audits**, analyze losses, and recommend improvement measures.
- Familiarize students with **co-generation concepts, tariffs, and economic evaluation** for reducing energy costs.

COURSE OUTCOMES (CO):

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

CO1: Explain concepts of energy efficiency, energy conservation, national energy scenario, and regulatory framework in India.

CO2: Apply energy-efficient practices and evaluate energy conservation opportunities in pumping systems, fans, and blowers.

CO3: Explain energy efficiency measures and loss-reduction techniques for air compressors and diesel generator sets.

CO4: Apply energy conservation techniques and innovative measures in industrial and commercial lighting systems.

CO5: Explain energy-efficient electrical machines, drives, co-generation concepts, and tariff systems for reducing energy losses and costs.

CO6: Conduct a basic energy audit, analyze energy flows and losses, and prepare an energy audit report with simple economic evaluation.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

Course Outcomes (COs)	PO1 Basics & Discipline Knowledge	PO2 Problem Analysis	PO3 Design & Development	PO4 Tools, Experimentation & Testing	PO5 Socio-Economic/ Environmental	PO6 Project Mgmt & Communication	PO7 Lifelong Learning	PSO 1	PSO 2
CO1	3	1	–	–	2	–	1	*	*
CO2	2	3	1	1	2	1	1	*	*
CO3	2	2	1	1	2	1	1	*	*
CO4	2	2	–	–	1	1	1	*	*
CO5	2	2	1	–	3	–	1	*	*
CO6	2	3	–	–	2	2	–	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENT

Unit – 1 **(4 Periods)**

Introduction to Energy Efficiency
Energy Scenario: Energy demand and supply, National scenario.
Energy Efficiency and Energy Conservation; concepts
Indian Electricity Act 2001; relevant clauses of energy conservation
BEE and its Roles
Star Labelling: Need and its benefits.

Unit – 2 **(5 Periods)**

Pumping Systems, Fans and Blowers
Factors affecting pump performance
Efficient Pumping system operation
Energy conservation opportunities in Pumping systems
Fan types, flow control strategies
Fan performance Assessment
Energy Conservation opportunities in Pumping systems
Tips for energy saving in fans and blowers

Unit – 3 **(5 Periods)**

Air Compressors and Diesel Power Generator sets
Classification of compressors
Pneumatic System components
Effect of various parameters on efficiency of Compressor
Capacity control of Compressors
Checklist for Energy Efficiency in Compressed air systems
Operating guidelines for diesel generator, operational factors
Effects of improper ventilation of genset
Energy saving measures for DG sets

Unit –4 **(4 Periods)**

Energy Conservation in Lighting System
Replacing Lamp sources
Using energy efficient luminaries
Using light controlled gears
Installation of separate transformer / servo stabilizer for lighting
Periodic survey and adequate maintenance programs
Innovative measures of energy savings in lighting
Open Elective Courses 454

Unit– 5 **(6 Periods)**

Energy Efficient Electrical Machines
Need for energy conservation induction motor and transformer
Energy conservation techniques in induction motor by:
Energy conservation techniques in Transformer
Energy Conservation Equipment: Soft starters, Automatic star delta converter, Variable Frequency Drives, Automatic p. f. controller (APFC)
Energy efficient motor; significant features, advantages, applications and Limitations
Energy efficient transformers, amorphous transformers; epoxy Resin cast transformers / Dry type of transformer
Aggregated Technical and commercial losses (ATC), Technical losses; causes and measures to reduce, Commercial losses: pilferage, causes and remedies
Application of tariff system to reduce energy bill
Co-generation and Tariff; concept, significance for energy conservation

Unit– 6 **(4 Periods)**

Energy Audit of Electrical Systems
Energy audit (definition as per Energy Conservation Act)
Energy audit instruments and their use
Questionnaire for energy audit projects
Energy flow diagram (Sankey diagram)
Simple payback period, Energy Audit procedure (walk through audit and detailed audit).
Energy Audit report format.

INSTRUCTIONAL STRATEGY

- Teachers should focus on conceptual clarity.
- An industrial visit can be organized in relevant industries. Audio-visuals aids should be used to teach.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Seminar, Presentation, Viva-voce.

REFERENCE BOOKS:

1. Guidebooks No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).
2. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi, Edition 2018, (ISBN: 978-93-86173-683).
3. Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539
4. Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708
5. Sharma, K. V., Venkataseshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298
6. Mehta,V. K., Principles of Power System, S. Chand andCo.New Delhi, 2016, ISBN 9788121905947
7. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K KatariaandSons, New Delhi ISBN-13: 9789350141014.
8. Desai, B. G.; Rana, J. S.; A. Dinesh, V.; Paraman, R., Efficient Use and Management of Electricity in

Industry, Devki Energy Consultancy Pvt. Ltd.
9. Chakrabarti, Aman, Energy Engineering and Management, e-books Kindle Edition

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	04	15
2.	05	17
3.	05	17
4.	04	15
5.	06	21
6.	04	15
Total	28	100

AUDIT COURSE	4.9 ESSENCE OF INDIAN KNOWLEDGE AND TRADITION	L	T	P
		2	-	-

COURSE OBJECTIVES:

Understand the fundamental aspects of the Indian Knowledge System, its integration with modern science, principles of Yoga and holistic healthcare, and practical applications in contemporary contexts.

COURSE OUTCOMES (CO) :

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

CO1: Explain the foundational structures of the Indian Knowledge System, including the Vedas, Upavedas, Vedangas, and Upangas, and discuss their historical significance.
CO2: Relate ancient Indian scientific and technological achievements to modern science and analyze the convergence of science and spirituality.
CO3: Describe the basic principles of Yoga and Holistic Healthcare and evaluate their benefits and potential for integration with modern medicine.
CO4: Analyze case studies to demonstrate the contemporary relevance and practical application of Indian Knowledge Systems in solving modern problems.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Engineering Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	1	-	-	-	3	-	2	*	*
CO2	2	2	-	-	2	-	2	*	*
CO3	-	-	-	-	3	2	3	*	*
CO4	1	2	2	-	3	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

COURSE CONTENTS

Unit 1: Introduction to Indian Knowledge System (16 Periods)
Overview of Indian Knowledge System
Importance and relevance

1. Introduction to the Vedas
2. Upavedas
3. Vedangas
4. Upangas

Unit 2: Modern Science and Indian Knowledge System (06 Periods)

1. Relevance of Science and Spirituality,
2. Science and Technology in Ancient India,

Unit 3: Yoga and Holistic Healthcare (04 Periods)

1. Basic principles of Yoga
2. Benefits of holistic healthcare practices
3. Integration with modern healthcare

Unit 4: Case Studies / Assignment (02 Periods)

Practical Applications / Case studies demonstrating the relevance of Indian Knowledge System in modern times.

INSTRUCTIONAL STRATEGY

This being one of the most important subject, teacher should lay emphasis on developing basic understanding of various concepts and principles and procedures involved herein. Teacher should involve students in different practices like meditation, yoga camp etc.

MEANS OF ASSESSMENT

- Viva -Voce Exam

RECOMMENDED BOOKS

1. Cultural Heritage of India-Course Material, V. Sivaramakrishna, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Modern Physics and Vedant, Swami Jitatmanand, Bharatiya Vidya Bhavan
3. Science of Consciousness Psychotherapy and Yoga Practices, R N Jha, Vidyanidhi Prakasham, Delhi, 2016.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	16	50
2.	06	20
3.	04	15
4.	02	15
Total	**28**	**100**

8. GUIDELINES FOR ASSESSMENT OF STUDENT-CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows

i. 15 Marks for general behaviour and discipline
(by HODs in consultation with all the teachers of the department)

ii. 10 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)

a)	75 - 80%	6 Marks
b)	80 - 85%	8 Marks
c)	Above 85%	10 Marks

iii. * Even Semester:

25 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSSactivities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a) State/National Level participation
b) Participation in two of above activities
c) Inter-Polytechnic level participation

****Odd Semester:**

25 Marks maximum

a) Language Lab Practices / foreign language practices
b) Group Discussion and Personality Development
c) Industrial Visits/Industrial Talks
d) Power Point Presentations and Resume Making
e) Development of Aptitude and Reasoning Skills
f) Participation in the technical Exhibitions, Symposiums, Seminars, Workshops at the Institute /District/State/National Level.

9. RESOURCE REQUIREMENT

A. PHYSICAL RESOURCES

a) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

b) Equipment Requirement:

Following Laboratories are required for diploma programme in Textile Technology (3rd and 4th Semester):

TEXTILE TESTING LAB

S.No	Name of Equipment	No.	@Rs.	Amt.in Rs.
1.	Baer Sorter (For Fibre Length) Acrylic Transparent Sheet - 6"X8"X2 pices, 3"X8"X2 pcs Fibre Mounting Templest 6"X8"X2 pices, 3"X8"X2 pcs with tweezers, velvet pad, scales, plan chass with all complete accessories or Latest Configuration	2	35000	35000
2.	Micro scope Digital Mocro scope - Microscope & Ends Counting Equipments-Magnifying Power 5X,10X,20X,40X,100X lenses Trinocular biological microscope with fibre cross section kit, high resolution CCD camera and imaging software with measurement facilities, Scope of use section of fibre or yarn, analysis of any fibre, yarn and fibre Range : 5X,10X,20X,450X,100X / as per requirements, Focus : Adjustable, Lights - White, Blue, Yellow, Upper & Lower, Supply -220 V AC supply Single Phase with all complete accessories Or Latest Configuration	2	65000	65000
3.	Moisture Meter	1	16000	16000
4.	Wrap reel	2	40000	80000
5.	Wrap Block	2	9500	19000
6.	Beesley Balance	4	7000	28000
7.	Quadrant Balance	2	6000	12000
8.	Lea Strength Tester	1	75000	75000
9.	Single Thread Tester (Digital)	1	100000	100000
11.	One Inch Twist Tester	2	9800	19600

12.	Take Up Twist Tester Yarn test length : 25 mm to 500 mm adjustable (Metric unit) Or 1" to 20" Maximum adjustable (imperial unit), The test length is automatically taken into account for calculation and final reading is displayed directly in TPM/TPL Range :Upto 60TPL Resolution :1 TPM or 0.01 TPI Motor Speed: Upto 1500 RPM Clamps : Spring loaded clamps at motor end for easy clamping of Yarn Averaging : Reading of at least 10 samples can be stored and average TPM/TPI value is calculated and digital display with pre set device. Supply : 220 V AC, single phase Suitable for S/Z type of twisted yarn with reset device. Tension weight upto 100 gm adjustable. Yarn spool mounting arrangement at one end of the twist tester with all complete accessories or Latest Configuration	2	28500	57000
13.	Fabric Strength Tester (Tensile Strength)	1	80000	80000
14.	Tearing Strength Tester	1	35000	35000
15.	Bursting Strength Tester	1	35000	35000
16.	Abrasion Resistance Tester(Martindle Type)	1	75000	75000
17.	Laundro meter (For washing fastness testing)	1	80000	80000
18.	Crocko Meter	1	10000	10000
19.	Digital Fibro graphMeasuring Principle-Optical Measuring Range-12.0 to 45.0 mm Measuring Accuracy - +/- 0.1 mm Result Output-2.5% SL,50% SL & UR % Front End Language-English Applicable Standard-ASTM	1	320000	320000

	D5332,ISO2648 & IS233 Power Supply-Single Phase 220V AC			
20.	Uster Evenness Tester	1	2000000	2000000
21.	Trash Analyser	1	150000	150000
22.	Conditioning Oven 220 V With capability of maintaining temperature up to 100oC and facility for smoth variation of temperature inside 27 liter.	1	98500	98500
23.	Stelometer (For bundle Strength)	2	150000	300000
24.	Crease Recovery Tester Size of the Test Specimen - 40mm X 15mm, Crease Load : 1Kg.(Stainless Steel), Angle measurement : On an Engraved circular scale graduated in 1 deg., Scale measurement : 0-180 with all complete accessories or Latest Configuration	2	15000	30000
25.	Water Repellency Tester	1	80000	80000
26.	Pilling Tester	1	30000	30000
28.	Air Permeability Tester	1	60000	60000
29.	Sheffield Micronaire with compressor (For Fibre Fineness)	1	150000	150000
31.	Miscellaneous Items-Thermometers, Whirling Hydrometer, Dry & Wet bulb thermometer, Physical Balance, 1.5 ton Air conditioner for atmosphere control etc.			
32.	Classimate (Yarn faults finding equipment)	1		1200000
34.	Sublimation fastness tester	1	100000	100000
35.	Round Sample of GSM with Electronic balance	1	20000	20000
36.	Stiffness Tester	1	15000	15000
37.	Drape meter	1	25000	25000
38.	Fabric Thickness Tester	1	8000	8000
39.	A.S.T.M. Cards For Threads/Inch	1		

SPINNING LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Blow Room Line With Six Beating Points (Lab Model) Latest Lab Model of blaow room line of 10 inch width or more complete with hopper feeder, Scutcher, beaters with adjustment grid bars, lattic, Krischner neater, Feed regulatory system, calendar rollers, lap rollers, lap tray with electric control pannel, beating point = 4.5 to 6 with complete accessories or Latest Configuration	1	5000000	5000000
2.	Model of mini carding plant 250 mm working width 250 mm cylinder, doffer, feed roller,opening roller, striping roller, crush roller stainless undercasing, takeup drum suitable for feeding, miniature draw frame with gear and pulleys to drive feed roller, cyliner and doffer and other accessories, Mechanical type possibility of processing 50 gms. per batch 10 "width, metallic wire clothing with complete accessories, Microprocessor based indidual drive or Latest Configuration	1No.	800000	800000
3.	Draw Frame : Having 3 over 3 drafting arrangement to process the silver from miniature carding machine with individual AC variable speed motors with change grars to vary the speeds of front roller, middle and back roller for different Total Draft and break Draft inclusive of motor, rpm indicators control system and other accessories Mechanical type single delivery, 3 over3 drafting arrangement, range 5-15 Draft Microprocessor based or Latest Configuration	1No.	800000	8,00,000
4.	High Speed Simplex (Lab Model) Latest Lab Model Range :6-12 Spindle Suitable for 110 mm dia package Draft Range=6-18, 3 roller apron dratingarragement SKF PK 1500, individual AC variable speed motors with control system with automatic stop motion, Inching mechanism, 100 empty PP bobbins with complete accessories and pinion according to draft change with all complete accrssories or Latest Configuration	1	480000	480000
5.	Ring Frame Ring Spinning Frame : No. of Spindle6-12, mechanical speed 25000 rpm, ring dia - 38 mm, 70mm gauge, 180 mm lift, SKF PK 2025/2035, 3 over 3 drafting arrangement with short cradles, for gearing arrangement to change the total draft, Break draft and TPI with	1	850000	850000

	change gears and other accessories. Mechanical draft 10-50 Microprocessor based or Latest Configuration			
6.	Sliver Lap Machine	1	250000	250000
7.	Ribbon Lap Machine	1	250000	250000
8.	Comber 6/8 Heads	1	800000	800000
9.	Parallel Winding Machine(24 Drums) (Lab Model) Cheese winding :Range 4-8 or more drum, Speed Range-600-800 y.p.m., Optical cleaner on individual spindle, Steel drum/ Bakelite drum as per parallel winding, 220V, Single phase motor, 100pp cheeses with all complete assessories or latest configuration	1	400000	400000
10.	Yarn Doubling Machine (Lab Model)	1	275000	275000
11.	Hank Reeling Machine	1	25000	25000
12.	Two For One Twister(T.F.O.) TFO type, No. of spindle= range 4-8, 230 mm guage, 150 mm pot dia, suitable for cheese of 170 mm traverse, twist range=3.0 to 45.0, count range 2/8's to 2/80's Ne, Tangential belt drive for S & Z twist both, with automatic shop motorn and other complete accessories, 100 PP empty package with all complete accessories or Latest Configuration	1	600000	600000
13.	Stripping Roller (For Card)	1	5000	5000
14.	Grinding Roller (Transverse wheel Grinder)	1	5000	5000
15.	Metallic Wire Mounting Equipment (With Butt Welder)	1	20000	20000
17.	Assembly Winder	1	250000	250000
18.	Open end spinning M/c of Twelve rotors (Lab Model) Having Range 4-8 head rotor guage-230 mm having 48 mm rotor with OK39/40 opening rollers, automatic stop motion R4/10 navels, built in automatic indicators and quick response sensors to monitor yarn continuty and sliver, trash separator and discharge tunel for better cleaning, Feeding can size of 14" X 42" and take up package cone and cheese both with individual motors with pully to change draft and twist with motors. Electrical PLC system, Computer, UPS, Control system, Dreft range suitable for 2' to 24's and other all complete accessories, draft range-50-200 user friendly menu driven software or Latest Configuration	1	750000	750000

NOTE:

1. Indian make working laboratory models for the costly equipment mentioned above be purchased if available.

WEAVING LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Warp Winding Machines			
	A. Ordanary Machine with 10 Heads	1	75000	75000
	B. Automatic Winding Machine with 10 Heads	1	800000	800000
2.	Pirn Winding Machine with 4 Heads	1	75000	75000
3.	Warping Machines			
	A. Beam Warping Machine (High Speed)	1	300000	300000
	B. Sectional Warping Machine	1	175000	175000
4.	Working Model of Sizing Plant	1	500000	500000
5.	Drawing and Denting Frames (cap. 200e nds) Stainless Screen Frame, Capacity 3200 ends with all Complete Accessories or Latest Configuration.	2	10000	20000
6.	Beam Knotting Machine	1	80000	80000
7.	Plane Looms			
	A. Plain Loom For Plain Tappet	1	70000	70000
	B. Plain Loom For Other Weave Tappets	1	100000	100000
8.	Dobby Looms			
	A. Single (Acting) Dobby Loom	1	200000	200000
	B. Double Acting (Double Lift) Dobby Loom	1	200000	200000
9.	Jacquard Looms			
	A. Loom with Single Lift Single Cylinder Jacquard	1	250000	250000
	B. Loom With Single Lift Double Cylinder Jacquard	1	250000	250000
	C. Loom With Double Lift Double Cylinder Jacquard	1	250000	250000
10.	Automatic Weaving Machines			
	A. Automatic Pirn Changing Loom	1	300000	300000
	B. Automatic Shuttle Changing Loom	1	300000	300000
11.	Shuttleless Weaving Machines			
	A. Gripper Type Shuttleless Loom	1	3500000	3500000
	B. Air Jet Weaving Machine	1	1200000	1200000
	C. Water Jet Weaving Machine	1	1200000	1200000
12.	Other Weaving Machines			
	A. Hand Looms	2	40000	80000
	B. Loom With Circular Multiple Box Motion.	1	150000	150000
	C. Loom With Drop Box Multiple Box	1	150000	150000
	D. Loom With Terry Motion	1	200000	200000
	E. Loom With Pick At Will Motion	1	150000	150000
13.	Card Cutting Machine	1	40000	40000
14.	Knitting Machines			
	A. Flat Knitting Machine	1	75000	75000
	B. Circular Knitting Machine	1	125000	125000
15.	Sewing Machine	6	10000	60000
16.	Model of Rapier Looms 20" with winding and warping unit complete set	1	3000000	3000000

10. EVALUATION STRATEGY

INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavour is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through

sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table: Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

11. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.

3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to institutional academic plan.

4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

5. Concept and content-based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem-based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feedback to every student

8. The student-centred activities may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.

9. Wherever possible, it is essential to use activity-based learning rather than relying on delivery based conventional teaching all the time.

10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.

13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

12. LIST OF EXPERTS

Sr.No.	Name and Designation	Organization
1.	Anubha Gupta, Lecturer Textile Technology	GP Kanpur
2.	Sh. Santosh Kumar, Lecturer Textile Technology	GP Mau
3.	Sh. Palash Kumar Patra, Lecturer Textile Design	GP Kuru Pindra, Varanasi
4.	Sh.Vijay Pratap Singh, Ret. Senior Executive	Elgin Mill Ltd.
5.	Sh. R.K Shrivastav, Ret. Factory Manager	National Textile Corporation, Bhopal

13. EVALUATION SCHEME GUIDELINES: As Per AICTE ATTACHED (ANNEXURE- 1)

a. For Theory Courses:

(The weightage of Internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

b. For Practical Courses:

(The weightage of Internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

c. For Summer Internship / Projects / Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc

ANNEXURE- 1

EVALUATION METHODOLOGY

1. EVALUATION METHOD for THEORY

	Internal Assessment (40 marks)				External Assessment (60 marks)
	IA 1	**IA 2**	**IA 3**	**IA 4**	
Mode	**Written Test**	**Written Test**	**Attendance and Assignments**	**Pre – Semester Examination**	**End Semester Examination**
Portion	2 units	2 units	Regularly	All units	All units
Duration1hr	1hr	1hr	-	3hrs	3hrs
Exam Marks	20	20	20	60	60
Converted to	10	10	15	15	60
Tentative Schedule	5^{th} Week	10^{th} Week	Regularly	12^{th} -13^{th} Week	

IA1 and IA2: A written assessment test worth 20 marks should be conducted for two units. The marks earned (20 marks) will be converted to 10 marks. The best of the two assessments will be evaluated for an internal 10-mark assessment.

IA3: Assignments given after the completion of each unit, along with attendance throughout the semester, will be assessed for a total of 15 marks.

IA4: The pre-semester examination should follow the end-semester examination question pattern. The marks should be adjusted to 15 for internal assessment.

2. EVALUATION METHOD for PRACTICAL

	Internal Assessment (60 marks)				External Assessment (40 marks)
	IA 1	**IA 2**	**IA 3**	**IA 4**	
Mode	**Practical Test**	**Practical Test**	**Attendance and Practical Documentation**	**Practical Test and Quiz – Viva Voce**	**Practical Examination**
Portion	50% Practical	50% practical	All practical	All practical	All practical
Duration	3hrs	3 hrs	Regularly	3 hrs	3hrs
Exam Marks	20	20	20	20	40
Tentative Schedule	5th Week	10th Week	Regularly	12th -13th Week	

IA1 and IA2: Complete all exercises and experiments as outlined and retain them for the practical test. The test should be conducted in accordance with the evaluation scheme. The best of the two practical tests will be internally evaluated for a total of 20 marks.

IA3: Maintain a practical file for each exercise while ensuring attendance throughout the semester. Submit the required documents for the practical file, quiz, and practical test along with a valid certificate (Progress Card). This will be assessed for 20 marks.

IA4: The pre-semester practical examination, quiz, and viva-voce should follow the end-semester practical examination pattern, with marks adjusted to 20 for internal assessment.

SUGGESTED DISTRIBUTION OF MARKS FOR **INTERNAL** EVALUATION

Part	Description	Marks Allotted
A.	Objective	**5**
B.	Circuit Diagram	**5**
C.	Procedure and Connections	**10**
D.	Observation Table and Calculation	**10**
E.	Result and its Discussion, Conclusion	**10**
F.	Practical Test	**20**
	Total	**60**

SUGGESTED DISTRIBUTION OF MARKS FOR **EXTERNAL** EVALUATION

Part	Description	Marks Allotted
A.	Objective	**5**
B.	Circuit Diagram	**5**
C.	Procedure and Connections	**5**
D.	Observation Table and Calculation	**5**
E.	Result and its Discussion, Conclusion	**10**
F.	Viva-Voce	**10**
	Total	**40**

3. EVALUATION METHOD for PRACTICUM (End Exam-Practical)

	Internal Assessment (60 marks)				External Assessment (40 marks)
	IA 1	**IA 2**	**IA 3**	**IA 4**	
Mode	**Practical Test**	**Practical Test**	**Attendance and Practical Documentation**	**Micro Project**	**Practical Examination**
Portion	50% practical	50% practical	All practical	All practical	All practical
Duration	3hrs	3 hrs	Regularly	Regularly	3hrs
Exam Marks	20	20	20	20	40
Tentative Schedule	5th Week	10th Week	Regularly	12th -13th Week	

- **IA1 and IA2:** Complete all exercises and experiments as instructed and retain them for the practical test. The test should be conducted according to the evaluation scheme. The best of the two practical tests will be internally assessed for a total of 20 marks.
- **IA3:** Maintain a practical file for each exercise, ensuring attendance throughout the semester. Submit the required documents for the practical file, quiz, practical test, and end-semester examination, along with a valid certificate (Progress Card). This will be evaluated by 20 marks.
- **IA4:** Submit a micro-project report along with a fabrication model or analysis report. The performance of each student in the group will be assessed by both the laboratory supervisor and an internal examiner. This evaluation will contribute 20 marks.

SUGGESTED DISTRIBUTION OF MARKS FOR **INTERNAL** EVALUATION

Part	Description	Marks Allotted
A.	Objective	**5**
B.	Circuit Diagram	**5**
C.	Procedure and Connections	**10**
D.	Observation Table and Calculation	**10**
E.	Result and its Discussion, Conclusion	**10**
F.	Mini Project	**20**
	Total	**60**

SUGGESTED DISTRIBUTION OF MARKS FOR **EXTERNAL** EVALUATION

Part	Description	Marks Allotted
A.	Objective	**5**
B.	Circuit Diagram	**5**
C.	Procedure and Connections	**5**
D.	Observation Table and Calculation	**5**
E.	Result and its Discussion, Conclusion	**10**
F.	Viva-Voce	**10**
	Total	**40**

4. EVALUATION METHOD for PRACTICUM (End Exam-Theory)

	Internal Assessment (40 marks)						External Assessment (60marks)
	IA 1		IA 2		IA 3	IA 4	
Mode	**Written Test**	**Practical Test**	**Written Test**	**Practical Test**	**Attendance and Practical Documentation**	**Pre Semester Examination and Micro Project**	**End Semester Examination**
Portion	2 units	Practical related to the units	2 units	Practical related to the units	All unit	All Practical	All unit
Duration	1hr	3hrs	1hr	3 hrs	3hrs	Regularly	3hrs
Exam Marks	10	20	10	20	60	60	60
	30		30				
Converted to	10		10		15	15	60
Tentative Schedule	5th Week		10th Week		Regularly	12th -13th Week	

IA1 and IA2: A written assessment test worth 10 marks should be conducted for two **UNIT**s. Complete all exercises and experiments as outlined and retain them for the practical test worth 20 marks. The practical test should be conducted in accordance with the evaluation scheme. The total marks earned (30 marks) will be converted to 10 marks. The best of the two assessments will be internally evaluated for a total of 10 marks.

IA3: Attendance and the pre-semester examination should follow the end-semester examination question paper pattern. The marks should be adjusted to 15 for internal assessment.

IA4: Maintain a practical file for each exercise. Submit the required documents for the practical file, quiz/viva-voice, practical test, and end-semester examination, along with a valid certificate (Progress Card). This will be assessed for 40 marks. Additionally, submit a micro-project report along with a fabrication model or analysis report. The performance of each student in the group will be evaluated by both the laboratory supervisor and an internal examiner. The total of 60 marks will be converted to 15 marks.

SUGGESTED DISTRIBUTION OF MARKS FOR **INTERNAL** EVALUATION FOR IA4

Part	Description	Marks Allotted
A.	Objective	**5**
B.	Circuit Diagram	**5**
C.	Procedure and Connections	**5**
D.	Observation Table and Calculation	**5**
E.	Result and its Discussion, Conclusion	**10**
F.	Attendance & Mini Project	**10**
	Total	**40**