


|  <b>MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI</b><br><b>TEACHING AND EXAMINATION SCHEME</b> |   |              |          |                 |           |           |                    |            |           |                                   |           |           |           |            |           |            |
|---|---|--------------|----------|-----------------|-----------|-----------|--------------------|------------|-----------|-----------------------------------|-----------|-----------|-----------|------------|-----------|------------|
| <b>COURSE NAME : DIPLOMA IN TEXTILE TECHNOLOGY</b>  |   |              |          |                 |           |           |                    |            |           |                                   |           |           |           |            |           |            |
| <b>COURSE CODE : TC</b>   |   |              |          |                 |           |           |                    |            |           |                                   |           |           |           |            |           |            |
| <b>DURATION OF COURSE : SIX SEMESTERS</b>   |   |              |          |                 |           |           |                    |            |           | <b>WITH EFFECT FROM : 2012-13</b> |           |           |           |            |           |            |
| <b>SEMESTER : FIFTH</b>   |   |              |          |                 |           |           |                    |            |           | <b>DURATION : 16 WEEKS</b>        |           |           |           |            |           |            |
| <b>PATTERN : FULL TIME - SEMESTER</b>   |   |              |          |                 |           |           |                    |            |           | <b>SCHEME : G</b>                 |           |           |           |            |           |            |
| SR. NO.   | SUBJECT TITLE                               | Abbreviation | SUB CODE | TEACHING SCHEME |           |           | EXAMINATION SCHEME |            |           |                                   |           |           |           |            |           | SW (17500) |
|   |   |              |          | TH              | TU        | PR        | PAPER HRS.         | TH (1)     |           | PR (4)                            |           | OR (8)    |           | TW (9)     |           |            |
|   |   |              |          |                 |           |           |                    | Max        | Min       | Max                               | Min       | Max       | Min       | Max        | Min       |            |
| 1   | Textronics β                                | TEX          | 17563    | 03              | --        | 02        | 03                 | 100        | 40        | --                                | --        | --        | --        | 25@        | 10        | <b>50</b>  |
| 2   | Technology of Dyeing-II                     | TOD          | 17564    | 03              | --        | 03        | 03                 | 100        | 40        | 50#                               | 20        | --        | --        | 25@        | 10        |            |
| 3   | Technology of Printing-II                   | TOP          | 17565    | 03              | --        | 03        | 03                 | 100        | 40        | 50#                               | 20        | --        | --        | 25@        | 10        |            |
| 4   | Technology of Finishing-II                  | TOF          | 17566    | 03              | --        | 03        | 03                 | 100        | 40        | --                                | --        | 25#       | 10        | 25@        | 10        |            |
| 5   | Process & Quality Control in Wet Processing | PQC          | 17567    | 03              | --        | --        | 03                 | 100        | 40        | --                                | --        | --        | --        | --         | --        |            |
| 6   | Computer Aided Textile Design & Colour      | CAT          | 17077    | --              | --        | 02        | --                 | --         | --        | --                                | --        | --        | --        | 25@        | 10        |            |
| 7   | Professional Practices-III                  | PPT          | 17078    | --              | --        | 03        | --                 | --         | --        | --                                | --        | --        | --        | 50@        | 20        |            |
| 8   | Industrial Training                         | ITR          | 17053    | --              | --        | **        | --                 | --         | --        | --                                | --        | 50#       | 20        | 50@        | 20        |            |
| <b>TOTAL</b>  |   |              |          | <b>15</b>       | <b>--</b> | <b>16</b> | <b>--</b>          | <b>500</b> | <b>--</b> | <b>100</b>                        | <b>--</b> | <b>75</b> | <b>--</b> | <b>225</b> | <b>--</b> | <b>50</b>  |

Student Contact Hours Per Week: **31 Hrs.**  
**THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.**  
 Total Marks : **950**  
 @ - Internal Assessment, # - External Assessment, \$ - Common to All Conventional Diploma,  No Theory Examination, β - Common to TX  
 \*-Assessment of Industrial Training in Fifth semester.  
 Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work.

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subject are to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

**Course Name : Diploma in Textile Manufactures / Diploma in Textile Technology**

**Course Code : TX/TC**

**Semester : Fifth**

**Subject Title : Textronics**

**Subject Code : 17563**

**Teaching and Examination Scheme:**

| Teaching Scheme |    |    | Examination Scheme |     |    |    |     |       |
|-----------------|----|----|--------------------|-----|----|----|-----|-------|
| TH              | TU | PR | PAPER<br>HRS       | TH  | PR | OR | TW  | TOTAL |
| 03              | -- | 02 | 03                 | 100 | -- | -- | 25@ | 125   |

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

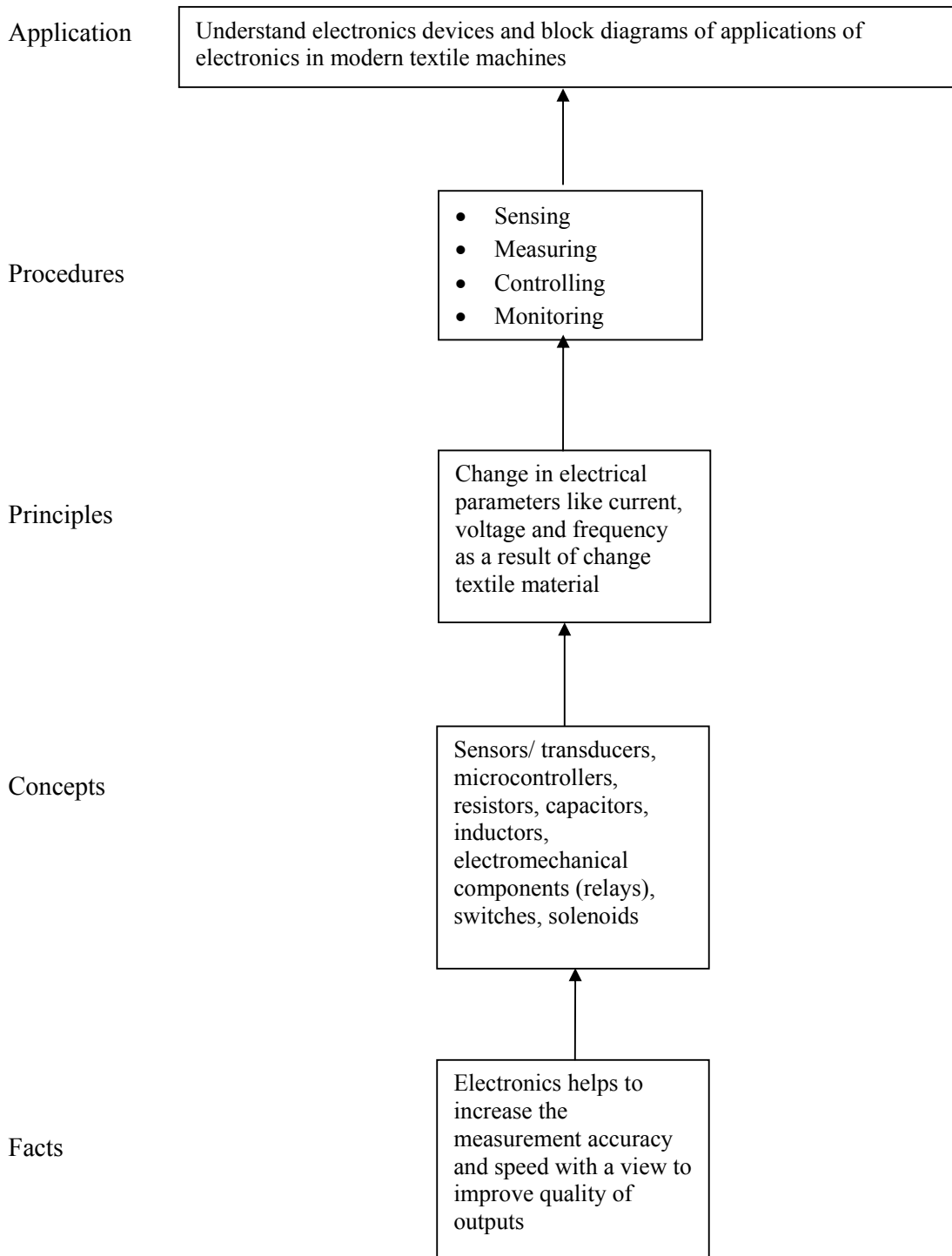
Textile Technology has been advanced by leaps and bounds. The present day situation needs the textile machinery, which can produce the best quality fabric with very high production rates. To keep the cost production the lowest is the order of day. For this textiles machinery manufacturers have introduced many electronic devices to indicate, measure and control various aspects of process. It has been possible to monitor process by use of microprocessors. This subject intends to impart basic knowledge regarding the electronic components used in machines, principles and their carry out function.

**Objectives:**

The Student will be able to:

1. Understand working of electronics devices.
2. Understand the working principles of sensors and actuators.
3. Understand various applications of electronics devices in textiles.

**Learning Structure:**



**Detail Content:**

| Chapter | Topic   | Hours | Marks |
|---------|---|-------|-------|
| 1.      | <b>Passive components</b><br><b>Specific Objectives:</b><br>Student will be able to <ol style="list-style-type: none"> <li>Describe types of passive components</li> <li>Determine value of resistance of resistor from color code</li> </ol>   | 06    | 10    |
|         | Introduction, active & passive components,<br>Resistors- principle, specifications, types, color coding<br>Capacitors- property, specifications, types<br>Inductors- property, specifications, types  |       |       |
| 2.      | <b>Semiconductor devices</b><br><b>Specific Objectives:</b><br>Student will be able to <ol style="list-style-type: none"> <li>Describe types of materials and semiconductors</li> <li>Describe working of semiconductor diode and transistor</li> <li>State applications of diodes and transistors</li> </ol>   | 10    | 24    |
|         | Classification of material- conductors, semiconductors, insulators<br>Semiconductor types- intrinsic, extrinsic- P & N type<br>PN junction diode- unbiased, forward & reverse bias,<br>VI characteristics of diode, application- full wave rectifiers<br>Transistor- construction, types- PNP & NPN, working<br>Operating regions- active, cut off, saturation;<br>Application- amplifier, transistor as a switch<br>Op-amp- introduction, block diagram, 741 pin out,<br>Applications- inverting, non inverting & differential amplifier |       |       |
| 3.      | <b>Sensors, actuators and signal conditioning</b><br><b>Specific Objectives:</b><br>Student will be able to <ol style="list-style-type: none"> <li>Specify different types of sensors and actuators used in textile</li> <li>Describe working principle of specified sensor, actuator</li> </ol>  | 10    | 20    |
|         | Optical sensors- LDR, photodiode, phototransistor, LED, opto-coupler<br>Displacement sensor- LVDT, capacitive sensor- level measurement<br>Force & weight measurement- strain gauge, humidity sensors<br>Temperature sensors- RTD, thermister, thermocouple<br>Pressure sensor- bourdon tubes, bellows<br>Actuators- relays, contactors, solenoids, electric & pneumatic<br>Signal conditioning- principle, need of bridges, data converters  |       |       |
| 4.      | <b>Control systems</b><br><b>Specific Objectives:</b><br>Student will be able to <ol style="list-style-type: none"> <li>Classify different types of control system</li> </ol>   | 04    | 10    |
|         | Introduction, open loop & closed loop control system<br>Automatic textile control system<br>Combined loop control system  |       |       |
| 5.      | <b>Digital Electronics, Microcontroller and PLC</b><br><b>Specific Objectives:</b><br>Student will be able to <ol style="list-style-type: none"> <li>Differentiate between digital and analog electronics</li> </ol>  | 12    | 24    |

|              |  |           |            |
|--------------|--|-----------|------------|
|              | 2. Explain function of various digital gates and circuits<br>3. Convert decimal number to binary number and vice versa<br>4. Explain use of microcontroller and PLC  |           |            |
|              | Difference between analog and digital electronics<br>Binary number system, digital gates, flip flops- RS, D & JK<br>Counter – asynchronous up and down counter<br>Memory- ROM & RAM (in brief, only basic concepts)<br>Introduction to microcontroller, features of 8051<br>Architecture of 8051 [programming, instruction set not included]<br>Programmable Logic Controller- introduction, block diagram |           |            |
| 6.           | <b>Applications</b><br><b>Specific Objectives:</b><br>Student will be able to<br>1. Explain applications of various types of electronic sensors and devices in textiles  | 06        | 12         |
|              | Applications- blow room, card autoleveller, yarn evenness tester, Tensile testing, sizing, automatic weft straightening  |           |            |
| <b>Total</b> |  | <b>48</b> | <b>100</b> |

**Practical:****Skills to be developed****Intellectual skills**

1. Interpret Circuit diagrams.
2. Follow standard test procedures.

**Motor skills**

1. Measure different parameters accurately.

**List of Practical:**

1. Draw VI characteristics of forward & reverse bias of diode.
2. Draw input and output voltage waveforms of full wave rectifier.
3. Determine voltage gain of inverting and non inverting amplifier using op-amp.
4. Measure temperature using RTD/ thermister.
5. Measure weight using strain gauge.
6. Draw LDR characteristics.
7. Measure displacement using LVDT.
8. Verify truth tables of basic gates.
9. Verify truth tables of RS, D, JK flip flop.

**References:****Books:**

| Sr. No. | Author   | Title   | Publication                   |
|---------|--|---|-------------------------------|
| 1.      | R. S. Sedha  | A Text Book of Applied Electronics                      | S. Chand & Company            |
| 2.      | Madhuri Joshi  | Electronic Components                                   | A. H. Wheeler Publication     |
| 3.      | A. K. Sawhney  | Electrical & Electronics measurements & instrumentation | Dhanpat Rai Publications      |
| 4.      | Dr. S. D. Bhide,<br>S. Satyanarayan,<br>N. A. Jalgaonkar | Feed Back Control System                                | Technova Publication,<br>Pune |

|    |                             |   |                                 |
|----|-----------------------------|---|---------------------------------|
| 5. | Ramakant Gaikwad            | Op-amp & Linear Integrated Circuits     | Pearson Publication             |
| 6. | R. P. Jain                  | Modern Digital Electronics              | Tata McGraw Hill                |
| 7. | Kenneth Ayala               | The 8051 Microcontroller                | Cengage Learning, India Edition |
| 8. | Mitsubishi, Messung Company | PLC Hardware/Instruction Manual         | Mitsubishi, Messung Company     |
| 9. | Hiren Joshi,<br>Gauri Joshi | Electronic controls in textile machines | NCUTE training program          |

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fifth**

**Subject Title : Technology of Dyeing-II**

**Subject Code : 17564**

**Teaching and Examination Scheme:**

| Teaching Scheme |    |    | Examination Scheme |     |     |    |     |       |
|-----------------|----|----|--------------------|-----|-----|----|-----|-------|
| TH              | TU | PR | PAPER<br>HRS       | TH  | PR  | OR | TW  | TOTAL |
| 03              | -- | 03 | 03                 | 100 | 50# | -- | 25@ | 175   |

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

The chemical processing of textiles is a value addition process by way of enhancing their aesthetic properties through dyeing and printing. In the second year of this course the students are taught about the preparatory processes before dyeing and printing on most common machines used in Indian Textile Industry.

In past few years many developments has been taken place in this area and new techniques with ultra modern machines have been introduced. Use of such machines becomes advisable for better quality and high production accompanied by other benefits like lower consumption of auxiliaries, water, and power etc. some of the machines impart special effects to the textiles.

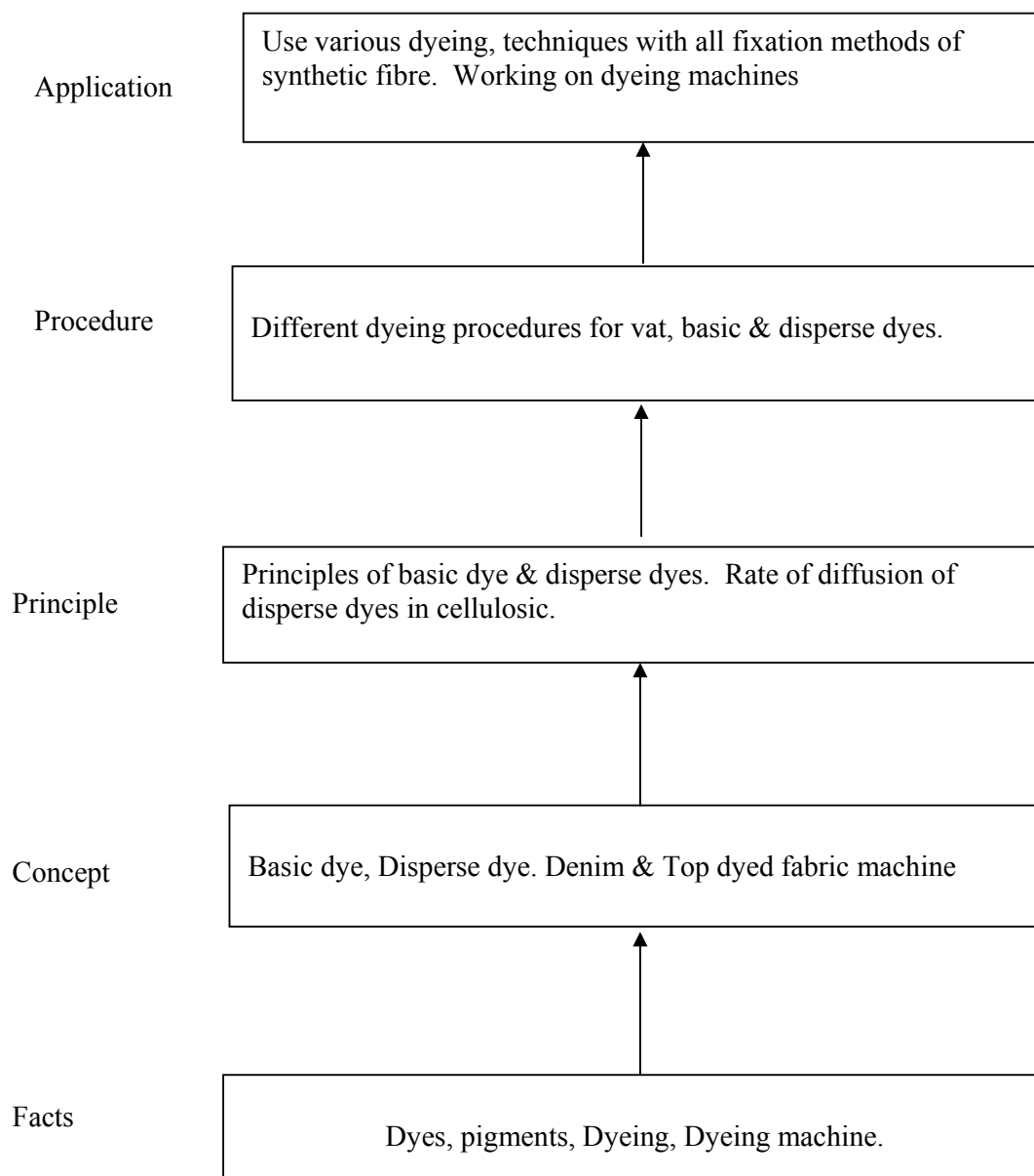
Moreover, due to advent of synthetic fibres, many techniques have been developed to treat the textiles made from synthetic fibres. The knowledge of this and the modern machines is very essential for the chemical processing technologist. This subject intends to impart the knowledge and skills in above-mentioned areas of the chemical processing of textiles.

**General Objectives:**

**The students will be able to:**

- Understand basic concepts of dyeing of synthetic fibres
- Know application methods of dyeing of synthetic fibres by various dyes.
- Understand process control and Quality control parameters.
- Understand dyeing methods of blended fabrics, denim, and various special fabrics.

**Learning Structure:**





**Contents: Theory**

| <b>Topic and Contents</b>  | <b>Hours</b> | <b>Marks</b> |
|--|--------------|--------------|
| <p><b>Topic 1: Dyeing of Polyester</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State properties of disperse dyes</li> <li>➤ Describe different dyeing methods of polyester</li> <li>➤ Identify faults and remedies in dyeing</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• Properties of disperse dyes,</li> <li>• Classification of disperse dyes,</li> <li>• Effect of pre-treatment's and heat setting on dyeing behaviour of polyester.</li> <li>• Auxiliaries used in polyester dyeing,</li> <li>• Dyeing Methods – <ul style="list-style-type: none"> <li>➤ Carrier method,</li> <li>➤ High Temperature High Pressure dyeing method,</li> <li>➤ Thermosol dyeing method,</li> <li>➤ Mass colouration of polyester.</li> </ul> </li> <li>• Dyeing of texturised &amp; micro denier PET.</li> <li>• Concept of rapid dyeing techniques.</li> <li>• Faults in dyeing and their corrections.</li> </ul> | 12           | 22           |
| <p><b>Topic 2: Dyeing of Acrylic</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe different dyeing methods of Acrylic</li> <li>➤ Identify faults and remedies in dyeing</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• Mechanism of dyeing,</li> <li>• Retarders used in acrylic dyeing</li> <li>• Dyeing procedure</li> <li>• Effect of temperature, compatibility value, saturation value, saturation limit, Saturation factor</li> <li>• Carrier dyeing</li> <li>• Dyeing method for acrylic yarns</li> <li>• Stripping of cationic dyes</li> <li>• Dyeing with disperse dyes</li> <li>• Fastness properties</li> </ul>   | 08           | 16           |
| <p><b>Topic 3: Dyeing of Nylon</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe different dyeing methods of Nylon</li> <li>➤ Identify faults and remedies in dyeing</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• Selection of dyes, levelling agents, swelling agents.</li> <li>• High and low temperature dyeing of nylon.</li> <li>• Dyeing with acid, disperse and reactive dyes,</li> <li>• Faults and remedies in nylon dyeing.</li> </ul>  | 07           | 14           |
| <p><b>Topic 4: Dyeing of Blended Fabrics</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe different dyeing methods of blended fabric</li> <li>➤ Identify faults and remedies in dyeing</li> </ul>  | 10           | 20           |

|   |           |            |
|---|-----------|------------|
| <b>Contents:</b> <ul style="list-style-type: none"> <li>• Dyeing of polyester/Cotton,</li> <li>• Dyeing of polyester/Viscose,</li> <li>• Dyeing of polyester/wool,</li> <li>• Dyeing of polyester/acrylic,</li> <li>• Dyeing of Acrylic/nylon, Acrylic/wool ,</li> <li>• Dyeing of Nylon/Cotton, Nylon/Wool</li> </ul>  |           |            |
| <b>Topic 5: Introduction to Yarn Dyeing</b><br>Specific Objectives: Students will be able to <ul style="list-style-type: none"> <li>➤ Describe yarn dyeing methods</li> <li>➤ Identify faults and remedies in dyeing</li> </ul> <b>Contents:</b> <ul style="list-style-type: none"> <li>• Yarn dyeing – hank form, package form,</li> <li>• Soft winding – winding angle, package density</li> <li>• Advantages and limitations of dyeing methods</li> <li>• Faults and remedies in yarn dyeing</li> </ul>                          | 05        | 10         |
| <b>Topic 6: Dyeing Machinery</b><br>Specific Objectives: Students will be able to <ul style="list-style-type: none"> <li>➤ Describe construction and working of various dyeing machines</li> <li>➤ State advantages and disadvantages of different dyeing machine</li> </ul> <b>Contents:</b> <ul style="list-style-type: none"> <li>• Package Dyeing machine:</li> <li>• H.T. H.P. beam dyeing machines,</li> <li>• Jet dyeing machine,</li> <li>• Soft flow dyeing machine.</li> <li>• Continuous dyeing ranges (CDR).</li> </ul> | 06        | 18         |
| <b>Total</b>  | <b>48</b> | <b>100</b> |

**Practical:****Skills to be developed:****Intellectual Skills:**

- 1) Calculate quantities of chemicals and auxiliaries
- 2) Select chemicals

**Motor Skills:**

- 1) Programming of dyeing machine
- 2) Operation of dyeing machines
- 3) Observe quality of dyed substrate

**List of Practicals: (Any ten)**

- 1) Dyeing of polyester by carrier dyeing method.
- 2) Dyeing of polyester by H.T.H.P. dyeing method
- 3) Dyeing of texturized polyester by thermosol dyeing method
- 4) Production of compound shades using disperse dye.
- 5) Dyeing of acrylic with Basic, Cationic and disperse dyes.
- 6) Computer colour matching. Preparation of at least 3 formulations for polyester, polyester / Cotton and polyester /Viscose

- 7) Dyeing of Nylon with acid, metal complex and disperse dyes.
- 8) Dyeing of polyester/ cotton blends with various dyes. Any one
- 9) Dyeing of polyester/ wool blends with various classes of dyes. Any one
- 10) Dyeing of polyester/ acrylic blends with various classes of dyes. Any one
- 11) Cross dyeing of polyester / cotton blends with various classes of dyes. Any one
- 12) Production of compound shades using azoic colours
- 13) Production of compound shade on polyester / cotton blends
- 14) Dyeing of polyester yarn in package form on H.T.H.P. package dyeing machine

**Learning Resources:****Books:**

| <b>Sr. No.</b> | <b>Author</b>                | <b>Title</b>   | <b>Publisher</b>                |
|----------------|------------------------------|--|---------------------------------|
| 1              | M. L. Gulrajni               | Dyeing of Polyester & Its Blends                     | I I T, Delhi Textile Department |
| 2              | K. V. Datye & A. A. Vaidya   | Chemical Processing of Synthetic and Their Blends    | Sevak Publication               |
| 3              | R. M. Mittal & S. S. Trivedi | Chemical Processing of Polyester / Cellulosic Blends | ATIRA, Ahmedabad                |
| 4              | Dr. V. A. Shenai             | Tech. of Dyeing                                      | Sevak Publication               |
| 5              | R. S. Bhagwat                | Handbook Of Textile Processing Machinery             | Colour Publication, Mumbai      |

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fifth**

**Subject Title : Technology of Printing-II**

**Subject Code : 17565**

**Teaching & Examination Scheme:**

| Teaching Scheme |    |    | Examination Scheme |     |     |    |     |       |
|-----------------|----|----|--------------------|-----|-----|----|-----|-------|
| TH              | TU | PR | PAPER<br>HRS.      | TH  | PR  | OR | TW  | TOTAL |
| 03              | -- | 03 | 03                 | 100 | 50# | -- | 25@ | 175   |

**NOTE:**

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**Rationale:**

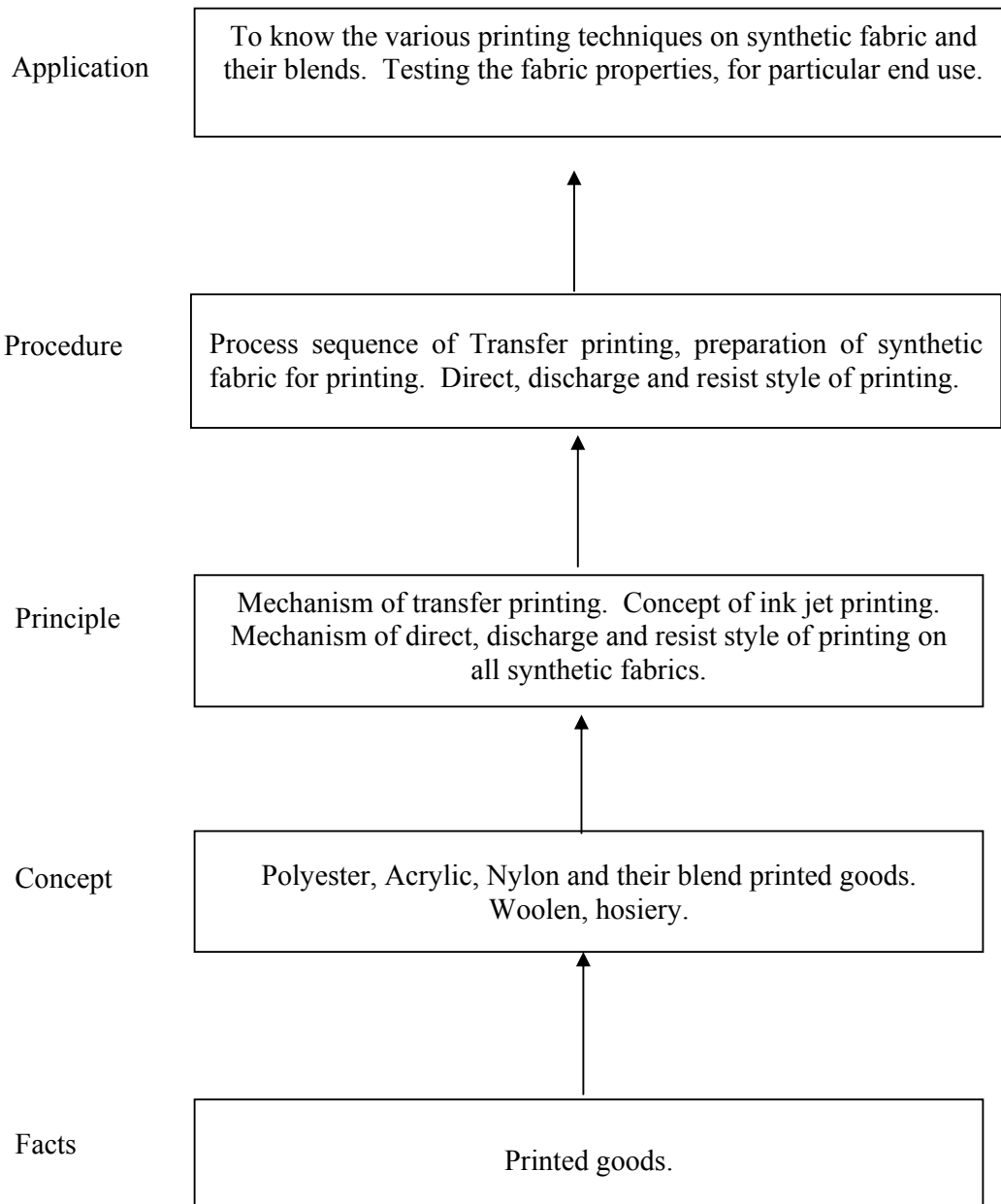
When the synthetic fibres came into existence, the existing cotton dyes, chemicals and finishing agents found no use for the processing of synthetics therefore, new dyes came into existence for dyeing and printing. Synthetic fibres being thermoplastic in nature, the conventional methods of printing sequence fail to provide serviceability to the customer. The technological advancements introduced new techniques and chemicals. The students should be given through knowledge of the same. This subject intends to impart the modern knowledge of printing.

**General Objectives:**

**The students will be able to:**

1. Describe printing of synthetic fibres with different classes of dyes.
2. Understand get the knowledge of transfer printing.
3. Understand Know the recent developments in textile printing.

**Learning Structure:**



**Contents: Theory**

| <b>Topic and Contents</b>  | <b>Hours</b> | <b>Marks</b> |
|--|--------------|--------------|
| <p><b>Topic 1: Printing Of Polyester</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe various print fixation methods for polyester fabric</li> <li>➤ Describe discharge and resist printing on polyester</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Preparation of Polyester fabric for Printing</li> <li>• Study of Various thickeners for Printing on Polyester</li> <li>• Various print fixation methods and mechanism of print fixation</li> <li>• Selection criteria of dyes</li> <li>• Various discharging and resisting agents</li> <li>• Discharge and resist style of printing on Polyester</li> <li>• After treatments</li> </ul> | 14           | 30           |
| <p><b>Topic 2: Printing of Polyester and Their Blends</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe printing of P/C, P/W, P/acrylic blended fabric</li> <li>➤ Describe speciality prints –Brasso and pigments printing</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Printing of P/C blended fabrics with disperse / reactive, disperse/vat system.</li> <li>• Single dye application on blended fabric</li> <li>• Direct style of printing on Polyester/ wool , Polyester/ Acrylic blends</li> <li>• Printing of P/C blends with pigments, Selection criteria of binders</li> <li>• Brasso style of printing</li> </ul>                    | 08           | 18           |
| <p><b>Topic 3: Printing of acrylic</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe printing of acrylic fabric</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Direct, discharge style of printing on acrylic fabric, fixation methods and after treatments</li> <li>• Selection criteria of dyes</li> </ul>   | 04           | 08           |
| <p><b>Topic 4: Printing of Nylon</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe printing of Nylon fabric with different dyes</li> <li>➤ Describe discharge and resist printing on nylon</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Preparation of Nylon fabric for printing</li> <li>• Direct style of printing with acid, metal complex and disperse dyes</li> <li>• Discharge and resist style of printing on nylon, fixation methods and after treatments.</li> </ul>  | 06           | 12           |

|   |           |            |
|---|-----------|------------|
| <b>Topic 5: Transfer Printing</b><br><b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ State concept of transfer printing</li> <li>➤ Describe machineries for paper printing and fabric printing for transfer printing</li> </ul> <b>Contents:</b> <ul style="list-style-type: none"> <li>• Mechanism of transfer printing,</li> <li>• Methods of transfer printing, Process sequence, Advantages and disadvantages of transfer printing.</li> <li>• Selection criteria of paper , ink and disperse dyes for transfer printing</li> <li>• Machineries used for printing paper for transfer printing.</li> <li>• Machineries used for transfer printing.</li> </ul> | 10        | 18         |
| <b>Topic 6: Recent developments in Printing</b><br><b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ State concept of inkjet printing, carpet printing</li> <li>➤ Describe printing with natural dyes</li> </ul> <b>Contents:</b> <ul style="list-style-type: none"> <li>• Ink jet printing - concept , classification</li> <li>• Printing with Natural dyes - advantages and disadvantages. Faults, their prevention and correction</li> </ul>  | 06        | 14         |
| <b>Total</b>  | <b>48</b> | <b>100</b> |

**Practical:****Skills to be developed;****Intellectual skills:**

1. Selection of thickening paste.
2. Use of different styles of printing on synthetic fabric.

**Motor skill:**

1. Preparation of screen.
2. Preparation of printing paste.
3. Printing on fabric

**List of Experiments:**

1. Stock & reduction thickening in printing.
2. Direct style of printing on 100 % polyester using disperse dye.
3. Direct style of printing on 100 % polyester using Pigments.
4. Direct style of printing by using carrier.
5. Discharge style of printing of polyester by using various reducing agents.
6. Resist style of printing on polyester.
7. Printing of acrylic fabric by using disperse dyes.
8. Printing of nylon with acid dyes.
9. Printing of nylon with disperse dyes.
10. Printing of PET / COTTON blended fabrics by disperse/reactive dyes.
11. Brasso style of printing.

**Learning Resources:****Books:**

| <b>Sr. No.</b> | <b>Author</b>                 | <b>Title</b>   | <b>Edition</b>  | <b>Year of Publication</b> | <b>Address of Publisher</b>        |
|----------------|-------------------------------|--|-----------------|----------------------------|------------------------------------|
| 1              | Dr. K.V. Datye & A. A. Vaidya | Chemical Processing of Synthetic and its Blends      | 2 <sup>nd</sup> | 1984                       | A Wiley Inter Science Publication  |
| 2              | R. M. Mittal & S. S. Trivedi  | Chemical Processing of Polyester & Cellulosic Blends | 3 <sup>rd</sup> | 1984                       | ATIRA, Ahemadabad                  |
| 3              | L. W. C. Miles                | Textile Printing                                     | 2 <sup>nd</sup> | 1981                       | The Dyer Company Publication Trust |
| 4              | Dr. V. A. Shenai              | Technology. of Printing, Vol. IV                     | 3 <sup>rd</sup> | 1990                       | Sevak Publication                  |
| 5              | W. Clerke                     | An Introduction to Textile Printing                  | 3 <sup>rd</sup> | 1974                       | Newnes Butterworth                 |



**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fifth**

**Subject Title : Technology of Finishing-II**

**Subject Code : 17566**

**Teaching & Examination Scheme:**

| Teaching Scheme |    |    | Examination Scheme |     |    |     |     |       |
|-----------------|----|----|--------------------|-----|----|-----|-----|-------|
| TH              | TU | PR | PAPER<br>HRS.      | TH  | PR | OR  | TW  | TOTAL |
| 03              | -- | 03 | 03                 | 100 | -- | 25# | 25@ | 150   |

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

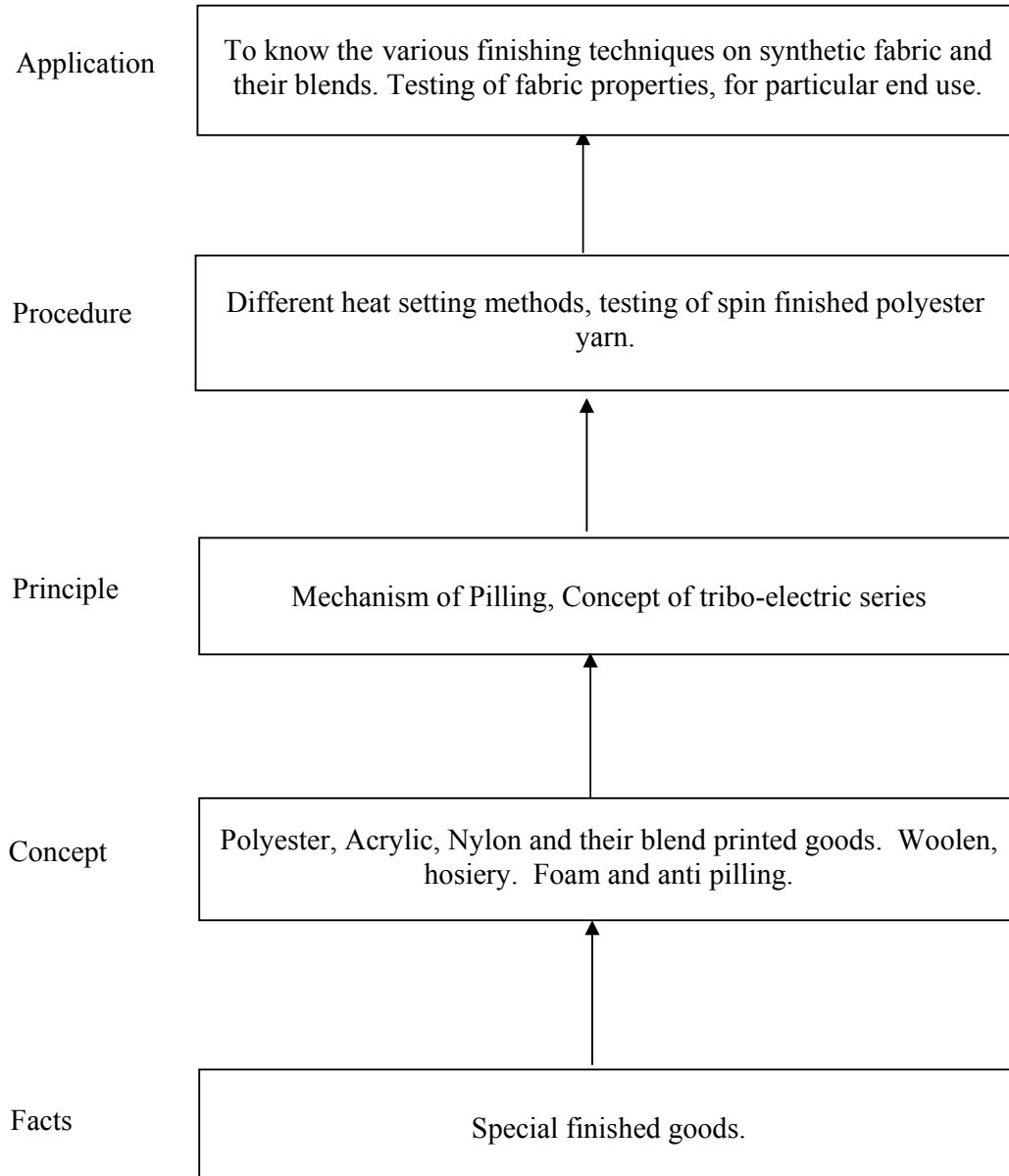
When the synthetic fibres came into existence, the existing cotton dyes, chemicals and finishing agents found no use for the processing of synthetics therefore, new dyes came into existence for dyeing and printing. Synthetic fibres being thermoplastic in nature, the conventional methods of printing sequence and finishing agents fail to provide serviceability to the customer. The technological advancements introduced new techniques and chemicals. The students should be given through knowledge of the same. This subject intends to impart the modern knowledge of printing and finishing.

**Objectives:**

The students will be able to:

1. Understand mechanical and chemical finishes.
2. Describe different finishes applied on textile fabric.
3. Understand recent finishes used for textiles.

**Learning Structure:**



## Contents: Theory

| Topic and Contents   | Hours | Marks |
|--|-------|-------|
| <p><b>Topic 1: Heat Setting</b><br/> <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State the importance and objects of Heat setting</li> <li>➤ Describe types of setting, Structural changes during the process</li> <li>➤ State process parameters, Method of evaluation.</li> </ul> <p><b>Contents :</b><br/> 1.1 Objects, Types of setting,<br/> 1.2 Mechanism of Heat setting,<br/> 1.3 Stages of Heat Setting,<br/> 1.4 Structural changes brought about by heat setting,<br/> 1.5 Heat setting conditions for 100% PET, Textured PET, P/C, P/V, P/W fabrics,<br/> 1.6 Evaluation of efficiency of heat setting by shrinkage method.</p> | 08    | 20    |
| <p><b>Topic 2: Anti-pilling</b><br/> <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State mechanism of pilling. Factors affecting pilling.</li> <li>➤ Describe methods to reduce pilling.</li> </ul> <p><b>Contents :</b><br/> 2.1 Definition of pill, Mechanism of pilling,<br/> 2.2 Factors affecting pilling.<br/> 2.3 Various physical &amp; chemical methods to minimize pilling.</p>   | 06    | 12    |
| <p><b>Topic 3: Foam Finishing</b><br/> <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State importance and advantages of foam finishing.</li> <li>➤ State factors affecting the process and methods of application.</li> </ul> <p><b>Contents :</b><br/> 3.1 Definition of foam &amp; blow ratio,<br/> 3.2 Properties of foam, stability of foam,<br/> 3.3 Factors affecting stability of foam,<br/> 3.4 Various methods of foam application.<br/> 3.5 Advantages &amp; disadvantages of foam finishing.</p>   | 10    | 20    |
| <p><b>Topic 4: Soil Release Finishes</b><br/> <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State the importance and Objects of soil release finish.</li> <li>➤ Describe chemistry of soil release finishes &amp; Method of evaluation.</li> </ul> <p><b>Contents:</b><br/> 4.1 Definition of soil, Types of soils, Mechanism of soiling,<br/> 4.2 Factors affecting soiling of fabrics,<br/> 4.3 Various types of Soil release finishing agents,<br/> 4.4 Evaluation of efficiency of soil release finishing.</p>  | 06    | 16    |
| <p><b>Topic 5: Finishing of special sorts</b><br/> <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State finishing sequence for special sorts.</li> <li>➤ State process parameters during finishing.</li> </ul> <p><b>Contents:</b><br/> 5.1 Finishing of woolen &amp; worsted fabrics<br/> 5.2 Finishing of knitted fabrics.<br/> 5.3 Finishing of micro denier Polyester fabrics.<br/> 5.4 Finishing of polyester for silk finish</p>   | 08    | 12    |

|   |           |            |
|---|-----------|------------|
| <b>Topic 6: Novel Finishes</b><br><b>Specific objectives:</b> <ul style="list-style-type: none"> <li>➤ Understand latest finishes used in the market.</li> <li>➤ Describe applications of nano technology in textile finishing.</li> </ul> <b>Contents:</b> <ul style="list-style-type: none"> <li>6.1 Concept of macro, micro and nano emulsion.</li> <li>6.2 Microencapsulation in textile finishing.</li> <li>6.3 Introduction to nano technology.</li> <li>6.4 Applications of nano technology in textile finishing.</li> </ul> | 10        | 20         |
| <b>Total</b>  | <b>48</b> | <b>100</b> |

**Practical:****Skills to be developed:****Intellectual Skills:**

- 1) Selection of various finishing ingredients.
- 2) Calculate quantities of finishing agents.
- 3) Interpret effect of different parameters.

**Motor Skill:**

- 1) Preparation of solutions.
- 2) Applying finishes by various techniques.
- 3) Carryout various tests.

**List of Practicals:**

- 1) Preparation and application of Blue Tone and Red Tone on Polyester and its blends.
- 2) Application & evaluation of various types of softeners on polyester and its blends.
- 3) Application of OBA on Polyester by continuous & exhaust method.
- 4) Heat setting of 100% Polyester fabric, its blends and it's evaluation using shrinkage method.
- 5) Weight reduction finishing for 100% Polyester fabric.
- 6) Soil release finishing of Polyester, its blends and evaluation.
- 7) Soft, Medium and Stiff finishing of Carbonized fabric.
- 8) Biopolishing (Enzyme wash) of knitted cotton fabric.
- 9) Stone wash effect on denim garments.
- 10) Stone less stone wash effect on cotton garments.

**Learning Resources:****Books:**

| <b>Sr. No.</b> | <b>Author</b>              | <b>Title</b>   | <b>Edition</b>  | <b>Year of Publication</b> | <b>Address of Publisher</b>            |
|----------------|----------------------------|--|-----------------|----------------------------|--|
| 1              | M.L. Gulrajani             | Silk Dyeing, Printing & Finishing                    | 2 <sup>nd</sup> | 1988                       | Dept. Of Textile Technology, IIT Delhi |
| 2              | K.V. Datye & A.A. Vaidya   | Chemical Processing of Synthetic And Its Blends      | 2 <sup>nd</sup> | 1984                       | A Wiley Interscience Publication       |
| 3              | V. A. Shenai               | Tech. of Finishing Vol. X                            | 3 <sup>rd</sup> | 1990                       | Sevak Publication                      |
| 4              | J.T. Marsh                 | Introduction To Textile Finishing                    | 2 <sup>nd</sup> | 1979                       | B.I. Publication                       |
| 5              | Marks, Atlas & Wooding     | Chemical after Treatments of Textiles.               | 4 <sup>th</sup> | 1971                       | Wiley Interscience                     |
| 6              | R.M. Mittal & S. S Trivedi | Chemical Processing of Polyester & Cellulosic Blends | 3 <sup>rd</sup> | 1984                       | ATIRA, Ahemadabad                      |

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fifth**

**Subject Title : Process & Quality Control in Wet Processing**

**Subject Code : 17567**

### Teaching and Examination Scheme

| Teaching Scheme |    |    | Examination Scheme |     |    |    |    |       |
|-----------------|----|----|--------------------|-----|----|----|----|-------|
| TH              | TU | PR | PAPER<br>HRS.      | TH  | PR | OR | TW | TOTAL |
| 03              | -- | -- | 03                 | 100 | -- | -- | -- | 100   |

#### NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW).**

#### Rationale:

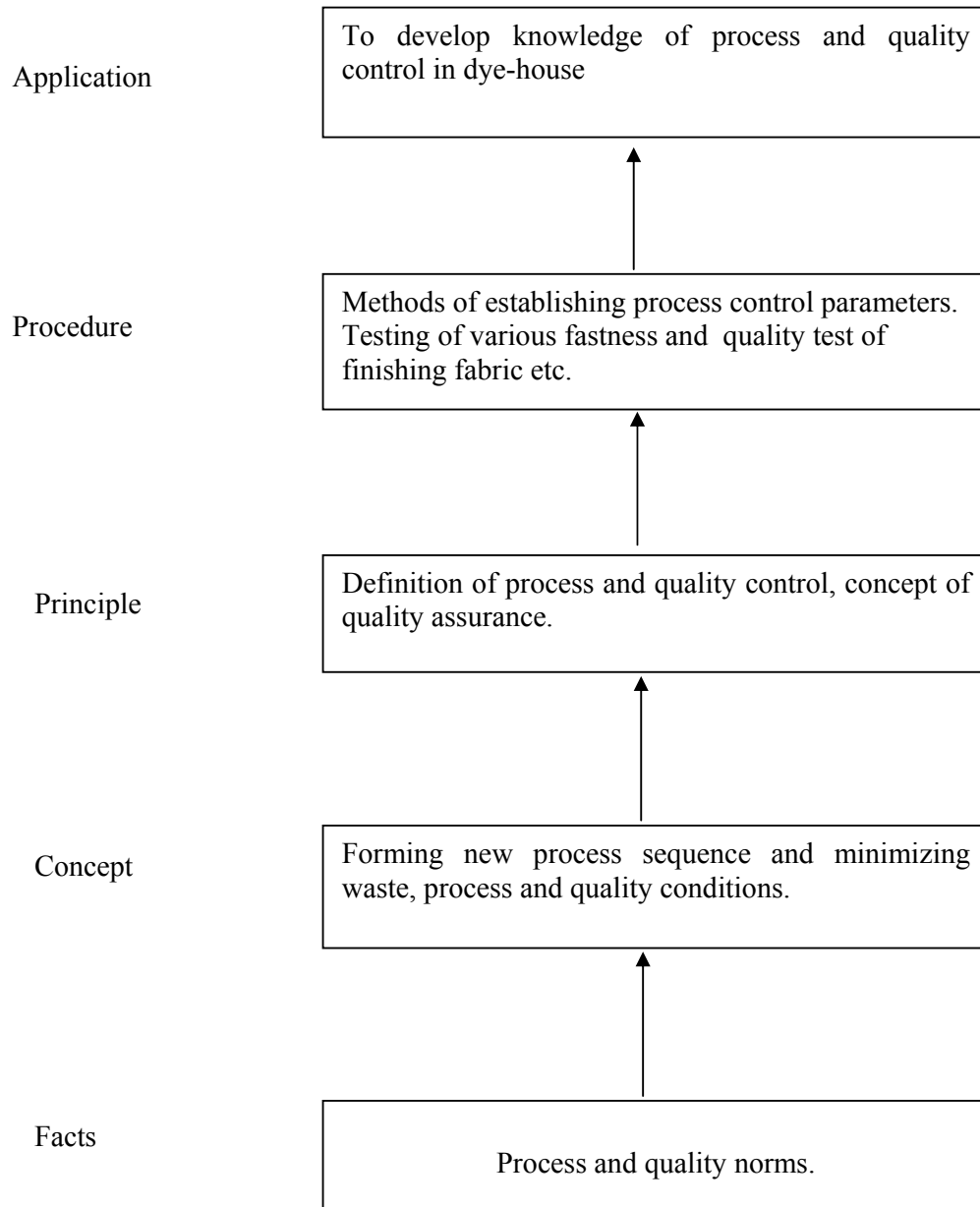
The chemical processing of textiles is a part of textile manufacturing process, which has various types of machines, which treat the fabric in stages to give desired properties or finishes suitable for particular use. During the processing for efficient working on a shop floor process control in every department is essential. The product of every department is also required to check for quality. These quality tests give assurance of quality to customer and manufacturer. Indirectly it helps to maintain efficiency of existing and next processing. The processing technologist should have knowledge of these aspects too.

#### General Objectives:

The students will be able to: -

1. Understand production norms for varies stages of processing
2. Describe process control in dye-house.
3. Understand quality control in dye-house.
4. State various quality and process control norms in dye-house.

**Learning Structure:**



**Theory:**

| <b>Topic and Contents</b>  | <b>Hours</b> | <b>Marks</b> |
|--|--------------|--------------|
| <p><b>Topic 1: Introduction of Process and Quality Control</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State object of process and quality control</li> <li>➤ Describe method of working quality department in industry.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Definition of process and quality control</li> <li>• Necessity of process control</li> <li>• Approach towards process control.</li> <li>• Definition of quality</li> <li>• Importance of quality assurance.</li> <li>• Structure and functions of quality assurance department.</li> </ul>  | 06           | 12           |
| <p><b>Topic 2: Process Control in Bleaching</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State different process control parameters in bleaching department.</li> <li>➤ Identify different practical problems and solutions</li> <li>➤ Describe production norms of each process.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Process control parameters in singeing, desizing.</li> <li>• Process control parameters in scouring, bleaching and mercerization continuous bleaching range.</li> <li>• Problem and remedies in pretreatments.</li> <li>• Norms and check points of above parameters.</li> </ul>                                | 07           | 14           |
| <p><b>Topics 3: Process Control in Dyeing</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand and use different process controls in dyeing machines</li> <li>➤ Apply effective production control in dyeing.</li> <li>➤ State production norms of each dyeing process.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Process control parameters for jiggers, padding mangles, jet</li> <li>• Dyeing m/c., package dyeing m/cs., soft flow dyeing m/cs. And continuous dyeing range.</li> <li>• Lab to bulk recipe formulation</li> <li>• Measures to achieve RIGHT FIRST TIME dyeing.</li> <li>• Problem and remedies in dyeing.</li> </ul> | 05           | 12           |
| <p><b>Topics 4: Process Control in Printing</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>• State different process controls in printing machines.</li> <li>• Describe effective production control in printing.</li> <li>• State production norms of each printing process.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Process control parameters for Flat bed screen printing m/c, Rotary screen printing m/c.</li> <li>• Problem and remedies in printing.</li> </ul>  | 06           | 12           |
| <p><b>Topics 5: Process Control in Finishing</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State different process controls in finishing machines.</li> </ul>  | 06           | 14           |



|   |           |            |
|---|-----------|------------|
| <ul style="list-style-type: none"> <li>➤ Describe effective production control in finishing.</li> <li>➤ State production norms of each finishing process</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Process control parameter for stenters, sanforising, calenders, drying range.</li> <li>• Problem and remedies in finishing.</li> </ul>   |           |            |
| <p><b>Topics 6: Quality Control in Pretreatment</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe various testing methods in pre-treatment for quality.</li> <li>➤ State existing quality norms for each stage of processing.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Various Testing methods like : Whiteness, Ash content, Barium activity number, Axial Ratio, Carboxyl group content, Copper number, Weight loss, Fluidity</li> <li>• Norms for the above test.</li> </ul> | 06        | 12         |
| <p><b>Topics 7: Quality Control in Dyeing and Printing</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe various testing methods in dyeing and printing for quality.</li> <li>➤ State existing quality norms in dyeing and printing.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Various testing methods like: Light, Washing, Rubbing, Sublimation, Perspiration</li> <li>• Norms for the above test.</li> </ul>  | 06        | 12         |
| <p><b>Topics 8: Quality Control in Finishing</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe various testing methods in finishing for quality.</li> <li>➤ State existing quality norms for finishing.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Various testing methods like – <ul style="list-style-type: none"> <li>- Iodine absorption.</li> <li>- Crease recovery angle</li> <li>- Bending length</li> </ul> </li> <li>• Norms for the above test.</li> </ul>              | 06        | 12         |
| <b>Total</b>  | <b>48</b> | <b>100</b> |

**Learning Resources:****Books:**

| Sr. No | Author                    | Title                                   | Publisher                           |
|--------|---------------------------|---|-------------------------------------|
| 01     | Dr. V. K. Kothari         | Testing and Quality Management-Vol I    | IAFL Publication, New Delhi.        |
| 02     | ATIRA                     | Norms for the textile industry Part-III | ATIRA, Ahmedabad                    |
| 03     | ATIRA, BTRA, SITRA, NITRA | Norms in Textile Industry               | ATIRA, BTRA, SITRA, NITRA           |
| 04     | Lawrence S.               | Industrial quality                      | St. Lucie Press, Washington D. C.   |
| 05     | James Park and John Shore | Dyes House Management Manual            | Multi-tech publishing co. Mumbai-77 |

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fifth**

**Subject Title : Computer Aided Textile Design & Colour**

**Subject Code : 17077**

**Teaching and Examination Scheme:**

| Teaching Scheme |    |    | Examination Scheme |    |    |    |     |       |
|-----------------|----|----|--------------------|----|----|----|-----|-------|
| TH              | TU | PR | PAPER<br>HRS.      | TH | PR | OR | TW  | TOTAL |
| --              | -- | 02 | --                 | -- | -- | -- | 25@ | 25    |

**Rationale**

A Microsoft windows based CAD system or any of its equivalent system for textile design helps manufactures and designers to deliver superior fashion products in a more timely and efficient manner to the market. The software has been devised as a natural extension of a designer's designs process.

The working of the systems have been designed as natural extensions of the manual designing processes. A user is not expected to know much about computers, but knowledge of textile design techniques is beneficial. Through strong development and regular information with its large and prestigious customer base, the products are upgraded to the latest trends in Textile and Computer technology.

**General Objectives:**

**The students will be able to:**

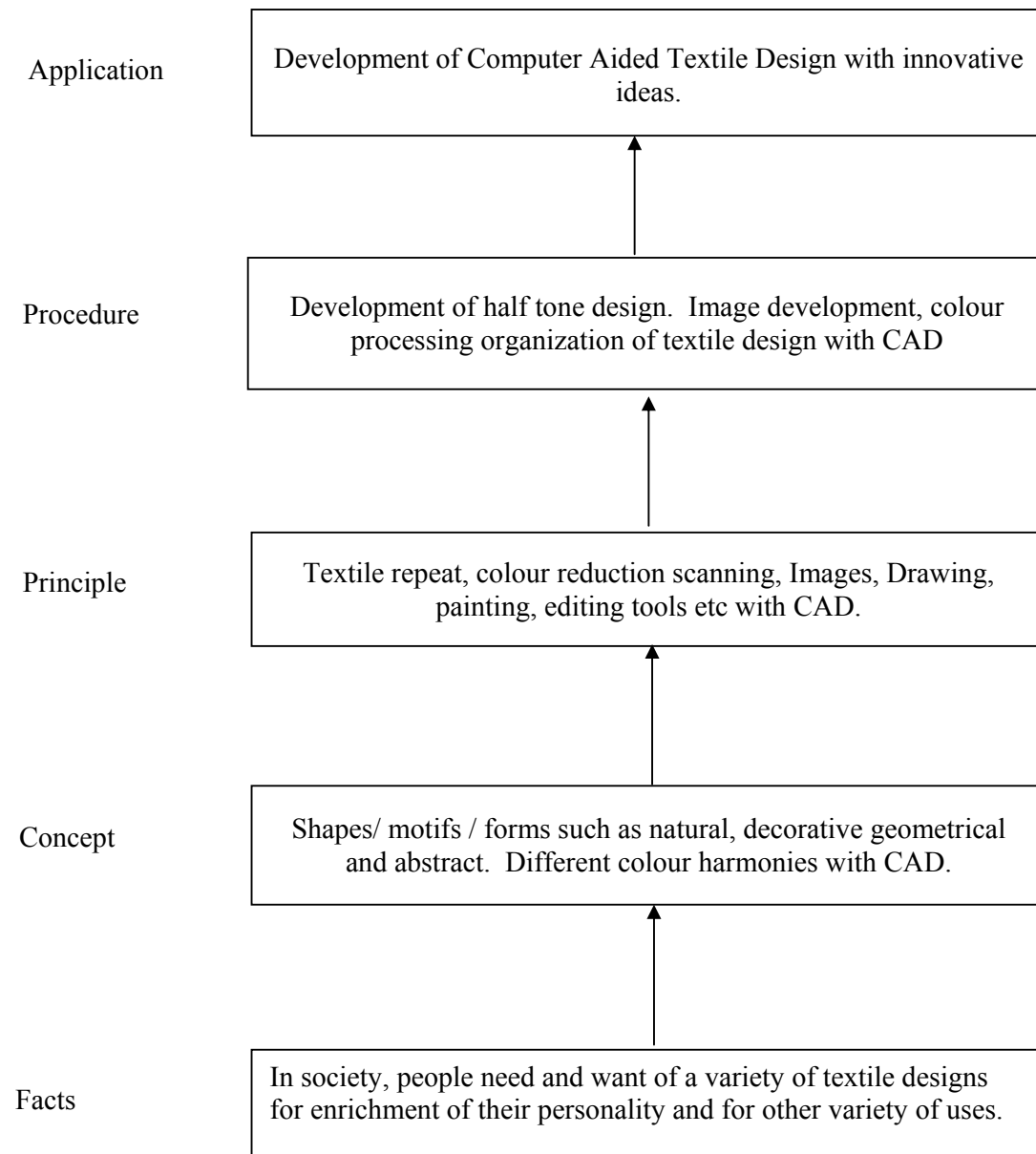
**Intellectual Skill:**

- 1) Create textile design with CAD software.
- 2) Use different motif /colour patterns as per need and end use of textile design.

**Motor Skill:**

- 1) Operate computer
- 2) Efficiently use the CAD software to develop appropriate designs as per requirement of customers

**Learning Structure:**



**Contents – Theory** (To be taught during practical hours)

| <b>Topic and Contents</b>                          |
|--|
| 01. Textile Repeat                                 |
| 02. Colour Reduction                               |
| 03. Scanning                                       |
| 04. Scanned Images                                 |
| 05. Drawing, Painting and Editing tools            |
| 06. Colour management and auto-colour ways wizard. |
| 07. Colour separation and plotting                 |
| 08. Auto plotting                                  |
| 09. Draping and Texture mapping                    |

**List of Experiments:-**

- 1) Development of motifs - natural
- 2) Development of motifs - Geometrical
- 3) Development of motifs - Decorative
- 4) Development of motifs - Abstract
- 5) Development of shirting design - Stripes
- 6) Development of shirting design - Checks
- 7) Development of ladies dress - material design.
- 8) Development of textile design with square rectangle base.
- 9) Development of textile design with half drop base.
- 10) Development of textile design with diamond base.
- 11) Development of textile design with ogee base.
- 12) Development of textile design with satin base.

**Learning Resources:****Books:**

| <b>Sr. No.</b> | <b>Author</b> | <b>Title</b>  | <b>Publisher</b>         |
|----------------|---------------|---|--------------------------|
| 01             | Shah & Gandhi | Instrumental colour measurement and computer aided colour matching for textiles | Mahajan Books, Ahmedabad |
| 02             | Watson W.     | Textile design and colour   | Longmans Greens & co.,   |
| 03             | Quin Bradly   | Textile designer at the cutting edge  | Quin bradly, London      |
| 04             | Gawand K. D.  | Colour matching   | --                       |

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fifth**

**Subject Title : Professional Practices-III**

**Subject Code : 17070**

**Teaching and Examination Scheme:**

| Teaching Scheme |    |    | Examination Scheme |    |    |    |     |       |
|-----------------|----|----|--------------------|----|----|----|-----|-------|
| TH              | TU | PR | PAPER<br>HRS.      | TH | PR | OR | TW  | TOTAL |
| --              | -- | 03 | --                 | -- | -- | -- | 50@ | 50    |

**Rationale:**

Most of the diploma holders in industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

**Objectives:**

**Student will be able to:**

1. Acquire information from different sources
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

| Serial No. | Activities   |
|------------|--|
| 1          | <p><b>Industrial Visits</b></p> <p>Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. <b>(2 visits)</b></p> <p>Following are the suggested types of Industries/ Fields -</p> <ol style="list-style-type: none"> <li>i. Yarn Dyeing unit</li> <li>ii. Fabric Processing unit</li> <li>iii. Garment Processing unit</li> <li>iv. Effluent treatment plant</li> <li>v. Textile industry machinery &amp; equipment manufacturing</li> <li>vi. Hydro electric and Thermal power plants.</li> <li>vii. Textile Research Associations/Institutes</li> <li>viii. Modern Laundry unit</li> <li>ix. Knitted fabric processing Unit</li> </ol>  |
| 2          | <p><b>The Guest Lecture/s</b></p> <p>From field/industry experts, professionals to be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work</p> <ol style="list-style-type: none"> <li>i. Electronic controls in Textile machines/equipment</li> <li>ii. Environmental pollution &amp; control.</li> <li>iii. Automotive Textiles</li> <li>iv. Material Handling devices and machines.</li> <li>v. Biotechnology in Textiles</li> <li>vi. Nanotechnology in textiles</li> <li>vii. Robotics in Textiles</li> <li>viii. TQM</li> <li>ix. Advances in textile processing</li> <li>x. Automation in textile industry</li> <li>xi. Six sigma systems</li> <li>xii. Japanese management techniques</li> <li>xiii. Other related topics</li> <li>xiv. Blanket printing</li> </ol> |
| 3          | <p><b>Group Discussion :</b></p> <p>The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (any one)-</p> <ol style="list-style-type: none"> <li>i. Alternative fuels</li> <li>ii. Alternative energy sources</li> <li>iii. Trends in Textile market.</li> <li>iv. Load shading and remedial measures.</li> <li>v. Rain water harvesting.</li> <li>vi. Trends in Temperature control Technology.</li> <li>vii. Disaster management.</li> <li>viii. Safety in day to day life and in Textile industry.</li> <li>ix. Energy Saving in Textiles</li> <li>x. Nano technology.</li> <li>xi. Other related topics</li> </ol>  |
| 4          | <p><b>Seminar : (any 2 topics)</b></p> <p>Seminar topic should be related to the subjects of fifth semester / topics from guest</p>  |

|          |   |
|----------|---|
|          | lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes for a group of 2 students)  |
| <b>5</b> | <p><b>Mini Projects : (in a group of 4-5 students)</b></p> <ol style="list-style-type: none"> <li>Design / drawing of simple layout of a Textile Unit</li> <li>Optimisation of process control parameters</li> <li>Production of compound shades using primary colours</li> <li>Cost calculations in wet processing</li> <li>Layout design of SSI units / factory / workshop of the institute</li> <li>Models of material handling route systems used in textile industry</li> </ol>  |
| <b>6</b> | <p><b>Student Activities</b> – students in a group of 3 to 4 shall perform <b>ANY TWO</b> of the following activities (other similar activities may be considered) and write a report as a part of term work.</p> <p><b>Activities :-</b></p> <ol style="list-style-type: none"> <li>Collection of data regarding loan facilities or other facilities available through different organizations / banks to budding entrepreneurs</li> <li>Survey and interviews of successful entrepreneurs in near by areas</li> <li>Survey of opportunities available in thrust areas identified by Government or DIC.</li> <li>Survey of data regarding different types of testing machines /equipment with specifications from manufacturers catalogue, local markets, end users (any other engineering products may be considered for survey)</li> </ol> |

**Learning Resources:****Books:**

| <b>Sr. No.</b> | <b>Author</b>                 | <b>Title</b>                             | <b>Publisher</b>              |
|----------------|-------------------------------|--|-------------------------------|
| 01             | Mark Ratner and Daniel Ratner | Nanotechnology                           | Pearson Educatuion, New Delhi |
| 02             | Yoram Korem                   | Computer Control of Manufacturing System | Mcgraw Hill Publication       |
| 03             | Sunil Chopra, Peter Meindl    | Supply Chain Management                  | Pearson Educatuion, New Delhi |