

**DEPARTMENT OF TECHNICAL EDUCATION ( DIPLOMA SECTOR )  
UTTAR PRADESH**

**CURRICULUM FOR DIPLOMA PROGRAMME  
IN  
CARPET TECHNOLOGY  
(5<sup>th</sup> to 6<sup>th</sup> Semester)**

=====

Semester System

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**(EFFECTIVE FROM YEAR 2026-27)**

**Prepared By:**

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

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## PREFACE

An important issue generally debated amongst the planners and educators' 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. Rapid industrialization and globalization have created an environment for free flow of information and technology through fast and efficient means. This has led to the shrinking of the world, bringing people from different cultures and environment together and giving rise to the concept of the 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 the 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. The initiatives are being taken by the State Board of Technical Education, UP to revise the existing curricula as per the needs of the industry and make NSQF compliant.

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 programmes. The curricula for diploma programmes have been revised by adopting a time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However, best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to the acquisition of appropriate physical resources, the availability of a 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.R. Khan**

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## **1. ACKNOWLEDGEMENT**

We gratefully acknowledge the guidance and contribution received from the following people:

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 concern staff of IRDT for their support and assistance in conducting curriculum workshops.

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## 2. SALIENT FEATURES

- |                                             |                                                                                                                         |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>1. Name of the Programme</b>             | ➤ Diploma in Carpet Technology                                                                                          |
| <b>2. Duration of the Programme</b>         | ➤ Three years (Six Semesters)                                                                                           |
| <b>3. Entry Qualification</b>               | ➤ Matriculation or equivalent NEP-<br>2020/NSQF Level 5 as Prescribed by<br>State Board of Technical Education,<br>U.P. |
| <b>4. Pattern of the Programme</b>          | ➤ Semester System                                                                                                       |
| <b>5. Ratio between theory and Practice</b> | ➤ 40% (Theory) / 60% (Practical)                                                                                        |

### 1) **Industrial Training/Internship:**

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<sup>th</sup> Semester) we have made the one semester Industrial training/Internship as optional along with usual classroom training.

### 2) **Audit & Pathways:**

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) **Student Centered Activities:**

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) **Project work:**

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 FOR DIPLOMA HOLDERS IN CARPET TECHNOLOGY**

Major clusters for carpet production in India are Panipat, Bhadohi, Mirzapur, Bhatinda, Ludhiana etc. There are very few colleges in India that are providing diploma engineering course in 'Carpet Technology'. 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 carpet producing clusters on India -

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

#### **4. (A) PROGRAM OUTCOMES (POS)**

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##### **PO1: Basics and Discipline specific Knowledge**

Assimilate knowledge of basic mathematics, science, engineering fundamentals, and Carpet Technology.

##### **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 OUTCOME OF THE PROGRAM

After undergoing this program, students will be able to

| Sr.No. | Learning Outcomes                                                                                      |
|--------|--------------------------------------------------------------------------------------------------------|
| 1.     | Prepare and interpret drawings engineering components.                                                 |
| 2.     | Communicate effectively in English in oral and written form with others.                               |
| 3.     | Apply basic principles of mathematics and science to solve engineering problems.                       |
| 4.     | Learning of basic operation of Eng.                                                                    |
| 5.     | Understanding of properties and identification of Man-Made Textile fibers                              |
| 6.     | Understanding of properties and identification of Natural Textile fibers                               |
| 7.     | Use cutting tools for machines and machine tools.                                                      |
| 8.     | Carry out welding and different shop floor operation.                                                  |
| 9.     | To know the origin and history of carpets.                                                             |
| 10.    | Prepare process plan for given part.                                                                   |
| 11.    | Carry out work measurements and method study to improve productivity.                                  |
| 12.    | Apply inventory control techniques to reduce.                                                          |
| 13.    | Manage activities related to procurement, Stacking, storage, and preservation of materials.            |
| 14.    | Prepare maintenance schedules.                                                                         |
| 15.    | To learn basic electrical and electronics machines.                                                    |
| 16.    | Utilize computer and IT tools for document creation, spreadsheet development, and presentation design. |
| 17.    | Learning a brief idea of manufacturing of yarn.                                                        |
| 18.    | Learning manufacturing carpet yarn.                                                                    |
| 19.    | Learning different textile testing instruments and their uses.                                         |
| 20.    | Application and development of Basic carpet Design.                                                    |

|     |                                                                                             |
|-----|---------------------------------------------------------------------------------------------|
| 21. | Application and development of Advance carpet Design.                                       |
| 22. | To learn different motions of Loom.                                                         |
| 23. | To learn machinery involved in manufacturing fabrics.                                       |
| 24. | To different kinds of carpet manufacturing process.                                         |
| 25. | Application of different dyes on Carpet.                                                    |
| 26. | To learn different kind of chemical coating and finishing on carpet.                        |
| 27. | To learn different methods of manufacturing non-Woven.                                      |
| 28. | To learn modern machinery of carpet manufacturing.                                          |
| 29. | Utilize appropriate practices for conserving energy and preventing environmental pollution. |
| 30. | Interpret factory acts and laws.                                                            |
| 31. | Manage resources effectively at workplace.                                                  |
| 32. | Plan and execute given task/project as a team member or leader.                             |
| 33. | Prepare detailed project proposal and report.                                               |
| 34. | Solve real life problems by application of acquired knowledge and skills.                   |
| 35. | Handle the customers effectively.                                                           |

## 5. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN CARPET TECHNOLOGY

### FIFTH SEMESTER

### CARPET TECHNOLOGY (328)

| Sr. No. | SUBJECTS                         | COURSE TYPE & CATEGORY   | STUDY SCHEME<br>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 |     |  |                                    |
| 5.1     | CARPET FINISHING AND MAINTENANCE | PROGRAM CORE (THEORY)    | 03                           | - | -  | 3       | 40                         |     | 40  | 60                  | 3   | -   | -   | 60  | 100 |  |                                    |
| 5.2     | MODERN CARPET TECHNOLOGY         | PROGRAM CORE (THEORY)    | 03                           | - | -  | 3       | 40                         |     | 40  | 60                  | 3   | -   | -   | 60  | 100 |  |                                    |
| 5.3     | CARPET CHEMICAL PROCESSING       | PROGRAM CORE (PRACTICUM) | 03                           | - | 02 | 4       | 40                         |     | 40  | 60                  | 3   | -   | -   | 60  | 100 |  |                                    |
| 5.4     | PROGRAM ELECTIVE - IV            | PROGRAM CORE (PRACTICUM) | 02                           | - | 04 | 4       | -                          | 60  | 60  | -                   | -   | 40  | 3   | 40  | 100 |  |                                    |
| 5.5     | (Q)INDIAN CONSTITUTION           | AUDIT COURSE             | 02                           |   |    |         | 50                         |     | -   |                     |     |     |     |     | N/A |  |                                    |
| 5.6     | CARPET TESTING                   | PROGRAM CORE (PRACTICUM) | 02                           | - | 04 | 4       | -                          | 60  | 60  | -                   | -   | 40  | 3   | 40  | 100 |  |                                    |
| 5.7     | SUMMER INTERNSHIP*** (6 Weeks)   |                          | -                            | - | -  | 2       | -                          | 60  | 60  | -                   | -   | 40  | 3   | 40  | 100 |  |                                    |
|         | #STUDENT CENTERED ACTIVITIES     | -                        | -                            | - | 11 |         |                            | 50  | 50  | -                   | -   | -   | -   |     | 50  |  |                                    |
| Total   |                                  |                          | 15                           | - | 21 | 20      | 120                        | 230 | 350 | 180                 |     | 120 |     | 300 | 650 |  |                                    |

\*\* Students will present a seminar/viva on their summer internship/ ADVANCE SKILL CERTIFICATION along with certificate, project and report.

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

# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, library, Cultural Activities and self-study etc.

**NORMAL PATHWAY  
SIXTH SEMESTER**

**CARPET TECHNOLOGY (328)**

| Sr. No.                      | SUBJECTS                       | COURSE TYPE & CATEGORY                    | STUDY SCHEME |   |    | Credits | MARKS IN EVALUATION SCHEME |     |     |                     |     |     |     |     |     | Total Marks of Internal & External |
|------------------------------|--------------------------------|-------------------------------------------|--------------|---|----|---------|----------------------------|-----|-----|---------------------|-----|-----|-----|-----|-----|------------------------------------|
|                              |                                |                                           | Periods/Week |   |    |         | INTERNAL ASSESSMENT        |     |     | EXTERNAL ASSESSMENT |     |     |     |     |     |                                    |
|                              |                                |                                           | L            | T | P  |         | Th                         | Pr  | Tot | Th                  | Hrs | Pr  | Hrs | Tot |     |                                    |
| 6.1                          | CARPET DESIGN - II             | PROGRAM CORE (PRACTICUM)                  | 02           | - | 04 | 4       | -                          | 60  | 60  | -                   | -   | 40  | 3   | 40  | 100 |                                    |
| 6.2                          | ENTREPRENEURSHIP AND START-UPS | PROGRAM CORE (THEORY)                     | 02           | - | -  | 2       | 40                         | -   | 40  | 60                  | 3   | -   | -   | 60  | 100 |                                    |
| 6.3                          | IN-HOUSE PROJECT               | PROJECT                                   | 04           | - | 16 | 12      | -                          | 240 | 240 | -                   | -   | 160 | -   | 160 | 400 |                                    |
| 6.4                          | ADVANCE SKILL DEVELOPMENT      | (Q)OPEN ELECTIVE-3 (THEORY)               | 02           | - | -  | 2       | 50                         | -   | -   | -                   | -   | -   | -   | -   | N/A |                                    |
|                              |                                | (Q)OPEN ELECTIVE-3 (CERTIFICATION COURSE) |              |   |    |         | -                          | -   | -   | -                   | -   | -   | -   | N/A |     |                                    |
| #STUDENT CENTERED ACTIVITIES |                                |                                           | -            | - | 06 | -       | -                          | 50  | 50  | -                   | -   | -   | -   | -   | 50  |                                    |
| Total                        |                                |                                           | 10           |   | 26 | 20      | 40                         | 350 | 390 | 60                  |     | 200 |     | 260 | 650 |                                    |

(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 6.4 in 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.

OR

# INDUSTRIAL PATHWAY

| Sr. No. | SUBJECTS                                     | CATEGORY & COURSE TYPE               | STUDY SCHEME<br>Periods/Week |   |   | Credits(C)<br>(L+T)+P=C | MARKS IN EVALUATION SCHEME |     |     |                     |      |    |     |     |     |        | Total Marks of Internal & External | ASSESSMENT |
|---------|----------------------------------------------|--------------------------------------|------------------------------|---|---|-------------------------|----------------------------|-----|-----|---------------------|------|----|-----|-----|-----|--------|------------------------------------|------------|
|         |                                              |                                      |                              |   |   |                         | INTERNAL ASSESSMENT        |     |     | EXTERNAL ASSESSMENT |      |    |     |     |     |        |                                    |            |
|         |                                              |                                      | L                            | T | P |                         | Th                         | Pr  | Tot | Th                  | Hrs. | Pr | Hrs | Tot |     |        |                                    |            |
| 6.1     | ENTREPRENEURSHIP AND START-UPS (ONLINE MODE) | HUMANITIES & SOCIAL SCIENCE (THEORY) | -                            | - | - | 2                       | -                          | -   | -   | 100                 | 03   | -  | -   | 100 | 100 | THEORY |                                    |            |
| 6.2     | INDUSTRIAL HANDS-ON PRACTICE                 | INDUSTRIAL TRAINING                  | -                            | - | - | 12                      | 150*                       |     |     | 200**               |      |    |     |     | 350 |        |                                    |            |
| 6.3     | INDUSTRIAL PROJECT                           | INDUSTRIAL TRAINING                  | -                            | - | - | 4                       | 50*                        |     |     | 50**                |      |    |     |     | 100 |        |                                    |            |
| 6.4     | SEMINAR                                      | IN HOUSE                             | -                            | - | - | 2                       | -                          | 100 | 100 | -                   | -    | -  | -   | -   | 100 |        |                                    |            |
| Total   |                                              |                                      | -                            | - | - | 20                      |                            |     |     |                     |      |    |     |     | 650 |        |                                    |            |

## NOTE:

- The Industrial training tenure should not be less than 14 weeks.
- Industry must be registered with MSME/Directorate of industries/Limited Organization/State/Central Government establishments.
- Monthly progress reports of Intern/ Trainee should be attested and forwarded by industrial supervisor (allotted to Intern/Trainee) during industrial Internship/Training.
- The Industrial unit/organisation must evaluate students using the format provided by polytechnic in the form of marks.
- The Industrial Hands on Practice, Industrial Project and seminar must be evaluated on the basis of the AICTE Internship Policy: Guidelines and procedures (Chapter -9 Procedures / format for organizing internship)
- "Entrepreneurship and Start-up" course is also mandatory in Industrial internship/training mode. It will be conducted online mode by his/her polytechnic institute. After completing the online course, students must appear for exam conducted by the Board of Technical Education, Lucknow.
- \*Evaluation by faculty mentor**  
The institute will depute one faculty member for mentoring at least 20-30 students undertaking apprenticeship training. Such mentors will monitor, guide and provide counselling to the students as and when required. Faculty mentor of the institute(s) may make a surprise visit to the internship/apprenticeship site to check the student's presence physically. (The Proforma of the evaluation is attached as the Annexure -1)
- \*\* Evaluation by industry** : The industry shall assess the candidates based on the following parameters attendance, discipline and punctuality, familiarity of tools and material, engineering skills, application of knowledge and problem-solving skills, comprehension and observation, professional ethics, safety and environmental consciousness, communication skills, supervisory skills and general conduct during the period (The Proforma of the evaluation is attached as the Annexure -2)
- # Evaluation through seminar presentation/Viva-Voce at the institute** : The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

### OPEN ELECTIVE-3

| SR.NO. | (Q) THEORY COURSES NAME                                                                                          |
|--------|------------------------------------------------------------------------------------------------------------------|
| 1.     | DISASTER MANAGEMENT (Course offered by Polytechnic Institute)                                                    |
| 2.     | ARTIFICIAL INTELLIGENCE (Course offered by Polytechnic Institute)                                                |
| -----  |                                                                                                                  |
| SR.NO. | CERTIFICATE COURSES                                                                                              |
| 1.     | COURSES CONDUCTED BY CENTRE OF EXCELLENCE (ESTABLISHED BY THIRD PARTY AS: - TATA TECHNOLOGIES. etc) (Annexure-1) |
| 2.     | COURSES CONDUCTED BY INFOSYS PRINGBOARD                                                                          |
| 3.     | COURSES CONDUCTED BY TCS ION                                                                                     |
| 4.     | COURSES CONDUCTED BY OTHER RELEVANT GOVERNMENT, INTERNATIONAL/NATIONAL ORGANIZATION OR PLATFORMS OF REPUTE       |
| 5.     | COURSES CONDUCTED BY AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES                                        |
| 6.     | COURSES CONDUCTED BY C-DAC                                                                                       |
| 7.     | COURSES CONDUCTED BY NEILIT                                                                                      |

### PROGRAME ELECTIVE-4

| SR.NO. | SUBJECT NAME                     |
|--------|----------------------------------|
| 1.     | TECHNOLOGY OF TEXTILE PRINTING-1 |
| 2.     | TECHNOLOGY OF DYEING-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

## 6. DETAIL CONTENTS OF VARIOUS SUBJECTS

| THEORY | 5.1 CARPET FINISHING AND MAINTENANCE | L | T | P |
|--------|--------------------------------------|---|---|---|
|        |                                      | 3 | - | - |

### COURSE OBJECTIVE

This course aims to develop technical expertise in carpet coating, finishing, washing, and sustainable processing. It provides knowledge of modern coating materials, formulation science, smart application systems, mechanical and chemical finishing, and eco-friendly washing techniques. The course emphasizes environmental compliance, effluent treatment, zero-VOC systems, and life cycle assessment to prepare students for sustainable carpet manufacturing practices.

### COURSE OUTCOMES (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.

#### Students will be able to

CO1 • Explain fundamentals of carpet coating materials, polymers, VOC regulations, and selection of eco-friendly binders.

CO2 • Formulate latex compounds and develop low/zero-VOC smart coating systems using appropriate ingredients.

CO3• Apply coating techniques and operate modern machinery with proper drying, curing, and quality control measures.

CO4• Implement mechanical and chemical finishing processes while ensuring safety and environmental compliance.

CO5 • Perform carpet washing processes, control parameters, and evaluate innovative washing techniques.

CO6• Apply sustainability practices including ETP operation, zero-discharge systems, surface enhancement, and life cycle assessment in carpet processing.

### SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 3                                              | -                       | -                                       | -                        | -                                                            | -                         | 2                         | *    | *     |
| CO2    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO3    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO4    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO5    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO6    | 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 CONTENT**

### **Unit 1: Fundamentals of Carpet Coating & Modern Materials (7 Periods)**

Introduction to chemical coating in carpets, Overview of latex and resin types: SBR, PU, EVA, acrylates, Role of synthetic vs. natural polymers in modern carpets, Emerging eco-friendly and biodegradable binders, Basics of VOC regulations and green chemistry in coatings, Identification and selection of coating materials, Sample analysis of various resins and latexes.

### **Unit 2: Formulation Science and Smart Coating Systems (7 Periods)**

Latex compound formulation: binders, fillers, thickeners, softeners, cross linkers, Functions and interactivity of ingredients, Nanotechnology in coatings: smart and functional coatings (e.g., thermo-responsive, colour-changing), Introduction to low-VOC and water-based coating systems, Formulate a simple eco-friendly latex compound, Zero-VOC carpet backing initiative

### **Unit 3: Coating Application Methods and Equipment (7 Periods)**

Application techniques: knife-over-roll, foam, spray coating, Modern machinery for mixing and coating, Drying and curing techniques: IR drying, hot air, UV curing, Automation trends and smart controls in coating lines, Quality assurance parameters in coating application, Demo/model of a coating application setup.

### **Unit 4: Mechanical and Chemical Finishing Techniques (7 Periods)**

Overview of mechanical tools: Bhukani, Beroni, shearing, embossing, Traditional vs. automated mechanical finishes, Modern hand tools: ergonomics and safety, Advanced chemical finishes: stain repellency, antimicrobial, anti-static, Application of fluorochemicals, silicones, nano-finishes, Environmental and health considerations in finishing, Safety drill: PPE and MSDS handling.

### **Unit 5: Carpet Washing: Techniques and Innovations (7 Periods)**

Stages: pre-wash, main wash, post-wash, Traditional vs. mechanized washing units, Innovative methods: antique wash, herbal wash, lustre wash, Parameters: pH, temperature, water hardness, dwell time, Washing chemicals: enzymatic vs. synthetic detergents, pH testing of washing water and chemical strength.

### **Unit 6: Sustainability, Effluent Treatment & Surface Enhancement (7 Periods)**

Surface enhancements: sheen, glaze, soft handle, Techniques for wool and silk, Effluent Treatment Plants (ETPs) in carpet finishing, Zero-discharge and water-reuse technologies, Sustainability practices in textile wet processing, Carbon footprint and life cycle assessment (LCA) of coated carpets, Local sustainable carpet/durry unit (virtual or physical).

## **INSTRUCTIONAL STRATEGY**

The course will combine lectures, multimedia presentations, and practical lab sessions to cover carpet finishing techniques. Industry visits and guest lectures will provide real-world insights, while hands-on training with equipment and materials will reinforce learning. Group projects and case studies will encourage critical thinking and teamwork.

## **MEANS OF ASSESSMENT**

Students will be evaluated through tests, assignments, practical work, projects, and final exams.

## **RECOMMENDED BOOKS**

1. Rollins, C. – Carpet Manufacture

2. Duck, K. J. – Textile Floor Coverings
3. Elliott, B. – Carpet and Rug Production
4. Textile Institute – Textile Terms and Definitions
5. Industry journals such as Carpet & Rug Institute (CRI) Guidelines and Textile World

**SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (periods)</b> | <b>Marks Allotted (%)</b> |
|------------------|--------------------------------|---------------------------|
| I                | 7                              | 15                        |
| II               | 7                              | 15                        |
| III              | 7                              | 15                        |
| IV               | 7                              | 15                        |
| V                | 7                              | 20                        |
| VI               | 7                              | 20                        |
| <b>Total</b>     | <b>42</b>                      | <b>100</b>                |

| THEORY | 5.2 MODERN CARPET TECHNOLOGY | L | T | P |
|--------|------------------------------|---|---|---|
|        |                              | 3 | - | - |

## COURSE OBJECTIVE

This course aims to provide comprehensive knowledge of carpet manufacturing technologies, structures, and materials. It develops understanding of woven, tufted, and non-woven production systems, yarn and fiber technologies, dyeing, printing, and finishing processes. The course also builds competency in quality testing, sustainability practices, environmental certifications, and modern industry requirements to prepare students for technical and quality roles in the carpet industry.

## COURSE OUTCOMES (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.

### Students will be able to

CO1 • Explain carpet structures, classifications, performance parameters, and industry trends.

CO2 • Describe and differentiate woven and tufted carpet manufacturing technologies including CAD/CAM applications.

CO3• Analyze non-woven and specialized carpet manufacturing methods and their application areas. CO4 • Evaluate yarn and fiber technologies, including BCF yarns, heat setting, testing, and eco-friendly innovations.

CO5 • Apply knowledge of dyeing, printing, and functional finishing processes in carpets.

CO6• Perform quality control tests and assess sustainability practices, certifications, and compliance requirements in carpet production.

## SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO2    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO3    | 3                                              | 2                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO4    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO5    | 3                                              | -                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO6    | 3                                              | -                       | 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 CONTENT**

### **Unit 1: Introduction to Carpet Technology and Structures (7 Periods)**

History and evolution of carpet manufacturing, Overview of global and Indian carpet industry trends, Basic carpet structure: pile, backing, bonding, Key performance parameters: resilience, density, texture retention, Classification based on construction, fiber, and end-use.

### **Unit 2: Woven and Tufted Carpet Technologies (7 Periods)**

Woven Carpets: Wilton, Axminster, Face-to-Face technologies, CAD/CAM design systems in woven carpets, Automation and quality in woven production, Tufted Carpets: Tufting process, pattern technologies (loop, cut, graphic), Backing and lamination systems; modern adhesives.

### **Unit 3: Non-Woven and Specialized Carpet Manufacturing (7 Periods)**

Needle-punched and adhesive bonded carpet technologies, Electrostatically flocked and thermally bonded constructions, Hybrid carpets and compact production systems, Application segments: automotive, commercial, exhibitions.

### **Unit 4: Yarn and Fiber Technologies in Carpets (7 Periods)**

BCF yarns: production and applications, Fiber types: nylon, polyester, polypropylene, wool, blends, Yarn texturization, heat setting, Yarn testing and performance criteria, Recycled and eco-friendly yarn innovations.

### **Unit 5: Carpet Dyeing, Printing, and Finishing (7 Periods)**

Solution dyeing, stock dyeing, yarn dyeing, Jet, screen, and digital printing technologies, Functional finishes: stain resistance, flame retardancy, anti-microbial, Innovations in sustainable finishing.

### **Unit 6: Quality Control and Sustainability in Carpet Industry (7 Periods)**

Physical and mechanical testing of carpets, Colour fastness, abrasion resistance, dimensional stability, Indoor air quality certifications (CRI Green Label, GUT), Sustainable production: LEED, ISO 14001, Waste management and circular economy in carpets, Employability Focus: QA technician roles, sustainability auditors, compliance documentation.

## **INSTRUCTIONAL STRATEGY**

The course will use a blended approach with lectures, multimedia content, and virtual tours to explain core concepts. Practical labs will offer hands-on experience in tufting, weaving, and finishing. Industry visits, guest lectures, and CAD/CAM training will provide real-world exposure and design skills. Case studies, group projects, and use of carpet samples will support critical thinking and experiential learning.

## **MEANS OF ASSESSMENT**

Students will be assessed through class tests, quizzes, assignments, lab work, group projects, and presentations. Midterm and final exams will evaluate both theory and practical knowledge. Attendance and class participation will also contribute to the final grade.

## **RECOMMENDED BOOKS**

1. **Rollins, C.** – Carpet Manufacture (A comprehensive guide on traditional and modern carpet manufacturing methods.)

2. **Duck, K. J.** – Textile Floor Coverings (Covers materials, construction, performance, and types of textile-based flooring.)
3. **Smith, J. E.** – Introduction to Textile Processes (Includes foundational knowledge relevant to carpet production techniques.)
4. **Elliott, B.** – Carpet and Rug Production (Focuses on design, fiber selection, and technological advancements in carpet making.)
5. **Textile Institute** – Textile Terms and Definitions (Useful for understanding industry-specific terminology used in carpet technology.)
6. **Industry Publications and Trade Journals** – e.g., Floor Covering Weekly, Textile World, Carpet & Rug Institute (CRI) Guidelines (For the latest trends, standards, and innovations in the carpet industry.)

#### SUGGESTED DISTRIBUTION OF MARKS

| Topic No.    | Time Allotted (periods) | Marks Allotted (%) |
|--------------|-------------------------|--------------------|
| I            | 7                       | 10                 |
| II           | 7                       | 15                 |
| III          | 7                       | 15                 |
| IV           | 7                       | 15                 |
| V            | 7                       | 15                 |
| VI           | 7                       | 15                 |
| <b>Total</b> | <b>42</b>               | <b>100</b>         |

| PRACTICUM | 5.3 CARPET CHEMICAL PROCESSING | L | T | P |
|-----------|--------------------------------|---|---|---|
|           |                                | 3 | - | 2 |

## COURSE OBJECTIVE

This course aims to develop technical competence in fibre preparation, dye selection, dyeing machinery, carpet printing, and advanced wool processing. It equips students with practical skills in eco-friendly pre-treatment, sustainable dyeing, process optimization, and functional finishing while emphasizing environmental compliance, energy efficiency, and effluent management for modern textile and carpet industries.

### COURSE OUTCOMES (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.

#### Students will be able to

CO1 • Perform fibre preparation and eco-friendly pre-treatment processes and evaluate their impact on dye uptake and quality.

CO2 • Select suitable dyes based on fibre type, compatibility, fastness, cost, and eco-toxicity considerations.

CO3 • Apply dyeing principles, calculate dyeing parameters (M:L ratio, exhaustion %), and operate conventional and automated dyeing machinery.

CO4 • Optimize dye application processes by controlling parameters affecting dye uptake, shade consistency, and fastness properties..

CO5 • Execute carpet printing techniques (screen, rotary, digital, yarn, flock) using sustainable formulations.

CO6 • Implement advanced wool processing, functional finishes, eco-bleaching, grease recovery, and effluent treatment practices in compliance with sustainability norms.

### SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO2    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO3    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO4    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO5    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO6    | 3                                              | -                       | -                                       | 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 CONTENT**

### **Unit 1: Fibre Preparation and Eco-Friendly Pre-treatment (7 Periods)**

Fibre-specific cleaning and preparation (wool, nylon, polyester, cotton, acrylic), Scouring and bleaching methods: conventional vs modern, Enzymatic and eco-friendly scouring agents, Role of pre-treatment in improving dye uptake

#### **Practical:**

1. Scouring & bleaching of various fibres.
2. Enzymatic vs conventional scouring of cotton.
3. Degreasing of synthetics.
4. Testing fibre whiteness and pH
5. Comparative analysis of eco vs traditional methods.

### **Unit 2: Dyes – Classification, Selection & Compatibility (7 Periods)**

Classification of dyes by fibre compatibility, Suitable dyes: Cotton – direct, reactive, Wool/Silk – acid, chrome, metal complex, Acrylic – basic, Polyester – disperse, Nylon – acid, metal complex, Selection criteria: shade, cost, fastness, eco-toxicity.

#### **Practical:**

1. Dyeing of all major fibres with compatible dyes.
2. Comparative fastness, uptake, and shade analysis.

### **Unit 3: Dyeing Principles, Terminologies, and Machinery (7 Periods)**

Key terminologies: M:L ratio, shade %, exhaustion %, etc., Dope dyeing and mass coloration, Overview of dyeing machines: Fibre: batch/pressurized, Yarn: hank/package, Fabric: winch, jigger, jet, HTHP, Automation and energy-efficient systems.

#### **Practical:**

1. M:L ratio calculation and dye bath preparation.
2. Demonstrate dope dyeing and measure exhaustion.
3. Operate various dyeing machines.
4. Introduction to automated and HTHP dyeing.

### **Unit 4: Principles of Dye Application & Process Optimization (7 Periods)**

Application principles of acid, basic, disperse, metal complex dyes, Dye-fibre compatibility, Process parameters affecting dye uptake and fastness.

#### **Practical:**

1. Dye various fibres using appropriate dyes.
2. Test dye uptake and fastness under variable conditions.

**Unit 5: Carpet Printing & Sustainable Techniques****(7 Periods)**

Printing styles: screen, rotary, digital, Components of printing paste, Yarn and flock printing, Emerging trends: pigment microcapsules, sustainable formulations.

**Practical:**

1. Prepare and apply printing pastes.
2. Demonstrate screen, rotary, yarn, and flock printing.
3. Explore digital inkjet samples and green formulations.

**Unit 6: Advanced Wool Processing & Functional Finishes****(7 Periods)**

Raw wool impurities and eco-scouring, Wool grease recovery, drying, pressing, and packaging, Chrome, acid, and metal complex dyes for wool, Functional finishes: insect/stain/flame/shrink-resist, Enzymatic bleaching, polymer grafting, Wool Scour Effluent Treatment (WSET), low-energy and closed-loop systems.

**Practical:**

1. Raw wool cleaning and grease recovery.
2. Functional finishing methods.
3. Chrome and metal complex dye application.
4. Eco-friendly bleaching, low-energy dyeing, effluent treatment.

**INSTRUCTIONAL STRATEGY**

The course will be delivered through a mix of lectures, multimedia presentations, and practical lab sessions. Students will engage with hands-on training in dyeing and printing processes using various machines. Industry visits and expert guest lectures will provide real-world insights. Case studies and group activities will help develop problem-solving and teamwork skills.

**MEANS OF ASSESSMENT**

Student performance will be evaluated through class tests, assignments, practical work, project presentations, and final examinations. Attendance and participation in lab sessions and industrial visits will also form part of the assessment.

**RECOMMENDED BOOKS**

1. Shenai, V.A. – Technology of Dyeing
2. Trotman, E.R. – Dyeing and Chemical Technology of Textile Fibres
3. Ingamells, W. – Colour for the Dyer
4. Broadbent, A.D. – Basic Principles of Textile Colouration
5. Shore, J. – Colorants and Auxiliaries (Volume 1 & 2)
6. Lewin, M. – Handbook of Fiber Chemistry
7. Industry Journals: Textile World, Indian Journal of Fibre & Textile Research, Textile Today

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (periods) | Marks Allotted (%) |
|-----------|-------------------------|--------------------|
| I         | 7                       | 15                 |

|              |           |            |
|--------------|-----------|------------|
| II           | 7         | 15         |
| III          | 7         | 15         |
| IV           | 7         | 15         |
| V            | 7         | 20         |
| VI           | 7         | 20         |
| <b>Total</b> | <b>42</b> | <b>100</b> |

| PRACTICUM | 5.4 TECHNOLOGY OF TEXTILE PRINTING-I (PE-4) | L | T | P |
|-----------|---------------------------------------------|---|---|---|
|           |                                             | 2 | - | 4 |

## COURSE OBJECTIVE

This course aims to develop technical proficiency in textile printing technologies, from traditional methods to advanced digital systems. It equips students with practical knowledge of fabric pre-treatment, print paste formulation, screen and rotary printing, fixation methods, and sustainable coloration practices. The course emphasizes smart chemistry, eco-friendly processing, digital advancements, and quality control to prepare students for modern textile printing industries.

## COURSE OUTCOMES (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.

### Students will be able to

CO1 • Explain principles of textile printing, traditional and digital methods, and prepare thickener pastes using conventional and eco-friendly materials.

CO2 • Perform fabric pre-treatment using smart chemicals and enzymes while ensuring safety and environmental compliance.

CO3• Apply traditional printing techniques and identify printing faults using modern diagnostic approaches.

CO4• Execute screen and rotary printing processes, including UV screen preparation and motif development.

CO5 • Formulate pigment print pastes, carry out fixation processes, and adopt sustainable printing practices.

CO6• Implement modern printing styles and evaluates colour fastness and sustainability metrics using emerging technologies.

## SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 3                                              | -                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO2    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO3    | 3                                              | -                       | 3                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO4    | 3                                              | -                       | 2                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO5    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 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.

## DETAILED CONTENTS

### **UNIT 1: Introduction to Textile Printing and Digital Advancements (4 Periods)**

Basics of textile printing: definition, scope, evolution, Overview of traditional vs. modern methods (manual to digital), Introduction to digital textile printing and inkjet technology, Classification of printing thickeners: synthetic, natural, eco-friendly, Innovations in thickener paste preparation using bio-based materials.

#### **Practical:**

1. Preparation of thickener paste using both traditional and eco-friendly thickeners.
2. Demo on a basic digital textile printer (if available) or through simulation/video.

### **UNIT 2: Fabric Preparation and Smart Chemistry (4 Periods)**

Role of pre-treatment in quality printing, Eco-friendly desizing, scouring, and bleaching agents, Smart chemicals: low-VOC wetting, dispersing, oxidative & reducing agents, Role of enzymes and nano-finishes in pre-treatment, Health & safety, environmental compliance (GOTS, OEKO-TEX, ZDHC).

#### **Practical:**

1. Pre-treatment of cotton using bio-enzymes.
2. Preparation of print paste using smart auxiliaries.
3. Safe handling & storage of printing chemicals.

### **UNIT 3: Traditional Printing Techniques and Fault Diagnostics (4 Periods)**

Block printing: wood blocks, motifs, tools, trend revival, Roller printing: mechanism, roller engraving (modern methods), Introduction to smart defect detection systems, Common printing faults and machine learning-based quality control.

#### **Practical:**

1. Block printing on cotton/viscose fabric.
2. Simulation or video demo of roller printing and defect detection.
3. Fabric fault identification activity and solutions discussion.

### **UNIT 4: Advanced Screen & Rotary Printing (4 Periods)**

Screen printing: flat-bed (manual/automatic), rotary screen printing, Latest trends in rotary screen laser engraving, Photosensitive emulsions and UV screen preparation, Pros and cons of screen vs digital vs sublimation printing.

#### **Practical:**

1. UV or manual screen preparation and printing using water-based inks.
2. Group activity: Design to print – Create motif, screen it, print it.
3. Visit to a local printing unit (if feasible) or industry guest lecture.

### **UNIT 5: Print Fixation, Sustainability & Pigment Printing (6 Periods)**

Methods of print fixation: IR curing, steaming, thermal ageing, etc., Machines used in fixation: IR tunnel, loop steamer, curing units, Pigment printing: binder emulsion, formulation, process steps, Eco-friendly binders and low-formaldehyde systems, Introduction to zero-waste printing concepts.

#### **Practical:**

1. Print fixation using curing/steaming (demo or video-based).
2. Formulation of pigment print paste and printing on cotton.

### **UNIT 6: Modern Styles & Sustainable Coloration (6 Periods)**

Direct, resist, and discharge styles, Use of reactive, vat, pigment, and disperse dyes, Discharge printing using eco-compatible chemicals, Waterless printing, low-liquor ratio processes, and sustainability metrics, Future scope: AI in colour matching, blockchain in print traceability.

**Practical:**

1. Discharge or resist printing using reactive/vat dyes.
2. Project: Choose style → Prepare design → Print using selected style.
3. Analysis: Colour fastness (demo or report-based).

**INSTRUCTIONAL STRATEGY**

Lectures, practicals, demos, visuals, discussions, and assessments.

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**

1. Technology of Printing - V.A. Shenai
2. Printing - D.G. Kale
3. Technology of textile printing – R.S. Prayag
4. Textile Printing- L W C Miles ( Dyers Company Publication Trust, Bradford, England)

**Websites for Reference:**

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

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No.    | Time Allotted (Periods) | Marks Allotted (%) |
|--------------|-------------------------|--------------------|
| I            | 4                       | 15                 |
| II           | 4                       | 15                 |
| III          | 4                       | 15                 |
| IV           | 4                       | 15                 |
| V            | 6                       | 20                 |
| VI           | 6                       | 20                 |
| <b>Total</b> | <b>28</b>               | <b>100</b>         |

|           |                                      |   |   |   |
|-----------|--------------------------------------|---|---|---|
| PRACTICUM | 5.4 TECHNOLOGY OF DYEING-I<br>(PE-1) | L | T | P |
|           |                                      | 2 | - | 4 |

## COURSE OBJECTIVE

This course aims to develop comprehensive knowledge and practical skills in textile dyeing, covering natural and synthetic dyes, dye-fiber interaction mechanisms, modern dyeing machinery, and sustainable dyeing technologies. It emphasizes eco-friendly dyeing practices, process optimization, defect control, and environmental compliance to prepare students for responsible and efficient dye house operations.

## COURSE OUTCOMES (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.

### Students will be able to

CO1 • Explain fundamentals of dyeing, classification of dyes, and application of natural colorants on various fibres.

CO2 • Prepare dye baths using correct terminology and auxiliaries, and evaluate the role of mordants and enzyme-based systems.

CO3• Operate modern dyeing machines and understand automated and IoT-enabled dyeing systems.

CO4• Analyze dye-fiber interaction mechanisms, thermodynamics of dyeing, and dyeing behavior of synthetic fibres.

CO5 • Apply synthetic and reactive dyeing methods, troubleshoot common dyeing defects, and perform blended fabric dyeing.

CO6• Implement solubilized vat dyeing and adopts green innovations such as bio-dyeing, CO<sub>2</sub> dyeing, and zero-discharge systems with sustainability compliance.

## SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO2    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO3    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO4    | 3                                              | -                       | -                                       | 3                        | 2                                                            | -                         | 2                         | *    | *     |
| CO5    | 3                                              | 2                       | 2                                       | 3                        | 2                                                            | -                         | 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: Fundamentals of Dyeing and Natural Colorants**

**(4 Periods)**

Definition, scope, and historical evolution of textile dyeing, Classification of dyes based on application method (Direct, Vat, Acid, etc.), Recent trends: shift to natural and plant-based dyes, bio-dyes, Importance of sustainable dyeing and eco-certifications, Application techniques for natural dyes on cotton, silk, wool, and blends.

#### **Practical:**

1. Extraction of natural dyes from turmeric, indigo, henna, marigold, etc.
2. Dyeing cotton and silk using natural dyes with and without mordants
3. Demonstration of colour fastness of natural dyes

### **UNIT 2: Modern Terminology and Dyeing Auxiliaries**

**(4 Periods)**

Key dyeing terminologies: exhaustion, liquor ratio, mangle expression, etc., Role of auxiliaries: levelling agents, dispersing agents, wetting agents, retarders, Mordants: Types (alum, tannin, metal salts) and recent eco-mordants, Understanding enzyme-based auxiliaries for bio-dyeing, Digital dyeing concepts: precision in bath formulation.

#### **Practical:**

1. Preparation of dye bath using correct liquor ratio and auxiliaries
2. Measuring exhaustion level of dye bath
3. Testing different mordants on dyed samples
4. Comparison of enzyme-based and traditional auxiliaries

### **UNIT 3: Modern Dyeing Machines and Equipment**

**(4 Periods)**

Dyeing forms: loose fiber, yarn, fabric (woven/knit), Description & working of: Jigger & enclosed jigger, Winch dyeing machine, Hank dyeing machine, Package dyeing machine, Jet dyeing machine (for synthetics), Padding mangle and open-width dyeing systems, Automation in dyeing: PLC-based and IoT-enabled dyeing units.

#### **Practical:**

1. Demo of winch and hank dyeing machine operation
2. Loading and running a sample dyeing process on package dyeing machine
3. Calibration of liquor ratio and padding mangle pressure
4. Visit to industry or virtual simulation of automated dyeing machine

### **UNIT 4: Mechanism and Science of Dye-Fiber Interaction**

**(4 Periods)**

Principles: Adsorption, diffusion, fixation, equilibrium, Dye-fiber interactions: ionic, hydrogen bonding, covalent bonding, Thermodynamics of dyeing; factors affecting uptake, Dyeing synthetic fibers (polyester, nylon, acrylic): challenges and innovations, Concept of glass transition temperature (T<sub>g</sub>) and its effect on dyeing

#### **Practical:**

1. Testing adsorption behavior of direct dye on cotton
2. Dyeing polyester using high-temperature disperse dye method
3. Observation of T<sub>g</sub> impact on dyeing behavior using DSC data

#### 4. Comparative fixation on cellulose vs protein fibers

### UNIT 5: Application of Synthetic and Reactive Dyes on Different Fibers (6 Periods)

Direct, acid, basic, reactive, vat, and sulphur dyeing: methods and principles, After-treatments: cationization, fixatives for improving fastness, Sustainable reactive dyeing (low salt, low water), Common dyeing defects: Bronziness, tendering – causes and modern remedies, Blended fabric dyeing – poly-cotton, poly-wool.

#### Practical:

1. Reactive dyeing of cotton with salt and soda ash
2. Acid dyeing of wool and silk using temperature control
3. Troubleshooting dyed samples with bronzing defects
4. Vat dyeing cotton and comparing shades before and after oxidation

### UNIT 6: Solubilized Vat Dyes & Green Innovations in Dyeing (6 Periods)

Chemistry and process of solubilized vat dyes on cotton, Recent innovations: bio-dyes, digital dyeing, CO<sub>2</sub> dyeing, supercritical fluid dyeing, Sustainable certifications: GOTS, OEKO-TEX, ZDHC, Effluent treatment and zero-discharge dyeing technologies.

#### Practical:

- Dyeing cotton with solubilized vat dyes using leuco form
- Comparative study: traditional vat vs solubilized vat dyeing
- Case study on sustainable dye house practices (virtual or field-based)
- Lab report on effluent pH and COD before and after dyeing

### 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. Bleaching, mercerizing and Dyeing of Cotton Materials – R.S. Prayag
2. Dyeing of wool, silk and manmade fibers- R.S .Prayag
3. Technology of Dyeing- V.A. Shenai

#### Websites for Reference:

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

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|-----------|-------------------------|--------------------|
| I         | 4                       | 15                 |
| II        | 4                       | 15                 |

|              |           |            |
|--------------|-----------|------------|
| III          | 4         | 15         |
| IV           | 4         | 15         |
| V            | 6         | 20         |
| VI           | 6         | 20         |
| <b>Total</b> | <b>28</b> | <b>100</b> |

|              |                         |   |   |   |
|--------------|-------------------------|---|---|---|
| AUDIT COURSE | 5.5 INDIAN CONSTITUTION | L | T | P |
|              |                         | 2 | - | - |

#### COURSE OBJECTIVES:

To provide a comprehensive understanding of the Indian Constitution's history and philosophy, and to familiarize them with the administrative structure, powers, and functions of the Union, State, and Local governments, along with the Judiciary and Election Commission.

#### 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 making of the Indian Constitution, interpret the Preamble, and discuss the significance of Fundamental Rights and Duties.

**CO2:** Describe the structure of the Union Executive, detailing the powers and roles of the President, Prime Minister, and Council of Ministers.

**CO3:** Distinguish between the functions of the Lok Sabha and Rajya Sabha and explain the jurisdiction and structure of the Supreme Court.

**CO4:** Discuss the administrative framework of State Governments, focusing on the roles of the Governor, Chief Minister, and State Secretariat.

**CO5:** Outline the hierarchy and functions of Local Administration, including District Administration, Municipal Corporations, and Zila Panchayats.

**CO6:** Examine the structure of the Election Commission of India and its critical role in conducting free and fair elections.

#### SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Engineering Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PSO2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------------------|---------------------------|---------------------------|------|------|
| CO1    | -                                              | -                       | -                                       | -                        | 3                                                                        | 1                         | 3                         | *    | *    |
| CO2    | -                                              | -                       | -                                       | -                        | 2                                                                        | 2                         | 2                         | *    | *    |
| CO3    | -                                              | -                       | -                                       | -                        | 3                                                                        | 1                         | 2                         | *    | *    |
| CO4    | -                                              | -                       | -                                       | -                        | 2                                                                        | 2                         | 2                         | *    | *    |
| CO5    | -                                              | -                       | -                                       | -                        | 3                                                                        | 2                         | 2                         | *    | *    |
| CO6    | -                                              | -                       | -                                       | -                        | 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 CONTENT

**Unit – I: The Constitution – Introduction****(06 Periods)**

The History of the Making of the Indian Constitution, Preamble and the Basic Structure, and its interpretation, Fundamental Rights and Duties and their interpretation

**Unit – II: Union Government****(06 Periods)**

Structure of the Indian Union Government, President – Election, Role and Power, Prime Minister and Council of Ministers

**Unit – III: Indian Legislature & Judiciary****(06 Periods)**

Composition of Lok Sabha and Rajya Sabha, Powers & Functions of Lok Sabha and Rajya Sabha, Structure of Supreme Court including Appointment of Judges, Powers & Functions of Supreme Court

**Unit – IV: State Government****(03 Periods)**

Governor – Role and Power, Chief Minister and Council of Ministers, State Secretariat

**Unit – V: Local Administration****(04 Periods)**

District Administration, Municipal Corporation, Zila Panchayat

**Unit – VI: Election Commission****(03 Periods)**

Structure of Election Commission of India, Role and Function of Election Commission

**RECOMMENDED BOOKS:**

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition
4. Our Constitution Subhash Chand Kashyap NBT New Delhi.

**SUGGESTED SOFTWARE/LEARNING WEBSITES:**

1. <https://www.constitution.org/cons/india/const.html>
2. <http://www.legislative.gov.in/constitution-of-india>
3. <https://www.sci.gov.in/constitution>
4. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>
5. <https://ncert.nic.in/textbook.php>

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (periods) | Marks Allotted (%) |
|-----------|-------------------------|--------------------|
|-----------|-------------------------|--------------------|

|       |    |     |
|-------|----|-----|
| 1     | 6  | 20  |
| 2     | 6  | 20  |
| 3     | 6  | 20  |
| 4     | 3  | 12  |
| 5     | 4  | 16  |
| 6     | 3  | 12  |
| Total | 28 | 100 |

| PRACTICUM | 5.6 CARPET TESTING | L | T | P |
|-----------|--------------------|---|---|---|
|           |                    | 2 | - | 4 |

## COURSE OBJECTIVE

This course aims to develop competency in modern carpet testing, digital quality evaluation, and sustainability compliance. It equips students with knowledge of structural, functional, and performance testing using smart instruments, IoT-enabled systems, and global standards. The course emphasizes data-driven quality control, green certifications, and Industry 4.0/5.0 practices to prepare students for advanced quality assurance roles in the carpet industry.

## COURSE OUTCOMES (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.

### Students will be able to

CO1 • Explain the principles, relevance, and industry trends of carpet testing, including smart manufacturing and Industry 4.0 applications.

CO2 • Perform structural and dimensional testing of carpets using digital instruments and interpret stability parameters.

CO3 • Evaluate functional and advanced performance properties such as abrasion resistance, resilience, acoustic, thermal, ESD, and sustainability metrics.

CO4 • Operate modern IoT-enabled carpet testing equipment and implement smart laboratory practices with real-time data monitoring.

CO5 • Apply global testing standards (ISO, ASTM, BIS, EN) and assess sustainability certifications and regulatory compliance requirements.

CO6 • Utilize ERP/LIMS systems, data analytics, and digital QC dashboards for documentation, defect prediction, and quality management.

## SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 3                                              | 2                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO2    | 3                                              | 2                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO3    | 3                                              | 2                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO4    | 3                                              | 2                       | -                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO5    | 3                                              | 2                       | 3                                       | 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 CONTENT**

### **Unit 1: Fundamentals of Carpet Testing and Industry Relevance (4 Periods)**

Evolution and current trends in carpet testing, Objectives of carpet quality evaluation in modern markets (exports, luxury, hospitality, green buildings), Consumer-focused performance indicators: comfort, durability, aesthetics, Role of testing in digital product development and smart manufacturing, Industry 4.0 and its influence on textile floor coverings.

#### **Practical:**

1. Visual inspection and grading using digital tools.
2. Identify quality attributes using AI-assisted mobile applications.
3. Overview of smart carpets and new materials (e.g., recycled fibers, conductive yarns).

### **Unit 2: Structural and Dimensional Testing of Carpets (4 Periods)**

Key parameters: pile height, density, thickness, tuft bind, Use of digital thickness gauges and laser scanners, Smart sensors for real-time dimensional monitoring, Advanced imaging for 3D surface mapping, Dimensional stability: factors affecting shrinkage, distortion.

#### **Practical:**

1. Measure pile height and density using digital gauges
2. Compare traditional vs. digital methods
3. Conduct shrinkage and curling tests using controlled environment chambers

### **Unit 3: Functional Property Testing and Advanced Performance Evaluation (4 Periods)**

Appearance retention under simulated environments, Abrasion resistance using AI-calibrated testers, Smart wear simulation: robotics and automated testing arms, Soil resistance and nano-coating behaviour, Advanced testing of: Acoustic insulation, Thermal performance, Electrostatic discharge behaviour, Sustainability metrics (VOC emissions, carbon footprint).

#### **Practical:**

1. Perform multi-cycle abrasion using Usometer and digital tracking
2. Measure resilience using dynamic load testing
3. Test noise absorption and heat insulation
4. Evaluate ESD behavior using conductivity testers

### **Unit 4: Modern Carpet Testing Equipment and Smart Lab Practices (4 Periods)**

IoT-enabled carpet testing machines, Tuft withdrawal using automated sensors, Pilfuzz Tester with digital fuzz monitoring, Tumble testers and robotic chair simulation systems, Smart flammability testing with real-time data logging, Calibration, maintenance, and remote diagnostics of equipment, VR/AR integration for training in carpet testing labs.

#### **Practical:**

1. Operate digital tuft strength testers
2. Use IoT-based flammability testers
3. Simulate wear using robotic chair simulators
4. Generate and analyze real-time test data via lab software

### **Unit 5: Global Standards, Sustainability, and Green Compliance (6 Periods)**

Overview of ISO, ASTM, BIS, and EN testing standards, Green certification bodies: GUT, Green Label Plus, Cradle-to-Cradle, LEED, Regulatory compliance: REACH, RoHS, and EPR, Environmental impact of carpet manufacturing and testing, Lifecycle assessment (LCA) and eco-labelling in carpets.

**Practical:**

1. Match lab results with global sustainability standards
2. Assess carpet recyclability and emissions
3. Study sample eco-certifications and material passports

**Unit 6: Digital Documentation, Data Interpretation & Quality Control Systems (6 Periods)**

Use of ERP and LIMS systems in carpet quality labs, Data analytics and machine learning in defect prediction, Cloud-based reporting tools, Factory audit systems using mobile inspection apps, Digital dashboards for real-time QC tracking, Industry 5.0 readiness: human-centered smart labs.

**Practical:**

1. Create digital test reports and dashboards
2. Interpret large test datasets using basic analytics tools
3. Conduct mock ISO-compliant audit using QC apps
4. Simulate test lifecycle documentation for market certification

**INSTRUCTIONAL STRATEGY**

The course will combine classroom teaching with demonstrations and hands-on lab sessions. Practical training on carpet testing equipment will be emphasized. Case studies, industry visits, and sample analysis will help students link theoretical knowledge with real-world applications. Factory compliance and standard testing procedures will be reinforced through guided assignments and projects.

**MEANS OF ASSESSMENT**

Assessment will be based on class tests, practical evaluations, assignments, project work, and final examination. Attendance, lab performance, and participation in industry visits will also be considered.

**RECOMMENDED BOOKS**

1. **E. R. Trotman** – Dyeing and Chemical Technology of Textile Fibres
2. **J. Hu** – Handbook of Fibres: Testing and Evaluation
3. **R. Horrocks & S. C. Anand** – Handbook of Technical Textiles
4. **K. L. Mittal** – Textile Testing
5. **BIS Standards (IS 2546, IS 6617, etc.)** – Indian Standards for Carpet Testing
6. **ISO & ASTM Standards Manuals** – Carpet Performance and Durability Testing

**SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (periods)</b> | <b>Marks Allotted (%)</b> |
|------------------|--------------------------------|---------------------------|
| I                | 4                              | 15                        |
| II               | 4                              | 15                        |
| III              | 4                              | 15                        |
| IV               | 4                              | 15                        |
| V                | 6                              | 20                        |
| VI               | 6                              | 20                        |
| <b>Total</b>     | <b>28</b>                      | <b>100</b>                |

|           |                      |   |   |   |
|-----------|----------------------|---|---|---|
| PRACTICUM | 6.1 CARPET DESIGN-II | L | T | P |
|           |                      | 2 | - | 4 |

## COURSE OBJECTIVE

This course aims to develop digital design competency in textile and carpet applications using modern CAD tools. It equips students with skills in motif creation, color management, digital graph preparation, jacquard integration, and print-ready design development. The course emphasizes AI-assisted designing, workflow optimization, and industry-oriented digital presentation techniques for textile and carpet production.

## COURSE OUTCOMES (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.

### Students will be able to

CO1 • Explain the role and evolution of CAD in textile and carpet design and digitize hand-drawn concepts using modern tools.

CO2 • Configure CAD workspace, manage digital assets, and create/edit motifs using drawing and image-processing tools.

CO3• Develop motif repeats and apply advanced transformations and AI-based enhancements.

CO4• Apply advanced color techniques, manage digital libraries, perform color separation, and estimate material requirements.

CO5 • Create digital graphs, control float settings, and prepare jacquard-compatible weaving design files.

CO6• Design print-ready layouts for textile/carpet printing and export professional presentation files.

## SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 3                                              | -                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO2    | 3                                              | -                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO3    | 3                                              | -                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO4    | 3                                              | -                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO5    | 3                                              | -                       | 3                                       | 3                        | -                                                            | -                         | 2                         | *    | *     |
| CO6    | 3                                              | -                       | 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 CONTENT**

### **Unit 1: Introduction to CAD in Textile & Carpet Design (4 Periods)**

Importance and evolution of CAD in textile/carpet industries, Features of modern CAD systems: vector, raster, AI tools, Interface overview and efficient design workflows, Transitioning from hand sketches to digital outputs, Cloud-based CAD tools for collaborative designing.

#### **Practical:**

1. Digitize hand sketches using CAD software
2. Explore AI design assistance and share designs via cloud platforms

### **Unit 2: CAD Tools, Utilities & Workspace Management (4 Periods)**

Setting up and customizing the CAD workspace, Editing scanned images: background removal, color cleanup, File handling: formats, data transfer, asset management, Drawing tools: freehand, shape tools, geometric paths, CAD integration with stylus/tablet devices.

#### **Practical:**

1. Customize the CAD environment and presets
2. Practice image cleanup and draw motifs with stylus/tablet

### **Unit 3: Motif Creation & Transformation (4 Periods)**

Digitizing motifs using pen and vector tools, Image scanning & vector conversion for graphs, Scaling, rotation, flipping, symmetry tools, Creating repeats: straight, brick, half-drop, Real-time color application and AI enhancements.

#### **Practical:**

1. Create motif repeats and apply colors
2. Use AI to enhance scanned motifs

### **Unit 4: Advanced Color Application & Digital Libraries (4 Periods)**

Color selection, gradients, blending, and layering, Transparent colors and tone reduction, Color separation and prediction for dyeing, Pantone and wool-based digital color libraries, DPI, resolution for print, and wool consumption estimation.

#### **Practical:**

1. Manage color libraries, perform color separation
2. Estimate wool usage and set resolution for digital printing

### **Unit 5: Digital Graph Design & Jacquard Integration (6 Periods)**

Creating digital graphs from motifs, Raster vs. vector for weaving design, X-Y coordinates, float control, and flat checking, Pixel-thread mapping, TPI, resolution in woven output, Introduction to Jacquard design and loom software formats.

#### **Practical:**

1. Create graph designs and control float settings

2. Export files for jacquard loom compatibility

## **Unit 6: CAD for Printing & Design Presentation**

**(6 Periods)**

CAD in digital carpet/textile printing, Print layout design and texture mapping, Repeats for screen, block, and sublimation printing, Color separation and RIP software basics, Exporting and presenting print-ready design files.

### **Practical:**

1. Design a digital print layout and mock-up
2. Perform color separation and export for print production

### **INSTRUCTIONAL STRATEGY**

The course uses lectures, demos, and hands-on labs for CAD skills. Projects, case studies, and guest talks link theory to practice. Digital tools and cloud platforms support interactive learning and design sharing.

### **MEANS OF ASSESSMENT**

Assessment includes written exams, practical tests, projects, quizzes, and viva to evaluate both theory and skills.

### **RECOMMENDED BOOKS**

1. "Textile CAD" by K. Thangamani
2. "Computer-Aided Textile Design" by J. A. Shepherd
3. "CAD for Textile and Fashion Design" by A. Shaik
4. "Digital Textile Design" by S. Kadolph
5. "Carpet Design and Technology" by S. K. Ghosh

### **SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (periods)</b> | <b>Marks Allotted (%)</b> |
|------------------|--------------------------------|---------------------------|
| I                | 4                              | 15                        |
| II               | 4                              | 15                        |
| III              | 4                              | 15                        |
| IV               | 4                              | 15                        |
| V                | 6                              | 20                        |
| VI               | 6                              | 20                        |
| <b>Total</b>     | <b>28</b>                      | <b>100</b>                |

| THEORY | 6.2 ENTREPRENEURSHIP AND START-UPS | L | T | P |
|--------|------------------------------------|---|---|---|
|        |                                    | 2 | - |   |

### COURSE OBJECTIVES:

The aim of this course is to help the student to attain the following industry identified competency through various teaching experiences:

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resources for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individuals and the nation.
4. Acquiring entrepreneurial quality, competence, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial ventures.

### 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 concept of entrepreneurship, classify business structures, and distinguish between the roles of an entrepreneur, intrapreneur, and manager.

**CO2:** Identify feasible business ideas using activity maps and develop a preliminary Business Plan based on case study analysis.

**CO3:** Analyze market strategies using STP and SWOT analysis, and formulate the Vision, Mission, and Objectives for a start-up.

**CO4:** Discuss the fundamental functions of management, organizational structures, and the processes of recruitment, selection, and training.

**CO5:** Select appropriate financing methods (Govt schemes, Venture Capital) and apply Intellectual Property Rights (IPR) concepts to protect business ideas.

**CO6:** Describe the strategies for business succession, harvesting, and the legal types of dissolution.

### SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Engineering Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PSO2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------------------|---------------------------|---------------------------|------|------|
| CO1    | -                                              | -                       | -                                       | -                        | 2                                                                        | 3                         | 2                         | *    | *    |
| CO2    | -                                              | 2                       | 2                                       | -                        | 1                                                                        | 3                         | 2                         | *    | *    |
| CO3    | -                                              | 2                       | 2                                       | -                        | 2                                                                        | 3                         | 2                         | *    | *    |
| CO4    | -                                              | -                       | -                                       | -                        | 1                                                                        | 3                         | 1                         | *    | *    |
| CO5    | -                                              | 2                       | -                                       | -                        | 2                                                                        | 3                         | 2                         | *    | *    |
| CO6    | -                                              | -                       | -                                       | -                        | 1                                                                        | 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 – I: Introduction to Entrepreneurship and Start – Ups (05 Periods)**

Definitions, Classification of Entrepreneur

Traits of an Entrepreneur, Intrapreneurship, Motivation

Types of Business Structures- On the Basis of size and on the basis of ownership

Similarities/differences between entrepreneurs and managers

**Unit – II: Business Ideas and their implementation (04 Periods)**

Discovering ideas and visualizing the business

Activity map

Business Plan (Case Study)

**Unit – III: Ideas to Start-up (08 Periods)**

Marketing and Accounting- Definition and Importance.

Market Analysis – STP (Segmentation, Targeting, Positioning)

Competition evaluation and Strategy Development – Vision, Mission, Goal, Objectives.

Risk analysis- SWOT Analysis.

**Unit – IV: Management (06 Periods)**

Definition Concept and Functions of Management

Company's Organization Structure- Concept and Classification

Recruitment and Selection- Definition,

Training and Development- Importance.

**Unit – V: Financing and Protection of Ideas (03 Periods)**

Financing methods available for Entrepreneurship/ Startups in India (Government Scheme, Banking, NBFCs, SHG and Micro Financing).

Intellectual Property Rights- Overview of - Copyrights, Trademark, Geographical Indicators, Patenting and Licenses

Communication of Ideas to potential investors – Investor Pitch.

**Unit – V: Succession, Dissolution and Harvesting strategy (06 Periods)**

Ways of succession

Types of Dissolution

**INSTRUCTIONAL STRATEGY**

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial and start- up qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organizations on visit. Approach extracted reading and handouts may be provided.

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

**BOOKS RECOMMENDED**

1. The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company – Steve Blank and Bob Dorf, K & S Ranch, ISBN: 978-0984999392
2. Entrepreneurship Development (A New Venture Creation) – Vasant Desai, Himalaya Publishing House
3. Entrepreneurship Development – Khanka S.S., S. Chand & Company Ltd., New Delhi
4. Entrepreneurship Development – Gupta and Srinivasan, S. Chand & Company Ltd., New Delhi
5. Demand: Creating What People Love Before They Know They Want It – Adrian J. Slywotzky with Karl Weber, Headline Book Publishing, ISBN: 978-0755388974

6. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses – Eric Ries, Penguin UK, ISBN: 978-0670921607
7. The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business – Clayton M. Christensen, Harvard Business Review Press, ISBN: 978-1422196021

#### **SUGGESTED SOFTWARE/LEARNING WEBSITES:**

- <https://www.fundable.com/learn/resources/guides/startup>
- <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/>
- <https://www.finder.com/small-business-finance-tips>
- <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>
- NPTEL Course on Entrepreneurship [https://onlinecourses.nptel.ac.in/noc23\\_mg74/preview](https://onlinecourses.nptel.ac.in/noc23_mg74/preview)
- National Geographic Channel you tube Video on “GI Tag Crafts of Bharat”

#### **SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (periods)</b> | <b>Marks Allotted (%)</b> |
|------------------|--------------------------------|---------------------------|
| 1                | 05                             | 17                        |
| 2                | 04                             | 14                        |
| 3                | 08                             | 20                        |
| 4                | 06                             | 17                        |
| 5                | 03                             | 21                        |
| 6                | 02                             | 11                        |
| <b>Total</b>     | <b>28</b>                      | <b>100</b>                |

| THEORY | 6.4 DISASTER MANAGEMENT (OE-3) | L | T | P |
|--------|--------------------------------|---|---|---|
|        |                                | 2 | - | - |

## COURSE OBJECTIVE

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organisations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

## COURSE OUTCOMES (CO):

After completing this course, student will be:

CO1: Acquainted with fundamental concepts of disaster, hazard, vulnerability, risk, and capacity, and explain their inter-relationships.

CO2 : Classify various types of disasters (Geological, Hydro-meteorological, Biological, Man-made) and analyze their causes, trends, and consequences.

CO3 : Apply the Disaster Management Cycle (Pre, During, Post) and global frameworks (Hyogo, IDNDR) to plan for risk assessment and mitigation.

CO4 : Familiarised with institutional and legal mechanism of Disaster Management in India, including the DM Act 2005 and the role of various agencies.

CO5: Able to select scientific tools (GIS, RS, GPS) and engineering practices (structural/non-structural mitigation) for disaster preparedness and safe construction.

## SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| CO No. | PO1<br>Basic and Discipline Specific Knowledge | PO2<br>Problem Analysis | PO3<br>Design/ Development of Solutions | PO4<br>Engineering Tools | PO5<br>Practices for Society, Sustainability and Environment | PO6<br>Project Management | PO7<br>Life Long Learning | PSO1 | PS O2 |
|--------|------------------------------------------------|-------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------------|---------------------------|---------------------------|------|-------|
| CO1    | 2                                              | -                       | -                                       | -                        | 3                                                            | -                         | 1                         | *    | *     |
| CO2    | 3                                              | 2                       | -                                       | -                        | 3                                                            | -                         | 2                         | *    | *     |
| CO3    | 1                                              | 2                       | 1                                       | -                        | 3                                                            | 2                         | 2                         | *    | *     |
| CO4    | 2                                              | -                       | -                                       | -                        | 3                                                            | 1                         | 2                         | *    | *     |
| CO5    | 3                                              | 2                       | 1                                       | 2                        | 3                                                            | 2                         | 2                         | *    | *     |
| CO6    | 3                                              | -                       | 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 CONTENT

### Unit – I: Understanding Disaster

(02 Periods)

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management.

### Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

(05 Periods)

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

### Unit - III: Disaster Management Cycle and Framework

(08 Periods)

Disaster Management Cycle – Paradigm Shift in Disaster Management. Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

### Unit – IV: Disaster Management in India

(05 Periods)

Disaster Profile of India – Mega Disasters of India and Lessons Learnt. Disaster Management Act 2005 – Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies 457 Open Elective Courses

### Unit – V: Applications of Science and Technology for Disaster Management

(08 Periods)

Geo-informatics in Disaster Management (RS, GIS, GPS and RS). Disaster Communication System (Early Warning and Its Dissemination). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non-Structural Mitigation of Disasters S&T Institutions for Disaster Management in India

### LIST OF RECOMMENDED BOOKS:

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management.
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi.
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi.
4. Alexander, David, Natural Disasters, Kluwer Academic London.
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation.
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No.    | Time Allotted (periods) | Marks Allotted (%) |
|--------------|-------------------------|--------------------|
| I            | 02                      | 10                 |
| II           | 05                      | 19                 |
| III          | 08                      | 28                 |
| IV           | 05                      | 19                 |
| V            | 08                      | 24                 |
| <b>Total</b> | <b>28</b>               | <b>100</b>         |

| THEORY | 6.4 ARTIFICIAL INTELLIGENCE (OE-3) | L | T | P |
|--------|------------------------------------|---|---|---|
|        |                                    | 2 | - | - |

## COURSE OBJECTIVES

The objectives of this course are to:

- Introduce students to the fundamental concepts, goals, and applications of Artificial Intelligence.
- Enable understanding of intelligent agents and their interaction with different environments.
- Develop basic knowledge of search algorithms and problem-solving techniques used in AI.
- Familiarize students with fuzzy logic systems and their role in decision-making.
- Introduce neural network concepts and their applications in intelligent systems.

## COURSE OUTCOMES (CO):

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

**CO1:** Explain the concept, goals, history, and applications of Artificial Intelligence.

**CO2:** Describe intelligent agents, their types, and properties of environments.

**CO3:** Apply basic search algorithms and heuristic techniques for problem solving.

**CO4:** Explain principles and components of fuzzy logic systems.

**CO5:** Describe the structure and working of neural networks including perceptron and back-propagation.

## SUGGESTED COURSE ARTICULATION MATRIX (CAM):

| Course Outcomes (COs) | PO1<br>Basics &<br>Discipline<br>Knowledge | PO2<br>Problem<br>Analys<br>is | PO3<br>Design &<br>Development | PO4<br>Tools,<br>Experimentati<br>on & Testing | PO5<br>Socio-<br>Economic/<br>Environme<br>ntal | PO6<br>Project<br>Mgmt &<br>Communic<br>ation | PO7<br>Lifelong<br>Learnin<br>g | PSO<br>1 | PSO<br>2 |
|-----------------------|--------------------------------------------|--------------------------------|--------------------------------|------------------------------------------------|-------------------------------------------------|-----------------------------------------------|---------------------------------|----------|----------|
| CO1                   | 3                                          | 1                              | –                              | –                                              | –                                               | –                                             | 1                               | *        | *        |
| CO2                   | 2                                          | 2                              | –                              | –                                              | –                                               | –                                             | 1                               | *        | *        |
| CO3                   | 2                                          | 3                              | –                              | –                                              | –                                               | –                                             | 1                               | *        | *        |
| CO4                   | 2                                          | 2                              | –                              | –                                              | –                                               | –                                             | 1                               | *        | *        |
| CO5                   | 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.

## COURSE CONTENT:

### Unit 1 – Introduction to Artificial Intelligence

(06 Periods)

- Artificial Intelligence (AI) definition
- Goals of AI
- History of AI
- Applications of AI

### Unit 2 – Agents and Environments

(06 Periods)

- Agent Terminology, Types of Agents – Simple Reflex Agents, Model Based Reflex Agents, Goal Based Agents
- Nature of Environments, Properties of Environments

### Unit 3 – Search Algorithms Terminology

(06 Periods)

- Brute Force Search Strategies – Breadth First Search, Depth First Search.
- Heuristic Search Strategies, Local Search Algorithms.

### Unit 4 – Fuzzy Logic Systems

(05 Periods)

Introduction to Fuzzy Logic and Fuzzy systems,

- Membership functions,
- Fuzzification/Defuzzification

#### **Unit 5 – Neural Networks**

(05 Periods)

Basic structure of Neural Networks

- Perceptron
- Back-propagation

#### **RECOMMENDED BOOKS**

Artificial Intelligence By Example: Develop machine intelligence from scratch using real artificial Intelligence use cases Denis Rothman Packt Publishing ISBN – 978-1788990547

#### **SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (periods)</b> | <b>Marks Allotted (%)</b> |
|------------------|--------------------------------|---------------------------|
| 1                | 06                             | 15                        |
| 2                | 06                             | 25                        |
| 3                | 06                             | 20                        |
| 4                | 05                             | 20                        |
| 5                | 05                             | 20                        |
| <b>Total</b>     | <b>28</b>                      | <b>100</b>                |

## 7. GUIDELINES FOR THE 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/NSS activities 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. |

## **8. 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 classrooms, 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 a diploma programme in Carpet Technology (3<sup>rd</sup> and 4<sup>th</sup> Semester):

**TEXTILE TESTING LAB (COMMON WITH T.T., T.C., T.E.)**

| <b>S.No.</b> | <b>Name of Equipment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>No.</b> | <b>Rate (₹)</b> | <b>Amt. in (₹)</b> |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------|--------------------|
| 1.           | Baer Sorter (For Fiber Length)<br>Acrylic Transparent Sheet<br>6"X8"X2 pieces, 3"X8"X2 pieces<br>Fiber Mounting Templates<br>6"X8"X2 pieces, 3"X8"X2 pieces<br>With tweezers, velvet pad, scales,<br>Plain glass, and all complete<br>accessories or Latest Configuration                                                                                                                                                                                                                                                                                                  | 2          | 20000           | 40000              |
| 2.           | Microscope<br>Digital Microscope<br>Magnifying Power 5X, 10X, 20X, 40X,<br>100X lenses<br>Trinocular biological microscope<br>with fiber cross-section kit, high<br>resolution CCD camera, and imaging<br>software with measurement facilities<br>Scope of use section of fiber or yarn<br>analysis of any fiber, yarn, and<br>fiber<br>Range: 5X, 10X, 20X, 450X, 100X /<br>as per requirements<br>Focus: Adjustable<br>Lights: White, Blue, Yellow, Upper<br>& Lower<br>Supply: 220 V AC supply Single Phase<br>with all complete accessories or Latest<br>Configuration | 2          | 65000           | 130000             |
| 3.           | Moisture Meter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1          | 16000           | 16000              |
| 4.           | Wrap reel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2          | 30000           | 60000              |
| 5.           | Wrap Block                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2          | 6000            | 12000              |
| 6.           | Beesley Balance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4          | 7000            | 28000              |
| 7.           | Quadrant Balance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2          | 4000            | 8000               |
| 8.           | Lea Strength Tester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1          | 50000           | 50000              |
| 9.           | Single Thread Tester (Digital)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1          | 100000          | 100000             |
| 10.          | R. B. Twist Tester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2          | 25000           | 50000              |
| 11.          | One Inch Twist Tester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2          | 8000            | 16000              |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |         |         |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------|---------|
| 12. | Take Up Twist Tester<br>Yarn test length: 25 mm to 500 mm adjustable (Metric unit) or 1" to 20" Maximum adjustable (Imperial unit)<br>Range: up to 60 TPL<br>Resolution: 1 TPM or 0.01 TPI<br>Motor Speed: Up to 1500 RPM<br>Clamps: Spring-loaded clamps at motor end for easy clamping of Yarn<br>Averaging: Reading of at least 10 samples can be stored and average TPM/TPI value is calculated and digital display with preset device<br>Supply: 220 V AC, single phase<br>Suitable for S/Z type of twisted yarn with reset device<br>Tension weight up to 100 gm adjustable<br>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 | 50000   | 50000   |
| 14. | Tearing Strength Tester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 | 20000   | 20000   |
| 15. | Bursting Strength Tester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1 | 35000   | 35000   |
| 16. | Abrasion Resistance Tester (Martindale Type)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1 | 50000   | 50000   |
| 17. | Laundromat (For washing fastness testing)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 | 50000   | 50000   |
| 18. | Crock Meter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 | 10000   | 10000   |
| 19. | Digital Fibro graph<br>Measuring Principle: Optical<br>Measuring Range: 12.0 to 45.<br>Measuring Accuracy: +/- 0.1 mm<br>Result Output: 2.5% SL, 50% SL, and UR %<br>Front End Language: English<br>Applicable Standard: ASTM D5332, ISO2648, and IS233<br>Power Supply: Single Phase 220V AC                                                                                                                                                                                                                                                                                                                                                                                                             | 1 | 320000  | 320000  |
| 20. | Uster Evenness Tester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 | 2000000 | 2000000 |
| 21. | Trash Analyzer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1 | 150000  | 150000  |

|       |                                                                                                                                                                                                                                                                              |   |       |         |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------|---------|
| 22.   | Conditioning Oven<br>220 V with capability of<br>maintaining temperature up to<br>100°C and facility for smooth<br>variation of temperature inside<br>27 liters                                                                                                              | 1 | 98500 | 98500   |
| 23.   | Stelometer (For Bundle Strength)                                                                                                                                                                                                                                             | 2 | 70000 | 140000  |
| 24.   | Crease Recovery Tester<br>Size of the Test Specimen:<br>40mm X 15mm<br>Crease Load: 1 Kg (Stainless Steel)<br>Angle Measurement: On an Engraved<br>circular scale graduated in 1 deg<br>Scale Measurement: 0-180<br>with all complete accessories<br>or Latest Configuration | 2 | 15000 | 30000   |
| 25.   | Water Repellency Tester                                                                                                                                                                                                                                                      | 1 | 80000 | 80000   |
| 26.   | Pilling Tester                                                                                                                                                                                                                                                               | 1 | 30000 | 30000   |
| 27.   | Crimp Rigidity Tester<br>Minor Load: 2 g to 10 g<br>Major Load: 100 g to 500 g<br>Digital display, 220 V<br>with all complete accessories<br>or Latest Configuration                                                                                                         | 1 | 20000 | 20000   |
| 28.   | Air Permeability Tester                                                                                                                                                                                                                                                      | 1 | 35000 | 35000   |
| 29.   | Sheffield Micronaire<br>(For Fiber Fineness)                                                                                                                                                                                                                                 | 1 |       |         |
| 30.   | Uster Stapler for Fiber Length<br>(Spectrophotometer)                                                                                                                                                                                                                        | 1 |       |         |
| Total |                                                                                                                                                                                                                                                                              |   |       | 3811000 |

### CARPET DESIGN LAB

| S. No. | Item                                                                                                                                                                                               | Quantity | Rate (₹)     | Amount (₹)   |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------|--------------|
| 9.     | Pick counting glass                                                                                                                                                                                | 15       | 300.00       | 4,500.00     |
| 10.    | Scissors                                                                                                                                                                                           | 5        | 500.00       | 2,500.00     |
| 11.    | Crimp tester                                                                                                                                                                                       | 1        | 30,000.00    | 30,000.00    |
| 12.    | Computer with latest configuration (i5 or higher), RAM 8 GB or higher, 27 Inch Monitor, integrated or separate graphics card, 512 GB or higher SSD. Pre-loaded latest windows and office software. | 30       | 1,00,000.00  | 30,00,000.00 |
| 13.    | Graphics tablet and pen                                                                                                                                                                            | 30       | 15,000.00    | 4,50,000.00  |
| 14.    | Plotter colour printer 24 inches                                                                                                                                                                   | 01       | 1,00,000.00  | 1,00,000.00  |
| 15.    | Scanner A3 size 600 dpi or higher                                                                                                                                                                  | 01       | 40,000.00    | 40,000.00    |
| 16.    | Coloured inkjet printer                                                                                                                                                                            | 01       | 20,000.00    | 20,000.00    |
| 17.    | Networking                                                                                                                                                                                         | L.S.     | 60,000.00    | 60,000.00    |
| 18.    | Carpet designing CAD software – Galicia, Net graphics or equivalent or multiuser                                                                                                                   | 1        | 20,00,000.00 | 20,00,000.00 |

### **CARPET TESTING LABORATORY**

| <b>S. No.</b> | <b>Item</b>                                   | <b>Quantity</b> | <b>Rate (₹)</b> | <b>Amount (₹)</b> |
|---------------|-----------------------------------------------|-----------------|-----------------|-------------------|
| 1             | Tuft withdrawal tension meter                 | 1               | 2,00,000.00     | 2,00,000.00       |
| 2             | Thickness, static and dynamic loading machine | 1               | 50,00,000.00    | 50,00,000.00      |
| 3             | Hexapod tumbler tester                        | 1               | 25,00,000.00    | 25,00,000.00      |
| 4             | Carpet Flammability tester                    | 1               | 3,00,000.00     | 3,00,000.00       |
| 5             | Carpet digital thickness tester               | 1               | 2,50,000.00     | 2,50,000.00       |
| 6             | Pile height leaf gauge                        | 1               | 20,000.00       | 20,000.00         |
| 7             | Carpet wear and abrasion tester               | 1               | 20,00,000.00    | 20,00,000.00      |
| 8             | Pick counting glass                           | 10              | 300.00          | 3,000.00          |
| 9             | Electronic weighing balance                   | 1               | 50,000.00       | 50,000.00         |

### CARPET MANUFACTURING LABORATORY

| S. No. | Item                                            | Quantity | Rate (₹)    | Amount (₹)  |
|--------|-------------------------------------------------|----------|-------------|-------------|
| 1      | Vertical hand knotting loom with accessories    | 4        | 35,000.00   | 1,40,000.00 |
| 2      | Horizontal carpet weaving loom with accessories | 1        | 1,00,000.00 | 1,00,000.00 |
| 3      | Tibetan carpet weaving loom with accessories    | 4        | 35,000.00   | 1,40,000.00 |
| 3      | Carpet tufting frame                            | 10       | 5,000.00    | 50,000.00   |
| 4      | Manual tufting gun                              | 20       | 1,000.00    | 20,000.00   |
| 5      | Automatic tufting gun                           | 2        | 6,000.00    | 12,000.00   |
| 6      | Carpet latex mixing machine                     | 1        | 10,000.00   | 10,000.00   |
| 7      | Squeeze for latexing                            | 5        | 300.00      | 1,500.00    |
| 8      | Shearing machine                                | 1        | 10,000.00   | 10,000.00   |
| 9      | Shearing scissors                               | 10       | 500.00      | 5,000.00    |
| 10     | Cutting scissors                                | 10       | 500.00      | 5,000.00    |
| 11     | Sorting scissors                                | 10       | 500.00      | 5,000.00    |
| 12     | Sewing machines                                 | 6        | 12,000.00   | 72,000.00   |

### CARPET CHEMICAL PROCESSING LAB

| S. No. | Item                                             | Quantity | Rate (₹)    | Amount (₹)  |
|--------|--------------------------------------------------|----------|-------------|-------------|
| 1.     | Water shaker bath – 8 heads                      | 3        | 80,000.00   | 2,40,000.00 |
| 2.     | Blocks for printing                              | 10       | 500.00      | 5,000.00    |
| 3.     | Screens various sizes                            | 20       | 1,000.00    | 20,000.00   |
| 4.     | Screen preparation chemicals                     | L.S.     | 10,000.00   | 10,000.00   |
| 5.     | Chemicals and dyes as per need                   | L.S.     | 50,000.00   | 50,000.00   |
| 6.     | LPG gas stove 2 heads                            | 3        | 3,500.00    | 10,500.00   |
| 7.     | LPG cylinder                                     | 2        | Market rate | Market rate |
| 8.     | Printing table 5'x15'                            | 2        | 35,000.00   | 70,000.00   |
| 9.     | Safety equipment's – gloves, shoes, goggles etc. | L.S.     | 50,000.00   | 50,000.00   |

**TEXTILE FIBRE LAB**

| <b>S. No.</b> | <b>Item</b>                             | <b>Quantity</b> | <b>Rate (₹)</b> | <b>Amount (₹)</b> |
|---------------|-----------------------------------------|-----------------|-----------------|-------------------|
| 1.            | Projection microscope                   | 1               | 5,00,000.00     | 5,00,000.00       |
| 2.            | Conditioning chamber                    | 1               | 1,50,000.00     | 1,50,000.00       |
| 3.            | Moisture meter                          | 1               | 40,000.00       | 40,000.00         |
| 4.            | Chemistry glassware as per requirements | L.S.            | 50,000.00       | 50,000.00q        |
| 5.            | Spirit lamps                            | 10              | 800.00          | 8,000.00          |
| 6.            | Desiccator                              | 2               | 10,000.00       | 20,000.00         |
| 7.            | Hot air oven                            | 1               | 80,000.00       | 80,000.00         |
| 8.            | Electronic weighing balance             | 1               | 50,000.00       | 50,000.00         |

## CARPET YARN MANUFACTURING LABORATORY

| S. No. | Item                                   | Quantity | Rate (₹)  | Amount (₹) |
|--------|----------------------------------------|----------|-----------|------------|
| A.     | Willow machine lab model               | 1        | 15,00,000 | 15,00,000  |
| B.     | Wollen cum semi worsted card lab model | 1        | 22,50,000 | 22,50,000  |
| C.     | Gill box/ Gilling machine lab model    | 1        | 15,00,000 | 15,00,000  |
| D.     | Worsted comber lab model               | 1        | 22,50,000 | 22,50,000  |
| E.     | Woolen spinning frame lab model        | 1        | 18,75,000 | 18,75,000  |
| F.     | Rubbing frame lab model                | 1        | 15,00,000 | 15,00,000  |
| G.     | Semi worsted/ worsted ring frame       | 1        | 22,50,000 | 22,50,000  |
| H.     | Rotor spinning machine lab model       | 1        | 18,75,000 | 18,75,000  |
| I.     | Hank reeling machine                   | 1        | 15,00,000 | 15,00,000  |

### FABRIC MANUFACTURING LAB

| S.No. | Name of Equipment                                                                                                                                                                                  | No.                     | Rate (₹)                                           | Amt. in (₹)                                        |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------|----------------------------------------------------|
| 1.    | Warp Winding Machines<br>A. Ordinary Machine with 10 Heads<br>B. Automatic Winding Machine with 10 Heads                                                                                           | 1<br>1                  | 50,000<br>800,000                                  | 50,000<br>800,000                                  |
| 2.    | Pirn Winding Machine with 4 Heads                                                                                                                                                                  | 1                       | 40,000                                             | 40,000                                             |
| 3.    | Warping Machines<br>A. Beam Warping Machine (High Speed)<br>B. Sectional Warping Machine                                                                                                           | 1<br>1                  | 300,000<br>175,000                                 | 300,000<br>175,000                                 |
| 4.    | Drawing and Denting Frames (cap. 200 ends)<br>Stainless Screen Frame, Capacity 3200 ends with all Complete Accessories or Latest Configuration                                                     | 2                       | 10,000                                             | 20,000                                             |
| 5.    | Plain Looms<br>A. Plain Loom for Plain Tappet<br>B. Plain Loom for Other Weave Tappets                                                                                                             | 1<br>1                  | 40,000<br>45,000                                   | 40,000<br>45,000                                   |
| 6.    | Dobby Looms<br>A. Single (Acting) Dobby Loom<br>B. Double Acting (Double Lift) Dobby Loom                                                                                                          | 1<br>1                  | 150,000<br>150,000                                 | 150,000<br>150,000                                 |
| 7.    | Jacquard Looms<br>1. Loom with Single Lift Single Cylinder<br>2. Loom With Single Lift Double Cylinder<br>3. Loom With Double Lift Double Cylinder                                                 | 1<br>1<br>1             | 150,000<br>160,000<br>175,000                      | 150,000<br>160,000<br>175,000                      |
| 8.    | Automatic Weaving Machines<br>1. Automatic Pirn Changing Loom<br>2. Automatic Shuttle Changing Loom<br>3. Water Jet Weaving Machine                                                                | 1<br>1<br>1             | 200,000<br>200,000<br>1,200,000                    | 200,000<br>200,000<br>1,200,000                    |
| 9.    | Other Weaving Machines<br>A. Hand Looms<br>B. Loom With Circular Multiple Box Motion<br>C. Loom With Drop Box Multiple Box Motion<br>D. Loom With Terry Motion<br>E. Loom With Pick At Will Motion | 2<br>1<br>1<br>1<br>1   | 15,000<br>100,000<br>100,000<br>150,000<br>150,000 | 30,000<br>100,000<br>100,000<br>150,000<br>150,000 |
| 10.   | Card Cutting Machine                                                                                                                                                                               | 1                       | 25,000                                             | 25,000                                             |
| 11.   | Sewing Machine                                                                                                                                                                                     | 6                       | 8,000                                              | 48,000                                             |
| 12.   | A. Hand Knotting loom<br>B. Carpet Wearing loom<br>C. Carpet Tufting Frame<br>D. Manual Tufting Guns<br>E. Automatic Tufting Guns                                                                  | 4<br>1<br>10<br>20<br>2 | 35,000<br>35,000<br>5,000<br>800<br>10,000         | 140,000<br>35,000<br>50,000<br>16,000<br>20,000    |

|     |                                           |    |           |           |
|-----|-------------------------------------------|----|-----------|-----------|
| 13. | Carpet Latex mixing Machine               | 1  | 10,000    | 10,000    |
| 14. | Squeegee for latexing                     | 5  | 200       | 1,000     |
| 15. | Semi-automatic Carpet backing machine     | 1  | 2,000,000 | 2,000,000 |
| 16. | Wire Wilton cut and loop pile wearing m/c | 1  | 10,000    | 10,000    |
| 17. | Shearing machine                          | 1  | 10,000    | 10,000    |
| 18. | Embossing machine                         | 1  | 10,000    | 10,000    |
| 19. | Edge Binding Machine                      | 1  | 10,000    | 10,000    |
| 20. | Carpet Embossing Scissors                 | 10 | 200       | 2,000     |

## LEARNING RESOURCE MATERIALS

| S.No. | Description                                                                                                                                                                           | Qty. | Approx. Cost (₹) |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|
| 1.    | LCD Projector with Screen                                                                                                                                                             | 1    | 50,000           |
| 2.    | Handicam                                                                                                                                                                              | 1    | 30,000           |
| 3.    | Cutting, Binding & Stitching equipment                                                                                                                                                | 1    | 30,000           |
| 4.    | Desktop Computer with Internet Core i5/i7-760 Processor, Genuine Windows 7 Professional, 18-inch HD Flat Panel Monitor, Optical Mouse, Keyboard & all related media or latest version | 1    | 40,000           |
| 5.    | Home Theater Support Disc type CD, CDR/CDRW, DVDR/DVDRW, VCD Supported with USB Port Support-DIVX/JPEG/MP3                                                                            | 1    | 25,000           |
| 6.    | Commercial PA System 16W-220W output, AC & 24V DC Operated, 5 Mic & 2 Auxiliary input, Speaker output 4 Ohm, 8 Ohm, 17V & 100V                                                        | 1    | 20,000           |
| 7.    | Interactive Board                                                                                                                                                                     | 1    | 50,000           |

## B. FURNITURE REQUIREMENT

Norms and standards laid down by AICTE -APH (latest) be followed for working out furniture requirement for diploma courses

## C. HUMAN RESOURCES:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE

## **9. EVALUATION SCHEME GUIDELINES: As Per AICTE ATTACHED (ANNEXURE- 2)**

### **a. Theory Courses:**

- Internal Assessment: 40%
- End Semester Examination: 60%
- Passing Criteria: A student must secure a minimum of 40% marks separately in both internal assessment and end semester examination to pass the course.

### **b. Practical Courses:**

- Internal Assessment: 60%
- End Semester Examination: 40%
- Passing Criteria: A student must secure a minimum of 40% marks separately in both internal assessment and end semester examination to pass the course.

### **c. Summer Internship / Projects / Seminars, etc.:**

- Evaluation is based on the following components:
  - Quality of work completed
  - Report preparation and documentation
  - Viva-voce performance
  - Presentation skills

### **Note:**

Internal assessment is conducted based on the student's overall performance, which includes:

- Two best out of three mid-semester tests
- Quizzes and assignments
- Class participation and attendance
- Viva-voce and lab records (for practical subjects)

## ANNEXURE- 2

### 1. EVALUATION METHOD for THEORY

|                           | Internal Assessment (40 marks) |                       |                                   |                                         | External Assessment<br>(60 marks) |
|---------------------------|--------------------------------|-----------------------|-----------------------------------|-----------------------------------------|-----------------------------------|
|                           | IA 1                           | IA 2                  | IA 3                              | IA 4                                    |                                   |
| <b>Mode</b>               | <b>Written Test</b>            | <b>Written Test</b>   | <b>Attendance and Assignments</b> | <b>Pre – Semester Examination</b>       | <b>End Semester Examination</b>   |
| <b>Portion</b>            | 2 units                        | 2 units               | Regularly                         | All units                               | All units                         |
| <b>Duration1hr</b>        | 1hr                            | 1hr                   | -                                 | 3hrs                                    | 3hrs                              |
| <b>Exam Marks</b>         | 20                             | 20                    | 20                                | 60                                      | 60                                |
| <b>Converted to</b>       | 10                             | 10                    | 15                                | 15                                      | 60                                |
| <b>Tentative Schedule</b> | 5 <sup>th</sup> Week           | 10 <sup>th</sup> Week | Regularly                         | 12 <sup>th</sup> -13 <sup>th</sup> 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 -13 <sup>th</sup> 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             |
|      | <b>Total</b>                          | <b>60</b>      |

### 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             |
|      | <b>Total</b>                          | <b>40</b>      |

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

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

#### 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             |
|      | <b>Total</b>                          | <b>40</b>      |

#### 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 | 5 <sup>th</sup> Week           |                                | 10 <sup>th</sup> Week |                                | Regularly                              | 12 <sup>th</sup> -13 <sup>th</sup> Week    |                               |

**IA1 and IA2:** A written assessment test worth 10 marks should be conducted for two **UNITs**. 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 |
|-----------|---------------------------------------|----------------|
| <b>A.</b> | Objective                             | <b>5</b>       |
| <b>B.</b> | Circuit Diagram                       | <b>5</b>       |
| <b>C.</b> | Procedure and Connections             | <b>5</b>       |
| <b>D.</b> | Observation Table and Calculation     | <b>5</b>       |
| <b>E.</b> | Result and its Discussion, Conclusion | <b>10</b>      |
| <b>F.</b> | Attendance & Mini Project             | <b>10</b>      |
|           | <b>Total</b>                          | <b>40</b>      |

## 10. LIST OF EXPERTS

| Sr. No. | Name of Participants                      | Organization   |
|---------|-------------------------------------------|----------------|
| 1.      | Sh. Brijesh Mishra HOD, Textile Chemistry | GP Dibai       |
| 2.      | Sh. Alok Kumar, Lecturer Textile          | GP Sitapur     |
| 3.      | Sh. Himanshu Maurya, Textile Design       | GGP Prayagraj  |
| 4.      | Sh. Arunabh Agnihotri, Textile Technology | GP Farrukhabad |
| 5.      | Sh. Harish Kumar Sahu, Textile Design     | GP Farrukhabad |

#### 4. PROCEDURES / FORMATS FOR ORGANIZING INTERNSHIPS.

##### STUDENT INTERNSHIP PROGRAM APPLICATION

Complete and submit to the TPO/ Internship Program Coordinator.

|                                                                                                                 |                  |                               |          |
|-----------------------------------------------------------------------------------------------------------------|------------------|-------------------------------|----------|
| 1. Student Name:                                                                                                |                  | Enroll. No.:                  |          |
| 2. Campus Address:                                                                                              |                  | Phone:                        |          |
| 3. Home Address:                                                                                                |                  | Phone:                        |          |
| 4. Student email address:                                                                                       |                  |                               |          |
| 5. Branch:                                                                                                      |                  | 6. Internship Semester: _____ |          |
| 7. Internship Preferences                                                                                       |                  |                               |          |
|                                                                                                                 | Company/Industry | Core Area                     | Location |
| Preference-1                                                                                                    |                  |                               |          |
| Preference-2                                                                                                    |                  |                               |          |
| Preference-3                                                                                                    |                  |                               |          |
| Faculty mentor Signature: _____ Date _____.                                                                     |                  |                               |          |
| Student Signature: _____ Date _____.                                                                            |                  |                               |          |
| Signature confirms that the student agrees to the terms, conditions, and requirements of the Internship Program |                  |                               |          |

Signature with seal  
HOD/Principal

**(ANNEXURE-I)**

**REQUEST LETTER FROM INSTITUTE TO INTERNSHIP/INDUSTRIAL TRAINING PROVIDER**

Ref. No.: \_\_\_\_\_

Date: \_\_\_\_\_

To,  
The HR Manager/Training Coordinator  
.....  
.....

Subject: Request for Internship/Industrial Training for Diploma Students

Sir/Madam,

We are pleased to introduce....., a premier institution affiliated with Board of Technical Education, Uttar Pradesh, offering diploma programs in various diploma disciplines.

As a part of the curriculum, our students are required to undergo Internship/Industrial Training to gain practical exposure and enhance their technical competencies. Therefore, we kindly request your esteemed organization to provide Internship/Training opportunities to our students during the period from ..... to .....

| S. No. | Name | Enroll. No. | Semester/Year | Discipline |
|--------|------|-------------|---------------|------------|
|        |      |             |               |            |
|        |      |             |               |            |
|        |      |             |               |            |

Yours sincerely,  
**(Head of Department/Principal)**

**PROFORMA FOR EVALUATION OF INTERNSHIP BY INDUSTRY**

Student Name: .....Evaluation Date: .....

Industry Supervisor Name: .....

Company/Organization: .....

Title ..... of ..... the

Project: .....

..... Dates of

Internship: ..... to .....

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

| Parameters                                         | Max. Marks | Marks Given |
|----------------------------------------------------|------------|-------------|
| Attendance and Punctuality                         | 20         |             |
| Discipline and Professional Behavior               | 20         |             |
| Technical Knowledge and Understanding of Processes | 30         |             |
| Practical Skills and Quality of Work               | 20         |             |
| Ability to Apply Theoretical Knowledge             | 20         |             |
| Problem Solving and Analytical Ability             | 10         |             |
| Communication and Interpersonal Skills             | 20         |             |
| Teamwork and Collaboration                         | 10         |             |
| Internship Report/Documentation                    | 20         |             |
| Presentation and Viva-Voce                         | 30         |             |
| Total Marks                                        | 200        |             |

Additional comments, if any:

Signature with seal of Industry supervisor

HR Manager

## INTERNSHIP REPORT

### STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and got ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

### INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

- i. Originality.
- ii. Adequacy and purposeful write-up.
- iii. Organization, format, drawings, sketches, style, language etc.
- iv. Variety and relevance of learning experience.
- v. Practical applications, relationships with basic theory and concepts taught in the course.

## **MONITORING & EVALUATION OF INTERNSHIP**

The industrial training of the students will be evaluated in three stages:

1. Evaluation by Industry.
2. Evaluation by faculty supervisor of Industry.
3. Evaluation through seminar presentation/viva-voce at the Institute.

### **1. EVALUATION BY INDUSTRY**

The industry will evaluate the students based on the Punctuality, eagerness to learn, Maintenance of Daily Diary and skill test in addition to any remarks.

### **2. MONITORING/ SURPRISE VISIT BY TPO/ STAFF/ FACULTY MENTOR**

TPO/Staff/ Faculty Mentor of the institutes will make a surprise visit to the internship site, to check the student's presence physically, if the student is found absent without prior intimation to the T & P Cell, entire training will be cancelled. Students should inform the TPO, faculty mentor as well as the industry supervisor at least one day prior to availing leave by email. Students are eligible to avail 1-day leave in 4 weeks and 2 days leave in 6 weeks of the internship period apart from holidays and weekly offs.

### **3. EVALUATION THROUGH SEMINAR PRESENTATION/VIVA-VOCE AT THE INSTITUTE**

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

Seminar presentation will enable sharing knowledge & experience amongst students & teachers and build communication skills and confidence in students.