

6.1 TEXTILE TESTING AND QUALITY CONTROL – II

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RATIONALE

The diploma holders in textile technology have to ensure quality at all levels. The skills in testing of materials and textiles of various stages of production and finishing are essential to be developed in the students. To train the students in assessment of performance characteristics of various textile materials i.e. fibre, yarns and fabrics the subject of Textile Testing and Quality Control has been included in the curriculum.

DETAILED CONTENTS

Sr. No.	Theory	Practical
1.	Tensile Testing of Textiles (24 hrs)	
1.1	Definition and units of stress, strain, initial young's modulus, tenacity, yield point, elasticity, and work of rupture, work factor, toughness, toughness index, stiffness and resistance. Stress and strain curves. Load elongation curves for various textile fibres. (4 hrs)	
1.2	Principle of pendulum testers, single yarn strength testing and lea testing machines. Factors affecting yarn strength. Count Strength Product (CSP) and its importance (6 hrs)	Find out single yarn strength Find out lea strength of yarn by Lea Strength Tester
1.3	Fibre strength testing by pressley fibre strength tester (3 hrs)	
1.4	Yarn testing by ballistic/tearing strength tester (3 hrs)	Find out breaking strength of yarn and fabric by Ballistic Strength Tester. Determine twist per inch in yarn by Twist Tester
1.5	Fabric strength testing by Cut Strip, Grab Strip and Reveled Strip Methods (4 hrs)	Find out breaking strength of fabric by different methods

1.6	Bursting strength testing of fabric by Hydraulic Bursting Strength Tester (4 hrs)	Find out bursting strength of fabric by Hydraulic Strength Tester
2.	Fabric Dimension (26 hrs)	
2.1	Fabric thickness testing by thickness tester (2 hrs)	
2.2	Definition of air permeability, air resistance. Porosity Measurement of permeability by Shirley Air Permeability Tester (3 hrs)	Find out air permeability of fabric by Air Permeability Tester
2.3	Crease recovery of fabric. Measurement of crease recovery by Shirley Crease Recovery Tester (2 hrs)	Find out Crease Recovery of fabric by Crease Recovery Tester
2.4	Abrasion resistance and serviceability test on fabrics. Measurement of serviceability by Abrasion Tester Stiffness, Handle & drape of fabric (3 hrs)	<ul style="list-style-type: none"> - Find out serviceability of fabric by abrasion tester - Use of Drapemeter.
2.5	Definition of crimp, measurement of warp and weft crimp in fabric by crimpmeter (2 hrs)	Find out crimp in warp and weft of fabric
2.6	Fabric shrinkage relaxation and felting. Measurement of fabric shrinkage (2 hrs)	
2.7	Flammability test for fabrics (2 hrs)	Flammability test by Flammability Testers.
2.8	Fabric cover and its relation with fabric properties (2 hrs)	
2.9	Test of colour Fastness for <ul style="list-style-type: none"> - Washing - Rubbing (Wet & Dry) (3 hrs)	Use of laundrometer crock meter for fastness testing. Grey scale & Blue scale
2.10	Blend tests by solubility methods (2 hrs)	Blend testing by chemical (Solubility) methods
2.11	Wettability test for fabric water proofing and shower proofing. Drop penetration test. Spray test and Hydrostatic pressure tests (3 hrs)	

3.	Evenness Testing (16 hrs)	
3.1	Importance of evenness in yarn. Short term, medium term and long term variations in yarns). Periodic and non-periodic irregularities. Causes and remedies for yarn uneven-ness (8 hrs)	Uster classmate testing.
3.2	Principle of electronic capacitor testers. Evenness testing by uster evenness tester (6 hrs)	

REFERENCE BOOKS

1. Principles of Textile Testing by JE Booth
2. Textile Testing by P Angappan, R Gopalakrishnan
3. Handbook of Textile Testing and Quality Control by Grover and Hamby

6.2 MODERN METHODS IN YARN PRODUCTION

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RATIONALE

A student of diploma in textile technology must be familiar with the new systems of yarn manufacturing coming in modern industry. Hence the subject has been included in the curriculum.

DETAILED CONTENTS

1. Fibre properties, requirements for different spinning processes (4 hrs)
2. Limitations of ring spinning (3 hrs)
3. Basic elements and principles of Rotor Spinning Machine. Passage through the Rotor Spinning Frame (7 hrs)
4. Range of speed for opening roller and rotor (3 hrs)
5. Functions of transport channel (3 hrs)
6. Structure and Properties of Rotor Yarn and its comparison with Ring Frame Yarn (3 hrs)
7. Introduction to Air-jet Spinning. Principle of yarn formation and its comparison with Ring Yarn and Rotor Yarn (6 hrs)
8. Introduction to Friction Spinning. Principle of yarn formation. Yarn structure and its comparison with Ring and Rotor Yarn (6 hrs)
9. Introduction to texturing process. Different texturing processes, their overview. Application and advantages of Textured Yarn (10 hrs)
10. Fibre characteristics required for blending. Modification of blow room machinery, speeds and setting for and man-made fibre processing and their blends (10 hrs)
11. Recommended speeds and settings of different parts in card for man-made fibres and blend processing (4 hrs)
12. Recommended changes in speeds and drafting zones of Draw Frames, Simplex and Ring Frame for man-made fibre processing and blends processing. Twist and twist multipliers for different man-made fibres and their blends. (5 Hrs)

REFERENCE BOOKS

1. Manual of Textile Technology (Vol.5) by W Klein
2. Manual of Textile Technology (Vol.6) by W Klein
3. Spinning of man-made Fibres and their Blends in Cotton Spinning by KR Salhotra
4. Open End Spinning by V.Rohlena
5. Spun Yarn Technology by Venktasubramanian

6.3.1 PROCESS CONTROL IN SPINNING

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RATIONALE

This subject will help the students to appreciate & understand various methods to control various spinning processes. Hence this subject.

DETAILED CONTENTS

1. Consideration for evolving a system for process control in Spinning: its scope, key variables, standards and norms. Taking corrective actions. (6 hrs)
2. Control of mixing quality and cost through fibre characteristics and linear programming, its applications.

Yarn realization, its estimation, norms, method of judgment and final implementation (10 hrs)
3. Determination of trash content in blow-room and carding machine, norms for trash percentage, waste percentage and cleaning efficiency of blow room and carding, methods of accessing the performance of blow-room and carding, measures for improvement. (10 hrs)
4. Productivity, its measurement, definition, indices of productivity and their analysis, productivity and profitability. Productivity index, choice of productivity improvement in ring spinning by machine efficiency end breakage rate, and preparatory section by standards and controls. (10 hrs)
5. Control of yarn quality with reference to count (within and between Bobbins), and strength (lea strength), & their variability. (10 hrs)
6. Machine audit, its impact on machine condition, method of its implementation. (8 hrs)
7. Irregularity of drafted material, random, quasi-periodic and periodic irregularity, causes of irregularity, influence of machine variable on irregularity. (10 hrs)

RECOMMENDED BOOKS

1. Process control in Spinning-Subramanian, (ATIRA) Publication Ahmedabad

6.3.2 PROCESS CONTROL IN WEAVING

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RATIONALE

The aim is to provide basic knowledge about process control in Warping, Sizing, Drawing in Loom Shed etc. through this course so that the students are able to assist the textile engineers in weaving operations.

DETAILED CONTENTS

1. **Process Control in Warping** (15 hrs)
 - Process control parameters in warping (4 hrs)
 - Efficiency of warping department (2 hrs)
 - Work load in warping department (2 hrs)
 - Maintenance check points at warping (2 hrs)
 - Control of end breaks at warping (2 hrs)
 - Costing calculation in warping (3 hrs)

2. **Process Control Parameters in sizing** (15 hrs)
 - Process control parameters in sizing (4 hrs)
 - Efficiency of sizing departments (2 hrs)
 - Calculation of ingredients consumption in a typical sizing machine (3 hrs)
 - Work load distribution in sizing (2 hrs)
 - Common defects at sizing & remedies (2 hrs)
 - Costing calculation in sizing (2 hrs)

3. **Process control in drawing in** (10 hrs)
 - Process control parameters in drawing-in (2 hrs)
 - Calculation regarding drawing-in frames (2 hrs)
 - Work load distribution in drawing in (2 hrs)
 - Common defects in drawing-in & remedies (2 hrs)
 - Costing calculations in drawing in (2 hrs)

4. **Process control at loom shed** (24 hrs)
 - Process control parameters in weaving (2 hrs)
 - Efficiency of a typical loom shed. Difference between installed & actual efficiency (2 hrs)
 - Evolving a maintenance schedule at loom shed various factor affecting it (2 hrs)
 - Inventory control & stores management of loom shed spare (2 hrs)
 - Bearing & lubrication management at loom shed (1 hrs)

- Maintenance of knitting machine. Gating & knitting (1 hrs)
- Plan to set up of a high speed loom shed. Architectural consideration, foundation and space measurement (2 hrs)
- Humidification systems at loom shed (2 hrs)
- Work load distribution in weaving (2 hrs)
- Weaving costing calculation (2 hrs)
- Material Handling, equipment, calculation of material handling equipment's and their maintenance (2 hrs)
- Common weave defects & a system to check (2 hrs)
- Controlling breaks at loom shed (2 hrs)

6.4 GARMENT MANUFACTURING TECHNOLOGY

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RATIONALE

Some of the diploma holders in Textile Technology may also find placement in the Garment House. The basic concept of Garment Manufacturing are included in this subject.

DETAILED CONTENTS

Sr. No.	Theory	Practical
1.	Cutting: Planning, Drawing, Drafting and Pattern Making and reproduction of the marker, spreading of the fabric to form a lay, cutting of the fabric (10hrs.)	To study tools and equipments used in clothing/garment constructions.
2.	Sewing Properties of Seams, Darts seam types, sewing machine needle types, sewing needles, sewing problems, basic sewing machine. (10hrs.)	To study machines parts of sewing machine, threading & working defects remedies and oiling. Type of stitches.
3.	Use of components and trimmings: Labels and motifs, linings, interlinking, waddings. (10hrs.)	Practice of making of different types of openings, button holes fasteners, taking & hemming, Types of pleating, Types of Collars, neck-lines, stitching of different cloths
4.	Pressing: The principle of pressing, pressing equipment and methods. (10hrs.)	Demonstration of Appliances required for pressing, finishing and pressing of textiles and finishes (through mill visits only)
5.	Quality control: Principles of quality control, Total Quality control, just in time. Inspection systems and care labeling of apparel and textiles. Eco labels, American Care Labeling (CLS), International care labeling system, British care labeling systems, Japanese care labeling system (8 hrs)	

REFERENCE BOOKS

1. Garment finishing and care labelling by S.S. Satsangi M/s Usha Publishers
53B/AC-IV Shalimar Bagh Delhi-110088
2. Textile Fibres and Fabrics by Bernard P Corbman-M/s Mc Graw-Hill, International
Edition
3. Garment Designs-by Amstrong.

6.5 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

DETAILED CONTENTS

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| (1) | Entrepreneurship | (4 hrs) |
| | 1.1 Concept/Meaning | |
| | 1.2 Need | |
| | 1.3 Competencies/qualities of an entrepreneur | |
| (2) | Entrepreneurial Support System | (6 hrs) |
| | 2.1 District Industry Centres (DICs) | |
| | 2.2 Commercial Banks | |
| | 2.3 State Financial Corporations | |
| | 2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level | |
| (3) | Market Survey and Opportunity Identification (Business Planning) | (6 hrs) |
| | 3.1 How to start a small scale industry | |
| | 3.2 Procedures for registration of small scale industry | |
| | 3.3 List of items reserved for exclusive manufacture in small scale industry | |
| | 3.4 Assessment of demand and supply in potential areas of growth | |
| | 3.5 Understanding business opportunity | |
| | 3.6 Considerations in product selection | |
| | 3.7 Data collection for setting up small ventures | |
| (4) | Project Report Preparation | (6 hrs) |
| | 4.1 Preliminary Project Report | |
| | 4.2 Techno-Economic feasibility report | |
| | 4.3 Project Viability | |

- (5) Managerial Aspects of Small Business (8 hrs)
- 5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control)
 - 5.2 Operational Aspects of Production
 - 5.3 Inventory Management
 - 5.4 Basic principles of financial management
 - 5.5 Marketing Techniques
 - 5.6 Personnel Management
 - 5.7 Importance of Communication in business
- (6) Legal Aspects of Small Business (6 hrs)
- 6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
 - 6.2 Factory Act and Payment of Wages Act
- (7) Environmental considerations (6 hrs)
- 7.1 Concept of ecology and environment
 - 7.2 Factors contributing to Air, Water, Noise pollution
 - 7.3 Air, water and noise pollution standards and control
 - 7.4 Personal Protection Equipment (PPEs) for safety at work places
- (8) Miscellaneous (6 hrs)
- 8.1 Human relations and performance in organization
 - 8.2 Industrial Relations and Disputes
 - 8.3 Relations with subordinates, peers and superiors
 - 8.4 Motivation – Incentives, Rewards, Job Satisfaction
 - 8.5 Leadership
 - 8.6 Labour Welfare
 - 8.7 Workers participation in management

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi

4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

6.6 MAJOR PROJECT WORK

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Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred. The Industrial/practice based major project is intended to place students for project oriented practical training in actual work situations for the stipulated period with a view to:

- i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.
- ii) Develop understanding of subject based knowledge given in the class room in the context of its applications at work places
- iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.
- iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values

The major project should not be considered as merely conventional Industrial training in which students are sent at work places with minimal supervision. This experience is required to be planned and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organisations for providing such and experience. It is necessary that each organisation is visited well in advance and activities to be performed by the students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to Industrial/field organisations. Each teacher is expected to supervise and guide 5-6 students.

Efforts should be made to identify actual field problems in the textile industries to be given as project work to the students. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Students may be assessed both by industry and polytechnic faculty.

Some of the suggested project activities are given below:

For Spinning group

1. Assessment of yarn realization, expected waste percentage at different stages from a specific trash percentage raw material
2. To prepare a spin plan for a particular count balancing the machines, material and labour
3. Modifications/changes required in the various machines for processing of stapled man made fibres on cotton spinning system
4. Comparison of semi high production and high production card silver on yarn quality and economics of the both
5. Effect of draft distribution and total draft and change in twist on ring spun yarn with respect to productivity and quality
6. Reasons of end breakages, their remedies and analysis in a ring frame machine

For Weaving Group

1. Graph to fabric (may be in the mill or institute)
2. Mill plan (for certain number of looms)
3. Sample testing
4. Loom efficiency
5. Project fire fighting
6. Reproduction from fabric samples
7. Fabric faults and remedial steps

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max.** marks	Rating Scale				
			Excellent	Very good	Good	Fair	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared “not eligible to receive diploma ”. It is also important to note that the students must get more than six “goods” or above “good” grade in different performance criteria items in order to get “Overall Good” grade.

Important Notes

- 1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**
- 2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**
- 3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**
- 4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve another criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.