

<b>Programme Name</b>	<b>Bachelor of Technology in Textile Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>TEXTILE FIBRE – II</b>	
<b>Course Code</b>	<b>PCC-TEX-202A</b>	
<b>Course Purpose</b>	<ul style="list-style-type: none"> <li>- To introduce basic chemistry of fibre forming polymers.</li> <li>- To study man-made fibre production and their properties.</li> </ul>	
<b>Course Outcomes</b>	<p>After completing this course, students will be able to:</p> <p>CO1 – Illustrate the fibre forming polymer chemistry</p> <p>CO2 – Understand the different spinning methods for the production of synthetic fibres viz., dry, wet and melt spinning techniques.</p> <p>CO3 – Explain principles of polymerisation and production methods for textile fibers viz. polyester, nylon, acrylic and polyolefin fibres</p> <p>CO4 – Understand the drawing and texturing process of synthetic fibres.</p>	
<b>Prerequisite</b>	Brief knowledge of basic polymer science and basic chemistry.	

**PCC-TEX-202A**  
**TEXTILE FIBRE – II**

**L T P**  
**3 1 -**

**Sessional: 25 Marks**  
**Exam: 75 Marks**  
**Total 100 Marks**  
**Time: 3 Hrs.**

**Note:**

*Question no. 1 is objective type fifteen subparts covering all the four units. Eight more questions will be set in the question paper i.e. two from each unit. The students will be required to attempt Question no. 1 compulsorily and one question from each unit.*

**UNIT-I**

**Introduction:** Basic concept of polymer, homopolymer, copolymer, thermoset, thermoplastic, elastomer, monomer, comonomers, oligomer, degree of polymerization, molecular weight and its practical significance, glass transition temperature, melting point, factors affecting  $T_g$ ,  $T_m$ , Criteria for fiber forming polymers.

Polymerization techniques w.r.t acrylic and polypropylene: bulk, solution, suspension, emulsion, gas phase polymerization, polymerization mechanism :( addition polymerization, condensation polymerization)

**UNIT-II**

Production of polyethylene terephthalate polymer, side reactions during PET synthesis, effect of DEG on polymer and fiber properties, methods to control DEF formation, advantages of TPA over DMT route.

**Melt Spinning:** polymer feed, melting device, extruder, static mixer, pre filtration, manifold, spin pack, spinneret parameters, quenching chambers parameters, take up & winding. High speed spinning and properties of polyester, Physical & chemical properties of polyester.

**UNIT-III**

**Nylon:** Nylon 6 polymer production, parameter in water catalyzed system in caprolactum polymerization,, effect of different parameters on polymerization of nylon 6, continuous polymerization in VK tube, Polymer production of nylon 6,6, fibre formation by melt spinning, Physical and chemical properties, application of nylon fiber.

**Acrylic:** Polymer production, fiber formation by wet and dry spinning, fiber formation and coagulation variables. Comparative study of wet and dry spinning process, dry jet wet spinning.

## UNIT-IV

**Polyolefin:** physical and chemical properties of polyethylene and polypropylene fibers, types of polypropylene fiber and their applications.

**Drawing & Texturing:** Drawing condition, phenomenon of necking, Continuous filament drawing machine, texturizing methods, draw texturing process, heat setting.

### **Suggested Text Books & References:**

- 1) Lewin M., "Handbook of Fiber Science and Technology (International Fiber Science and Technology)", CRC Press.
- 2) Gupta V B and Kothari V. K., "Manufactured Fiber Technology", Chapman & Hall, London, 1997.
- 3) McIntyre J. E., "Synthetic Fibres", 1<sup>st</sup> Edition, Wood Head Publishing.
- 4) Deopura B.L., Alagirusamy R., Joshi M., Gupta B., "Polyesters and Polyamides", Woodhead Publishing in Textiles, CRC, 2008.
- 5) Kothari V.K., "Textile Fibers: Developments and Innovations", IAFL Publication 2000.
- 6) Mishra S.P., "A text Book of Fiber Science and Technology", New Age International (P) Ltd.
- 7) Moorthy, S.H.V., "Introduction to Textile Fibers", Woodhead Textile Series, 2015.
- 8) Bernard P C., "Textile Fiber to Fabric", McGraw Hill Book Co.
- 9) Morton W.E & Hearle J.W.S., "Physical Properties of Textile Fibers", Textile Institute, U.K.
- 10) Kothari V.K., "Progress in Textiles: Science & Technology" Vol-2, IAFL Publication New Delhi.
- 11) Cook G., "Hand Book of Textile Fibers", Vol-1&2, Woodhead Publication.
- 12) Vaidya A.A., "Production of Synthetic Fibers" Prentice-Hall of India Pvt Limited.
- 13) Moncrieff R. W., "Manmade Fibres", Liffé Publication, The University of California, 1996.
- 14) Billmeyer F.W., "Textbook of Polymer Science", 3rd edition, Wiley-Blackwell, 1984.
- 15) Gowarikar V.R., Viswanathan N.V., Sreedhar J., "Polymer Science", Halsted Press New York, 1986.

<b>Programme Name</b>	<b>Bachelor of Technology in Textile Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>YARN MANUFACTURING-II</b>	
<b>Course Code</b>	<b>PCC-TEX-204A</b>	
<b>Purpose</b>	<ul style="list-style-type: none"> <li>- To study the principle involved in combing, speed frame and ring frame operation.</li> <li>- To study the function, working, construction and passage of materials through doubling machines.</li> </ul>	
<b>Course Outcomes</b>	<p>After completing this course, students will be able to:</p> <p>CO1 - Understand the combing process and comber settings</p> <p>CO2 - Illustrate the function of different components and working principle of speed frame, ring frame and doubling machines.</p> <p>CO3 - Interpret the mechanism of package formation and building motion in speed frame and ring frame.</p> <p>CO4 - Solve the numerical problems associated with comber, speed frame, ring frame and doubling machines.</p>	
<b>Prerequisite</b>	Fundamentals of yarn manufacturing process sequence.	

### **PCC-TEX-204A**

### **YARN MANUFACTURING-II**

**L T P**  
**3 1 -**

**Sessional: 25 Marks**  
**Exam: 75 Marks**  
**Total 100 Marks**  
**Time: 3 Hrs.**

**Note:**

*Question no. 1 is objective type fifteen subparts covering all the four units. Eight more questions will be set in the question paper i.e. two from each unit. The students will be required to attempt Question no. 1 compulsorily and one question from each unit.*

**UNIT-I**

**Combing**

Objective, Different combing preparatory process for lap preparation – Sliver lap, Ribbon lap and Unilap machine, Different types of comber, Combing cycle of rectilinear cotton comber, Timing diagram for combing operation, Configuration of fibre feed and its effect on quality of product, noil percentage and fractionation efficiency of comber, Influence of type of feed on noil extraction and cleanliness of sliver, Calculation pertaining to draft, production and noil percentage.

**UNIT-II**

**Speed frame**

Objective, Working principle of speed frame, Construction and working of important parts, Mechanism of drafting, twisting and winding, Basic principle of designing of cone drum, Differential motions & Building motions, Common defects in roving packages, their causes and remedies, Processing of man-made fibres on speed frame, Recent development in speed frame. Calculations pertaining to draft, TPI and production, twist multiplier and roving twist.

## **UNIT-III**

### **Ring frame**

Objective, Principle and mechanism involved in drafting, twisting and winding, Ordinary and high draft systems, Rising and falling lappets, balloon control rings, Design and types of spindle, ring and traveler, Concept of twist multiplier and yarn contraction due to twisting, types of builds, Mechanism of package formation, Causes and remedies to control end breaks, Recent developments in ring frame, Concept of average mill count and 20's conversion.

## **UNIT-IV**

### **Doubling**

Objective and terminology, Requirement of feed package for yarn plying, Systems of doubling (dry & wet) study of ring doublers, Two for one twister (TFO)- objective & working principle, Calculation of draft, TPI and production of ring frame & doubling frame.

### **Suggested Text Books and References:**

1. Klein, W., "Manual of Textile Technology: Vol. I. Technology of Short Staple Spinning", – Textile Institute, Manchester, 1998.
2. Klein, W., "Manual of Textile Technology: Vol. III. A practical Guide to Combing & Drawing", – Textile Institute, Manchester, 1995.
3. Klein, W., "Manual of Textile Technology: Vol. IV. A practical Guide to Ring Spinning", – Textile Institute, Manchester, 1995.
4. Klein, W., "Manual of Textile Technology: Vol. VI. Manmade Fibres and their Processing", – Textile Institute, Manchester, 1994.
5. Salhotra K R, "Spinning of Man Made Fibres and Blends on Cotton Spinning System", The Textile Association, Mumbai, 1989.
6. Salhotra, K.R., Alagirusamy, R. and Chattopadhyay R. (Eds.), "Course Material of Pilot Programme on Spinning: Ring Spinning, Doubling and Twisting", NCUTE Publication, 2000.
7. Chattopadhyay, R., and Rengasamy (Eds.), "Course Pilot Programme on Spinning: Drawing Combing and Roving", NCUTE Publication, 1999.
8. Oxtoby, E. "Spun Yarn Technology". Butterworths, London.
9. Khare A R, "Elements of Combing", Sai book center, Mumbai, 1999.
10. Khare A R "Elements of Ring Frame and Doubling", Sai book Centre, Mumbai, 1999.
11. Lawrence C A, "Fundamental of Spun Yarn Technology" CRC Press, USA, 2003.
12. Booth J E, "Textile Mathematics", Part II, Textile Institute, Manchester, 1978.
13. <https://nptel.ac.in/courses/116102038/> (31<sup>st</sup> May, 2019)

<b>Programme Name</b>	<b>Bachelor of Technology in Textiles Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>FABRIC MANUFACTURING – II</b>	
<b>Course Code</b>	<b>PCC-TEX-206A</b>	
<b>Purpose</b>	<ul style="list-style-type: none"> <li>- To study the secondary and auxiliary motions of weaving machines</li> <li>- To study various shedding devices in weaving operation</li> </ul>	
<b>Course Outcomes</b>	After completing this course, students will be able to: CO1 – Explain secondary and auxiliary motions of weaving machine CO2 – Elaborate the principle involved in shedding (dobby and jacquard) CO3 – Construct weave designs on dobbie and jacquard looms. CO4 – Calculate production and efficiency of weaving machinery.	
<b>Prerequisite</b>	Students must have completed course Fabric Manufacturing – I Brief knowledge of machine drawing and basic mathematics.	

### **PCC-TEX-206A**

### **FABRIC MANUFACTURING-II**

**L T P**

**3 1 -**

**Sessional: 25 Marks**

**Exam: 75 Marks**

**Total 100 Marks**

**Time: 3 Hrs.**

**Note:**

*Question no. 1 is objective type fifteen subparts covering all the four units. Eight more questions will be set in the question paper i.e. two from each unit. The students will be required to attempt Question no. 1 compulsorily and one question from each unit.*

#### **UNIT-I**

##### **Secondary motion**

**Take up motion:** Negative take up, positive take up, five wheel take up motion, seven wheel take up motion, electronic take up.

**Let Off Motion:** Objective, negative let off motion, positive let off motion- basic requirements, tension control mechanism, electrical let off motion, warp tension variation.

#### **UNIT-II**

**Auxiliary motion:** Objective, classification.

**Weft Stop motion:** objective, side weft fork motion, center weft fork motion.

**Warp Stop motion:** objective, mechanical warp stop motion, electrical warp stop motion.

**Warp Protecting motion:** objective, loose reed warp protecting motion, fast reed warp protecting motion, electromagnetic warp protecting motion.

Weft mixing motion, Multiple box motion, 4×1 drop box motion, preparation of pattern cards, pick at will motion.

#### **UNIT-III**

**Automatic looms:** basic features, advantages over plain looms, classification of automatic looms, weft feeling mechanism, mechanical weft feeler, electronic weft feeler, optical weft feeler, pirn changing mechanism, shuttle changing mechanism, bobbin loader mechanism.

**Dobby Shedding:** Main parts of dobbie loom, types of Dobby, negative dobbie, single, double lift single jack dobbie, double lift double jack dobbie, design and peg plan for dobbies, positive dobbie, electronic dobbie, types of shed formed in dobbie

## UNIT-IV

**Jacquard Shedding:** Principle parts of jacquard machine, types of jacquard, types of shed formed in jacquard, single lift single cylinder jacquard, double lift single cylinder jacquard, double lift double cylinder jacquard, harness building, harness ties, design ties, card cutting, card lacing

**Calculations:** Production, efficiency, Calculations related to weaving.

### Suggested Text Books & References

1. Marks and Robinson, "Principles of Weaving". Textile Institute, Manchester, 1986.
2. Thomas fox, "Mechanism of Weaving", Bombay Universal Publishing Co, 1993.
3. Lord and Mohamad, "Conversion of Yarn to Fabric", Merrow Publishing Co. Ltd, England, 1988.
4. Aswani, K. T., "Plain Weaving Mechanism", Mahajan Publishers, Ahmedabad, 1996.
5. Aswani, K.T., "Fancy Weaving Mechanism", Mahajan Publisher, Ahmedabad, 1990.
6. Sengupta, R., "Weaving Calculations", Taraporwala Sons, Bombay 1990.
7. Banerjee, N. N., "Weaving Mechanism Vol,-I & Vol .II", West Bengal, 1994.
8. Rai, Hasmukh, "Fabric Forming", S.S.M. Institute, Kuomarapalyam Tamil Nadu, 1996.
9. Talukdar, M. K., "Modern Weaving Technology", NICTAS, Ahmedabad, 1998.
10. Rapier Looms, WIRA Research & Technical Service Manual for industry.
11. Khatwani, P.A., "Weaving I Shuttle looms", NCUTE Publication, 1999.
12. Khatwani, P. A., "Weaving II Shuttleless Looms" NCUTE Publication, 1999.
13. Khatwani, P. A. "Filament Weaving", NCUTE Publication, 2000.

<b>Programme Name</b>	<b>Bachelor of Technology in Textile Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>Textile Chemical Processing– II</b>	
<b>Course Code</b>	<b>PCC-TEX-208A</b>	
<b>Purpose</b>	-To understand about the principles of dyeing, printing and finishing -Ecofriendly wet processing of textile materials.	
<b>Course Outcomes</b>	After completing this course students will able to: CO1: Understand various styles and methods of printing for textile materials. CO2: Explain the working principles of textile printing machines. CO3: Interpret the mechanisms of various chemical and mechanical finishes of textile materials. CO4: Understand latest developments in textile wet processing. CO5: Summarise pollution control measures in wet processing of textile materials. CO6. Identify of testing methods for colour fastness of textile materials.	
<b>Prerequisite</b>	Students must have completed course Textile Chemical Processing-I	

### PCC-TEX-208A

## TEXTILE CHEMICAL PROCESSING - II

**L T P**  
**3 1 -**

**Sessional: 25 marks**

**Exam: 75 marks**

**Total: 100 marks**

**Time: 3Hrs**

**Note:**

*Question no. 1 is objective type fifteen subparts covering all the four units. Eight more questions will be set in the question paper i.e. two from each unit. The students will be required to attempt Question no. 1 compulsorily and one question from each unit.*

### UNIT-1

**Printing:** Introduction to printing methods block, screen and roller printing. Advantages and disadvantages of each method. Various styles of printing like Direct, Discharge and Resist styles on natural, man-made and blended textiles. Ingredients of print paste with their details. Classification and mechanism of working of thickeners.

**Transfer Printing:** Types, mechanism of transfer printing and machineries.

**Pigment Printing:** Mechanism and recipe details of pigment printing.

### UNIT-II

#### **Finishing:**

**Mechanical Finishes:** Calendaring - its types, construction and function of various calendaring m/cs. Sanforizing - method, mechanism and machineries involved. Sueding /raising, Napping and Shearing finishes, Foam finishing technology.

**Chemical Finishes:** Problem of creasing, anti-crease finish on cotton. Drawback and advantages associated with use of various anti-crease chemicals. Water repellency and water repellent finishes on cotton. Evaluation of water repellency. Flame proofing and its evaluation. Softeners and their application. Silk Finishing: Weighting of silk and Scroop finish.

### UNIT-III

**Developments in preparatory and dyeing:** Continuous pre-treatment and Continuous dyeing. Mass coloration principle, technology and different methods, Tie and dye, Batik printing.

### UNIT-IV

Ecofriendly processing and Effluent generated from textile processing and its treatment.

**Fastness properties:** Light fastness, rubbing fastness, Sublimation fastness, Perspiration fastness, washing fastness properties evaluation.

#### **Suggested Text Books and References**

1. Shenai, V.A., "Technology of Textile Processing Vol. 2,3,4,6, and 10", Sevak Publisher, Bombay.
2. Koushik C.V and Jasico A. J., Chemical Processing of Textile, Preparatory Process and Dyeing, NCUTE.
3. R.S. Prayag, "Technology of Textile Printing", Shree J. Printers, 1999.
4. Marsh, J.T., "An Introduction to Textile Finishing", Chapman Publication, London, 1948.
5. Trotman, E.R. "Textile Technology and Dyeing of Textile Fibres". Griffin Publication, London, 1970.
6. Shenai, V.A. "Principle and Practice of Dyeing", Sevak Publisher, Bombay.
7. Datye, K.V. and Vaidya, A.A., "Chemical Processing of Synthetic Fibres and Blends", Wiley Publication, New York
8. Prayag, C.R., "Bleaching, Mercerising and Dyeing of Cotton", Dharwar, Karnataka, India, 1990.
9. Vankar, Padma, "Textile Effluents", NCUTE Publication, 2001.
10. Prayag R.S, "Textile Finishing", 1994.
11. V.A. Shenai, "Technology of Finishing", Sevak Publication, 1996.
12. V. A Shenai, "Technology of Printing", Sevak Publications, Mumbai, 1990.



<b>Programme Name</b>	<b>Bachelor of Technology in Textile Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>YARN MANUFACTURING-II LAB</b>	
<b>Course Code</b>	<b>PCC-TEX-210LA</b>	
<b>Purpose</b>	- To provide hands-on experience in working of comber, speed frame, ring frame and doubling machine.	
<b>Course Outcomes</b>	After completing this course, students will be able to: CO1 – Demonstrate working of the lap preparation machines. CO2 – Describe the passage of material through comber. CO3–Illustrate flow of material, building mechanism and differential motion in speed frame. CO4 – Explain the passage of material in ring frame and doubling machines.	
<b>Prerequisite</b>	Student must have knowledge of Yarn Manufacturing-I	

**PCC-TEX-210LA**

**YARN MANUFACTURING-II LAB**

**L T P**  
- - 2

**Practical/Viva 60 Marks**  
**Sessional: 40 Marks**  
**Total 100 Marks**  
**Time: 2 Hrs.**

**At least 7 experiments are to be performed by each student.**

**List of Experiments:**

**Combing**

1. To study the different methods of lap formation in combing preparatory.
2. To study the combing cycle of a rectilinear cotton comber.

**Speed frame**

3. To study the drafting, twisting and winding zone of speed frame.
4. To study the building motion in speed frame.
5. Calculation of break draft constant, draft constant and twist constant and production of speed frame.

**Ring frame**

6. To demonstrate the working principle of a ring-frame.
7. To study the different components of drafting system and twisting system.
8. Calculation pertaining to gearing, speed, constant, draft and production.

**Doubling**

9. To show the passage of yarn in doubling machine and demonstrate the working principle.

**Note:** The above experiment should be conducted and shall be decided on factors like:

- 1 Facilities installed at Institute
- 2 Accessibility to industry & nearby institute like IIT Delhi, NITRA Gaziabad, Textile Committee and NITRA Panipat.
- 3 Trend of technological developments in National & International perspective.

<b>Programme Name</b>	<b>Bachelor of Technology in Textile Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>FABRIC MANUFACTURING – II Lab</b>	
<b>Course Code</b>	<b>PCC-TEX-212LA</b>	
<b>Course Purpose</b>	- To provide practical knowledge on secondary and auxiliary motions of weaving machines - To get practical information about shedding devices i.e. dobby and jacquards	
<b>Course Outcomes</b>	After completing this course, students will be able to: CO1 – Explain the working of take up and let off motions CO2–Demonstrate the functioning of stop motions, protecting motions and pirn changing motions. CO3–Demonstrate the working of dobby and jacquards and construct designs on the same.	
<b>Prerequisite</b>	Knowledge of fundamentals of weaving.	

**PCC-TEX-212LA**  
**FABRIC MANUFACTURING-II LAB**

**L T P**  
- - 2

**Practical/Viva 60 Marks**  
**Sessional: 40 Marks**  
**Total 100 Marks**  
**Time: 3 Hrs.**

**At least 7 experiments are to be performed by each student.**

**List of Experiments:**

1. Study of take up motion.
2. Study of negative let-off system
3. Study of positive let-off system.
4. Study of Warp protection motion (both loose reed and fast reed).
5. Study of warp stop motion.
6. Study of weft stop motion.
7. Study of pirn changing mechanism.
8. Study of multiple box motion.
9. Study of dobby mechanism.
10. Study of jacquard mechanism.

**Note:** The above experiment should be conducted and shall be decided on factors like:

- a) Facilities installed at Institute
- b) Accessibility to industry & nearby institute like IIT Delhi, NITRA Gaziabad, Textile Committee and NITRA Panipat.
- c) Trend of technological developments in National & International perspective.

<b>Programme Name</b>	<b>Bachelor of Technology in Textile Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>FABRIC MANUFACTURING – II Lab</b>	
<b>Course Code</b>	<b>PCC-TEX-212LA</b>	
<b>Course Purpose</b>	- To provide practical knowledge on secondary and auxiliary motions of weaving machines - To get practical information about shedding devices i.e. dobby and jacquards	
<b>Course Outcomes</b>	After completing this course, students will be able to: CO1 – Explain the working of take up and let off motions CO2–Demonstrate the functioning of stop motions, protecting motions and pirn changing motions. CO3–Demonstrate the working of dobby and jacquards and construct designs on the same.	
<b>Prerequisite</b>	Knowledge of fundamentals of weaving.	

**PCC-TEX-212LA**

**FABRIC MANUFACTURING-II LAB**

**L T P**

- - 2

**Practical/Viva 60 Marks**

**Sessional: 40 Marks**

**Total 100 Marks**

**Time: 3 Hrs.**

**At least 7 experiments are to be performed by each student.**

**List of Experiments:**

1. Study of take up motion.
2. Study of negative let-off system
3. Study of positive let-off system.
4. Study of Warp protection motion (both loose reed and fast reed).
5. Study of warp stop motion.
6. Study of weft stop motion.
7. Study of pirn changing mechanism.
8. Study of multiple box motion.
9. Study of dobby mechanism.
10. Study of jacquard mechanism.

**Note:** The above experiment should be conducted and shall be decided on factors like:

- d) Facilities installed at Institute
- e) Accessibility to industry & nearby institute like IIT Delhi, NITRA Gaziabad, Textile Committee and NITRA Panipat.
- f) Trend of technological developments in National & International perspective.

<b>Programme Name</b>	<b>Bachelor of Technology in Textile Technology</b>	<b>Semester IV</b>
<b>Course Title</b>	<b>Textile Chemical Processing II Lab</b>	
<b>Course Code</b>	<b>PCC-TEX-214LA</b>	
<b>Purpose</b>	To make the students understand about practical methods involved in dyeing and printing.	
<b>Purpose</b>	After completing this course students will able to: CO1: Get hands on experience in dye affinity of vat and sulphur dyes for cotton fabric. CO2: Experiment with affinity of disperse dye for polyester fabric using HTHP machine. CO3: Demonstrate different styles and methods of printing. CO4: Analyse fastness tests on dyed and printed substrates.	
<b>Prerequisite</b>	Students should have knowledge of Textile Chemical Processing-I, Textile Chemical Processing-II and Textile Fibres	

### **PCC-TEX-214LA**

### **TEXTILE CHEMICAL PROCESSING-II LAB**

**L T P**  
- - 2

**Practical/Viva 60 Marks**  
**Sessional: 40 Marks**  
**Total 100 Marks**  
**Time: 3 Hrs.**

**At least 7 experiments are to be performed by each student.**

**List of Experiments:**

1. Conduct practical's on Conventional and latest machines (Preparatory / dyeing / Finishing).
2. Conduct practical's on Recent developed methods of dyeing using different type of dyes
  - (a) Natural
  - (b) Synthetic
  - (c) Blends
3. Dyeing of cotton yarn with vat, reactive and sulphur in a sample pot dyeing machine.
4. Dyeing of cotton fabric with vat, reactive and sulphur dyes in laboratory jigger machine.
5. Calibration of dyeing and recipe prediction with the help of CCM.
6. Study of fastness to washing and rubbing with the help of CCM.
7. Reproduction of shade with the aid of computer as well as visual methods.
8. Printing with kerosene and synthetic based thickeners. Evaluate the printing with qualitative and quantitative methods on different materials.
9. Conduct practical with transfer printing technique on different materials.
10. Quantitative analysis of different textile blends in fibre, yarn and fabric form.

**Note:** The above experiment should be conducted and shall be decided on factors like:

1. Facilities installed at Institute
2. Accessibility to industry & nearby institute like IIT Delhi, NITRA Ghaziabad, Textile Committee and NITRA Panipat.
3. Trend of technological developments in National & International perspective.