

**STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**  
**TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES**

<b>DISCIPLINE: TEXTILE ENGINEERING</b>						<b>SEMESTER: 3<sup>RD</sup></b>						
<b>SL NO</b>	<b>SUBJECT CODE</b>	<b>SUBJECT</b>	<b>PERIODS</b>			<b>EVALUATION SCHEME</b>						
			<b>L</b>	<b>T</b>	<b>P</b>	<b>INTERNAL EXAM</b>			<b>END SEM EXAM</b>	<b>TERM WORK</b>	<b>PRACTICAL EXAM</b>	<b>TOTAL MARKS</b>
						<b>TA</b>	<b>CT</b>	<b>Total</b>				
<b>THEORY</b>												
1.	MCT 321	ELEMENTARY MECHATRONICS ENGINEERING	4	-	-	10	20	30	70			100
2.	TXT 301	FIBRE SCIENCE	4	-	-	10	20	30	70			100
3.	TXT 302	YARN MANUFACTURE- I	4	-	-	10	20	30	70			100
4.	TXT 303	FABRIC MANUFACTURE-I	4	-	-	10	20	30	70			100
5.	TXT 304	TEXTILE CHEMICAL PROCESSING-I	4	-	-	10	20	30	70			100
<b>PRACTICAL/TERM WORK</b>												
1	TXP 301	YARN MANUFACTURE - I			4					25	25	50
2	TXP 302	FABRIC MANUFACTURE-I			4					25	25	50
3	TXP 303	TEXTILE CHEMICAL PROCESSING-I			4					25	25	50
4	MEP 321	WORKSHOP PRACTICE-II			4					25	25	50
5	TXP 304	FIBRE SCIENCE LAB			3					25	25	50
<b>GRAND TOTAL</b>			<b>20</b>		<b>19</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>350</b>	<b>125</b>	<b>125</b>	<b>750</b>

Total Contact hours per week: 39

Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assessment, CT- Class test

Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%

## Elementary Mechatronics Engineering

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	MCT 321	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

### Objective :

1. To understand the mechatronics concept.
2. To understand the mechatronics approach.
3. To understand the actuation systems.
4. To understand about the Valves.
5. To understand about the S.F & B.M of cantilever & simply supported beam with point loads & UDL.
6. To know about the machine & mechanism.
7. To understand about the open belt drive, brake, dynamometer, flywheel and Governor.
8. To understand about the properties of gas & steam.
9. To know about the function of boiler.
10. To study about the I.C. engine.
11. To know about the concept of refrigeration & air conditioning.

Sl. No	Topics	Topic wise distribution of periods
01	Module-I Mechatronics & it's elements	08
02	Module-II Actuator & Valves	09
03	Module-III Elementary Mechanical Engg	23
04	Module-IV Mineral & High performance fibre	20
TOTAL		60

### Module-I (Mechatronics & it's elements)

Definition , concept of mechatronics, Mechatronics system, Mechatronics in manufacturing the products, mechatronics in design, Mechatronics vs conventional.

Drive systems—Servomotor, Servo principle, Mechanical transmission System , Mechanism to convert rotary motion to linear motion, Torque transmitting elements.

Bearing, selection of Bearing antifriction bearing, Hydrostatic bearing hydrodynamic bearing.

### Module-II (Actuator & Valves)

Definition, classification & description of Actuator, types & description Valves, types & description of Cylinder.

### Module-III (Elementary Mechanical Engg )

Define shear force & bending moment ,Construct shear force & bending moment diagram of cantilevers, simple Supported beam with point load & UDL, Define machine, mechanism kinematics, Link, Kinematics, pair, kinematics chain, Illustrate 4-bar linkage, crank connecting rod, QRM, Understand the function of cam & follower. Determine the length of open belt drive, Determine the ratio of tensions & power transmitted by belt drive, Advantage of rope drive & belt drive, Working principle—brake & dynamometer Fly wheel & governor.

### Module-IV (Thermal Engg )

Define heat & work, Determine the work done by expansion & compression of gases.

Explain the properties of steam, sensible heat, Latent heat & dryness fraction, Use of steam table , Explain function of a boiler, Classify boilers (fire tube, water tube) & explain their working principle, Define & classify internal combustion engine, IHP, BHP & mechanical efficiency, Explain OTTO

cycle & diesel cycle, Explain two stroke, four stroke engine, Define refrigeration, air-conditioning & various applications, Explain vapour compression refrigeration system, Different types of refrigerant & properties ,Concept of air conditioning with reference to a room conditioner.

**LEARNING RESOURCES:**

1. A Text book of mechatronics – R.K.Rajput.
2. Mechatronics -- HMT
3. Pneumatics system & maintenance – Majumdar.
4. Hydraulic system – Majumdar.
5. Applied mechanics – R.S.Kurmi.
6. Theory of machine – R.S.khurmi.
7. Thermal Engineering –R.S.khurmi.
8. Thermal Engineering -- A.r.Basu

## FIBRE SCIENCE

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXT 301	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

**Objective :** A student of 3<sup>rd</sup> semester Textile Technology must acquire basic knowledge about the raw material of basic components before exploring deep into the Textile world. Without a sound knowledge of origin, growth, extraction, manufacturing process and properties of the basic material i.e. fibre, it will be like a blind without stick for him to explore different complex processes of textile materials. Though, the natural fibres are indispensable still the manufactured fibres have taken leading role in approval as well as Industrial Textiles.

Sl. No	Topics	Topic wise distribution of periods
01	Module-I Fundamental Concept	15
02	Module-II Natural fibre	20
03	Module-III Man-made fibre	20
04	Module-IV Mineral & High performance fibre	05
TOTAL		60

### Module-I ( Fundamental Concept )

Basic concept on Polymer and classification, Degree of polymerization, Brief idea on different polymerization methods, Features of fibre forming polymers, Concept of fibre, Classification of textile grade fibres, Concept of staple fibre and filament, State the essential & desirable properties of Textile grade fibre.

### Module-II ( Natural fibres )

Brief idea of extraction of fibres from their natural resources like- cotton, silk, jute etc.; Morphological structure of Cotton, silk, wool and Jute fibres; Physical, Chemical Properties of natural fibres like- Cotton, wool, Silk, jute, Flax etc. and end uses. ; Identification of natural fibres by physical & chemical processes.

### Module-III (Man-made fibre)

State the principles of Melt, Wet & Dry Spinning. ; Describe the manufacturing process & properties of Viscose rayon fibre from wood pulp, concept of high tenacity viscose rayon; Describe the manufacturing process of secondary & triacetate acetate rayon fibre. ; Describe manufacturing Process flow chart, Properties & end uses of – Nylon6, Nylon 6,6, Polyester, Acrylic & Mod-acrylic etc.

### Module-IV ( Mineral & High performance fibre)

Describe the properties and end uses of – poly propylene, Poly ethylene, Spandex, Carbon, Aramid fibres, Glass, PBI etc.

### Learning Resources:

1. Man-Made fibre by R.W.Moncrieff
2. Textile Fibre- V.A. Shenai
3. Fibre Science and Technology by S.P.Mishra.
5. Textbook of Polymer Science by F.W. Billmeyer.
7. Production of Man-made Fibres – A.Vaidya

## Yarn Manufacture- I

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXT 302	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

**Objective :** One of the major intermediate platform in the world of Textiles is the yarn stage. As proper grooming of a child delivers a better citizen. Similarly proper handling & processing of fibres yield a good yarn and ultimately a value added consumer product i.e. fabric. This paper being the first of its series deals with the preliminary concept of yarn manufacturing like- opening, cleaning & individualization.

Sl. No	Topics	Topic wise distribution of periods
01	Module-I Ginning	05
02	Module-II Mixing & Blending	10
03	Module-III Blow Room	20
04	Module-IV Carding	25
<b>TOTAL</b>		<b>60</b>

### Module-I ( Ginning )

State the purpose of ginning; Describe working principles of roller, Macarethy & Saw Gin, Baling.

### Module-II ( Mixing & Blending )

Objects of Mixing , general consideration for preparation of cotton mixing ,Methods of mixing and blending.

### Module-III (Blow Room)

Principal action in opening and cleaning. Study of various types of machinery arranged in the sequence of a single process Blowroom Line for the various type of mixing. Study of various openers & cleaners like Mixing bale opener, unifloc, blendomat, monocylinder, axiflow cleaner, uniclean, CVT, etc. Concept of measuring of opening and cleaning efficiency of different opener and cleaner. Method of dust extraction in Blow Room . Study of lap forming unit and chute feed mechanism and their comparison . Process parameters of Blow Room ,Waste control in Blow Room. Calculation relating to production and efficiency of machines. Maintenance schedules.

### Module-IV (Carding)

Objects of Carding. Constructional Features of Carding Machine. Principles of carding & stripping actions , Study of different parts and function of a Carding Machine. Settings and gauging of different parts of Carding Machine. Mechanical and Actual draft. . Study of card clothing :- metallic wire geometry of licker-in, cylinder, flat and doffer wire. Mechanics of fibre entanglement and fibre transfer during carding, Mechanics of neps and hook formation and its effect on yarn quality. Card waste –types and control. Calculation of production, speed, draft etc related to carding machine. Defects in card Sliver and their causes and remedies. Maintenance schedules. Study of the function of Auto leveller in Card.

#### Learning Resources:

- |                                                |                                |
|------------------------------------------------|--------------------------------|
| 1. Manual of Cotton Spinning (vol-ii,part-1)   | The Textile Institute,Manual.  |
| 1 Manual of Cotton Spinning (vol-iii)          | The Textile Institute, Manual. |
| 2 Manual of cotton spinning (vol-iv, part1&ii) | The Textile Institute, Manual. |
| 3 Cotton Spinning                              | W.S.Taggart.                   |
| 4 Cotton Spinning                              | Textile Association of India   |
| 5 Spun yarn Technology                         | V.Subramaniam.                 |
| 6 Cotton Spinning                              | E.R .Merill.                   |

## Fabric Manufacture-I

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXT 303	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

**Objective :** This paper enables 3<sup>rd</sup> semester students to develop concepts in preparatory to weaving. Also this paper partly prepares the technicians to upgrade their knowledge to cope –up with fast changing textile industries of India and abroad. On completion of this course ,students will be able to develop understanding of ;

- (a) Winding warping & sizing
- (b) Working of the machines
- (c) Functions of different parts.
- (d) Basic Mechanism of Loom (weaving)

Sl. No	Topics	Topic wise distribution of periods
01	Module-I Winding	20
02	Module-II Warping	10
03	Module-III Sizing & Drawing	20
04	Module-IV Basic Mechanism of Loom	10
TOTAL		60

### Module-I (Winding)

Objects of warp and weft winding, Different types of yarn packages ,Types of winding M/C (specially precession & non precession), Features of warp and weft winding machine(anti patterning device, knotters, splicers, electronic clearers, slub catchers, yarn tensioners, waxing, different types of traverse mechanisms)

Classification of yarn faults ,Package defects and their remedies ,Modern developments in winding machine ,Calculations related to winding(related to traverse ratio, winding angle, winding speed, yarn tensioner, production of machines.)

### Module-II (Warping )

Objects of warping,Types of warping machine (direct and sectional) , Explain passage of yarns through sectional & beam warping M/C, Features of high speed direct and sectional warper (types of creel, stop motions, tensioners etc.) , Package defects and their remedies ,Recent developments in warping machine , Calculations related to warping

### Module-III (Sizing & Drawing)

Objects of sizing, Sizing ingredients-- their properties and functions ,Preparation of size paste— formulation, cooking equipment and storing, slasher sizing machine – general description ,Different types of creel, Design of size box ,heating and temperature control, level control, immersion rollers and squeeze rollers, wet splitting

Application of size of cotton warp (types of sizing, factors governing pick up of size)

Drying equipments (cylinder drying, hot air drying, radiation drying, cooling of warp sheet, single end sizing).The head stock (dry splitting, beam pressing roller, measuring and marking motions) ,Tension on warp sheet and its control (factors governing tension, control of stretch) , Modern developments in sizing, Brief idea on drawing & denting.

### Module-IV (Basic Mechanism of Loom )

Explain passage of yarns through plain looms, Define and Describe Shedding, Classify & Explain Type of shedding devices and Type of Sheds, Describe tapper shedding ,Describe Picking and checking mechanism, Explain Beating up mechanism, State Timing and setting of shedding, picking and beating, Calculate different speeds.

**Learning Resources:**

- 1 Cotton yarn weaving -- Textile Association of India
- 2 Modern Preparation and weaving Machinery -- Ormerod.
- 3 Sizing, Material and weaving Machinery -- De Adgaonkar
- 4 Yarn preparation, vol I &II -- K.Sengupta.
- 5 Weaving Conversion of yarn to Fabric -- P.R Load & M.H Mo
- 6 Object of winding and warping -- Dr.tolukdar.
- 7 Weaving Mechanism (vol I & II) -- N.N Banerjee.

## Textile chemical Processing-I

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXT 304	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

**Objective :** Had there been all blinds, colours would have played little role in our life. As because most of are blessed with vision, so colour affect out life style to a large extent. Nobody will prefer to use a white grey fabric for long though these shades are symbols on peace & sacredness. More ever, in the ever changing modern world people require special functional finishes or performance or performances of their second skin i.e fabric. In this light, Textile chemical processing are to play a major role in achieving consumer satisfaction. This paper TCP-I will introduce the students the students to some preliminary processes required before proceeding to hard core processing. This paper will also enlight them regarding colouring of some fibers, yarns & made from natural sources.

Sl. No	Topics	Topic wise distribution of periods
01	Module-I Dry Processing	10
02	Module-II Desizing	05
03	Module-III Scouring	15
04	Module-IV Bleaching	15
05	Module-V Dyeing & Wet Processing M/C	15
TOTAL		60

### Module-I (Dry Processing)

Pre-cleaning, Mending, Stamping, stitching , Shearing and Cropping, Brief idea on Shearing and cropping M/c, Singeing, Different methods of singeing (Plate, Roller and Gas Singeing), drawbacks and advantages.

### Module-II (Desizing )

Object, types, method details and mechanism of removal of starch. Efficiency of desizing,

### Module-III (Scouring)

Objectives, mechanism of removal of impurities from cotton,wool etc, recipe and controlling parameters. Evaluation of scouring efficiency, Scouring of natural, man-made and blended textiles, Degumming of silk, Classification of Kier, Working mechanism of Industrial Kier, Brief idea on Souring .

### Module-IV (Bleaching)

Objectives of bleaching, classification of bleaching agents, hypochlorite, peroxide and chlorite bleaching. Field of application - Bleaching of cotton, silk, wool, and man-made blended textiles by suitable bleaching agents. Controlling parameters and mechanism, Principles and application of optical brightening and blueing agents.

### Module-V (Dyeing & Wet processing M/C)

Classify dyes used in textile industry, Compare between natural and synthetic dyes, Explain general properties of dyes (solubility, affinity , substantively Properties etc) State the basic principle of dyeing, Dyeing of textiles of natural fibres [ (Cotton by direct, reactive, vat, azoic & sulphur), (Silk and Wool by acid and basic dyes).

Working principles of Winch, Jet, Beam, Hank & Package Dyeing machine, Jigger, J-Box system etc.

### **Learning Resources:**

1. Textile Chemistry, Part-I & II : R.H. Peters, Elsevier
2. Chemical Technology of Scouring and Bleaching: E. R. Trotman, Griffin.
3. Technology of Bleaching and Mercerisation: V.A. Shenai, Sevak Publication,
4. Technology of Dyeing: V.A. Shenai , Sevak Publication.
5. Dyeing & Chemical Technology of Textile Fibres : E. R. Trotman,
6. Chemistry of Dyes and Principle of Dyeing : V.A. Shenai , Sevak Publication
7. The Dyeing of Synthetic Polymer and Acetate Fibres: Nunn D M, Dyers Company Publication Trust, London (1979).
8. Chemical Processing of polyester / cellulosic Blends: Mittal R M and Trivedi S S, Ahamedabad Textile Industries Research Association, Ahmedabad, India (1983).

### Yarn Manufacture – I (Lab.)

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXP 301	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	4 hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

1. To study the flow of materials through various organs of a Blow room line.
2. To study and sketch the working mechanism of various openers, cleaners, blenders and lap formation unit in a Blow-Room line.
3. To study and sketch the working mechanism of various operations of a card with respect to flow of material.
4. To study different settings of the card.
5. To study the gearing plan and calculation of draft constant, draft and Production constant of a Card.
6. Changing draft change pinions and production change gears.
7. Chute feed mechanism.

### Fabric Manufacture – I (Lab.)

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXP 302	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	4 hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

1. Passages of warp through different parts of none—auto high speed winding machine.
2. Step motion device, ribbon braker, tensioner and slub catcher and their Settings.
3. Passenger of warp in warping machine, creel and function of different Parts.
4. Step motion device, measuring motion, beam pressing device, mounting of warppers' beam and drive to the warppers, defects and remedies.
5. Passage of warp through different parts of the sizing machine, cut motion, beam defects and remedies.
6. Temperature and level controls, recipes, sizing defects and remedies.
7. Passage of warp through different parts of the loom.
8. Identification of loom parts.
9. Motor to different parts of the loom .
10. Tappet shedding process in a loom.
11. Over Pick and under pick motion in a loom, setting of picking tapper, factors affecting the picking force, detects in picking and their remedies.
12. Study the Beat up mechanism & sley eccentricity calculation.

### Textile chemical Processing-I (Lab.)

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXP 303	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	4 hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

1. Desizing of Cotton Yarn / Fabric.
2. Scouring of Cotton/ Jute / Synthetic Yarn / Fabric.
3. Bleaching of Cotton & jute yarn / Fabric with Bleaching powder / NaOCl
4. Bleaching of Cotton yarn / Fabric with Hydrogen Peroxide.
5. Mercerisation of Cotton yarn / fabric.
6. Degumming of Silk
7. Scouring and Bleaching of Wool.
8. Dyeing of cotton / Jute yarn/fabric by Direct, Reactive, Vat, Azoic and Sulphur Dyes.
9. Dyeing of Wool yarn / fabric with Acid.
10. Dyeing of Silk yarn / fabric with Acid dyes.

## Workshop practice-II

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	MEP 321	Semester	3 <sup>rd</sup>
Total Period:	60	Examination	4 hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

### MACHINE SHOP

1. Shop talks on different types of machine tools, their functions, different tools used and general safety precaution to be observed.
2. Study a centre lathe.
3. Operate a center lathe on a cylindrical of and perform following Operations turning, taper turning, facing, parting.
4. Operate a drill machine to perform drilling and counter boring operations on a job.
5. Observe milling, shaping and grinding operations during demonstration at shop floor.

### FOUNDRY SHOP

1. Prepare a simple wooden pattern
2. Study of different parts and function of Cupola (Furnace).

### SMITHY SHOP

1. Study different tools used in forging.
2. Make a hexagonal chisel
3. Prepare a door ring.

### WELDING SHOP

1. Observe demonstration of different type of welding electrodes.
2. Prepare a butt joint and lap joint using Arc welding.
3. Study different equipments and tools in gas welding.
4. Prepare a butt joint by using gas welding method.

### Reference books:

- 1 Engineering Thermodynamics—P.I Ballency
- 2 Workshop Technology—II, Hazra & Choudhury

### Fibre Science (Lab.)

Name of the Course: Diploma in TEXTILE ENGINEERING			
Course code:	TXP 304	Semester	3 <sup>rd</sup>
Total Period:	45	Examination	4 hrs
Lab. periods:	3 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

1. To learn the identification of different cellulosic, protein and synthetic fibres by burning test, touching, observing the cross-section.
2. To learn the identification of different cellulosic, protein and synthetic fibres by chemical test.
3. To determine % of blend composition of different variety of blended yarn/fabric (minimum 5 Varieties)
4. To calculate Trash Content % of a given Cotton sample by the TRASH ANALYSER.
5. To calculate the moisture regain and moisture content of a given Cotton by hot air oven method.