

**HIMACHAL PRADESH TECHNICAL UNIVERSITY,  
HAMIRPUR - 177 001, HP**



# **Syllabus & Examination Scheme**

*for*

## **B. Tech.**

### **Textile Engineering (TE)**

### **3<sup>rd</sup> to 8<sup>th</sup> Semester**

As per National Education Policy (NEP)-2020

w.e.f. the Academic Year 2024-2025

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**SCHEME OF TEACHING AND EXAMINATION  
B.TECH TEXTILE ENGINEERING**


**Semester – III**

S. N.	Categ.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	HS	IKS-311	Indian Knowledge System	2	0	0	2	40	60	100
2	PC	TEPC-311	Textile Fibre-I	3	0	0	3	40	60	100
3	PC	TEPC-312	Properties of Fibres	3	0	0	3	40	60	100
4	PC	TEPC-313	Yarn Manufacture-I	3	0	0	3	40	60	100
5	PC	TEPC-314	Fabric Manufacture-I	3	0	0	3	40	60	100
6	PC	TEPC-315	Theory of Textile Machines	3	1	0	4	40	60	100

**Labs:**

1	PC	TEPC-311P	Textile Fibre Laboratory	0	0	2	1	30	20	50
2	PC	TEPC-313P	Yarn Manufacture-I Laboratory	0	0	2	1	30	20	50
3	PC	TEPC-314P	Fabric Manufacture-I Laboratory	0	0	2	1	30	20	50
4	PC	TEPC-315P	Theory of Textile Machines Laboratory	0	0	2	1	30	20	50
			<b>Total</b>	<b>17</b>	<b>1</b>	<b>8</b>	<b>22</b>			<b>800</b>

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# SEMESTER-III



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Indian Knowledge System (IKS-311)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
2	0	0	2	MaximumMarks:40	MaximumMarks:60	100	3 Hours
				MinimumMarks:16	MinimumMarks:24	40	

### Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e., one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

### Course Learning Objectives:

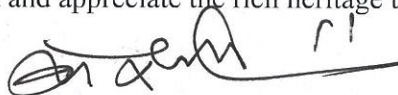
- To equip the students with the knowledge and understanding related to Indian knowledge systems, origin, evolution and the approaches used in ancient and modern times.
- To promote the youths to do research in the various fields of Bhāratīya knowledge system.

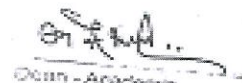
<b>Unit-I: Bhāratīya Civilization and Development of Knowledge System.</b>
Genesis of the Bharatbhumi and Civilization ,Discovery of the Saraswatī River, The Saraswatī-Sindhu civilization, Traditional knowledge system, The ancient education system, Brief introduction of the Takṣaśilā University, The Nālandā University, Knowledge export from Bharata
<b>Unit-II: Art, Literature and Scholars</b>
Natraja- A masterpiece of Bhartiya Art, Introduction to Vedas and Vedic Literature, Life and works of Agastya, Vālmīki, Patañjali, Vedvyāsa, Loapmudra, Maitreyi, Gārgī, Caraka, Suśruta, Kaṇāda, Kauṭīlya, Pāṇini, Āryabhaṭa, Varahmihira, Bhāskarācārya
<b>Unit-III: Engineering Science and Technology</b>
Engineering, science and technology in the Vedic Age, Post-Vedic period, History of Mathematics in Bharata, Concepts of Zero, History and Culture of Astronomy in India, Kerala School of Astronomy and Mathematics.
<b>Unit-IV: Cultural Heritage and Indian Traditional Practices</b>
Temple architecture in ancient India, Fairs and festivals, Yoga ,Āyurveda, Integrated approach to healthcare, Agriculture in Ancient India, Approaches and strategies to the protection and conservation of environment.

### Course Outcomes (COs):

After the completion of the course, the student will be able to:

- The students will be able to understand and appreciate the rich heritage that resides in our traditions.

  
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- The students will be able to improve mindfulness and more maturity leading to effective process of learning.

**Textbooks:**

- Bhag Chand Chauhan, IKS: The Knowledge of Bharata, Garuda Prakashan, 2023.
- Pradeep Kohle et. Al. Pride of India- A Glimpse of India's Scientific Heritage edited by SanskritBharati, 2006.
- Suresh Soni, India's Glorious Scientific Tradition, Ocean Books Pvt. Ltd., 2010.
- Sibaji Raha, et al, History of Science in India Volume-1, Part-I, Part-II, Volume VIII, NationalAcademy of Sciences, India and The Ramkrishna Mission Institute of Culture, Kolkata, 2014.



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TEXTILE FIBRE-I (TEPC-311)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	MaximumMarks:40	MaximumMarks:60	100	3 Hours
				MinimumMarks:16	MinimumMarks:24	40	

### INSTRUCTIONS TO THE QUESTION PAPER SETTER:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus

**COURSE OBJECTIVES:** The objective of this course is to familiarise the students with the different fibre forming polymers, their structure and properties. Another objective of this course is to introduce the natural fibres which are used for textile applications

### COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<b>Introduction:</b> Definition of Textiles, Fibre, Staple fibre, Filament, Yarn, Thread, Fabric and Clothing. Essential and desirable properties of textile fibres. Requirement of fibre forming polymers. Classification of textile fibres. <b>Polymers:</b> Degree of Polymerization. Types of polymer, Orientation and crystallinity in fibres. Molecular architecture, amorphous and crystalline phases, glass transition, plasticization, crystallization, melting, factors affecting $T_g$ and $T_m$ .	8
II	<b>Cotton</b> – Varieties: Genetically modified Cotton, Organic Cotton & Coloured Cotton, Cultivation and harvesting, Chemical composition, Chemical structure, Morphological structure, Physical properties, Chemical properties and uses. <b>Bast Fibres:</b> Jute: Cultivation, Retting, Fibre Extraction and Properties. Ramie: Chemical composition, properties and processing of Ramie fibre. Hemp: Physical and chemical properties, Structure, Primary processing of Hemp stalk and Retting. Sisal: Chemical composition, Properties, Fibre structure, Production and early processing. Mudar fibre: Properties and composition. Varieties and uses –Kenaf, Banana and coir	9

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	fibre.	
<b>III</b>	<b>Protein Fibres:</b> Wool – Types, Fibre extraction, Chemical Composition, Chemical structure, Morphological structure, Physical properties, Chemical properties and uses. Silk – Types, Production of Raw silk, Wild silk, Spun silk, Chemical composition, Chemical structure, Physical properties, Chemical properties and uses. Spider Silk: Types and Properties. <b>Regenerated Protein Fibres:</b> Principle of manufacture of Casein fibre, Vicara fibre, and Ardil fibre. General properties and applications.	<b>9</b>
<b>IV</b>	<b>Regenerated Cellulosic Fibres:</b> Principle of manufacture, Viscose rayon production, Purification of viscose fibre, Physical properties, Chemical properties & Uses. Modification of viscose rayon. Other regenerated cellulosic fibres – Tencel, Modal and Bamboo. Unconventional natural fibres. <b>Identification of Fibres:</b> Feeling Test. Burning test. Microscopic test. Staining Test. Chemical test and Density measurement.	<b>8</b>

#### **COURSE OUTCOMES:-**

**At the end of the course, the student will be able to**

- CO1** Classify textile fibres and explain the concept of orientation and crystallinity in fibre
- CO2** State the process of cultivation, harvesting and fibre extraction of natural cellulosic fibres and to analyze various factors contributing to properties of these fibres.
- CO3** Explain the extraction process of natural and regenerated protein fibres and to compare their properties.
- CO4** Discuss the process of formation of regenerated cellulose fibre and to demonstrate different fibre identification methods.

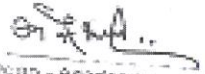
#### **TEXT BOOKS:**

1. Mishra S P, —*A Text Book of Fibre Science and Technology*,|| New Age. International (P) Ltd., Pub., New Delhi, (2000).
2. Sreenivasamurthy H V —*Introduction to Textile Fibres*||, The Textile Association India, Mumbai, (1998).
3. Gohl E.P.G & Valensky —*Textile Science*|| CBS Publishers and Distributors, New Delhi, 2nd Ed Reprint- (2005).

#### **REFERENCE BOOKS:**

1. Bernard P Corbman, —*Textiles: Fibre to Fabric*,|| McGraw Hill Book Co., Singapore, (1983). ISBN:0070131376
2. Marjory L Joseph, —*Essentials of Textiles*”, CBS College Publishing, New York, (1984), ISBN:0030627389
3. NPTEL course on Textile Fibres by S. Mukhopadhyay, IIT Delhi.

  
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PROPERTIES OF FIBRE (TEPC-312)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks:40	Maximum Marks:60	100	3 Hours
				Minimum Marks:16	Minimum Marks:24	40	

### INSTRUCTIONS TO THE QUESTION PAPER SETTER:

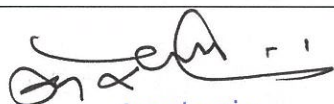
Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus

### COURSE OBJECTIVES:


To teach the fundamentals of fibre structure and physical characterization methods and to provide knowledge of fibre properties such as moisture, mechanical, optical, frictional, electrical and thermal properties in terms of structure of the fibres.

### COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p><b>Fiber structure:</b> Basics of polymers, Homo and copolymers, amorphous and crystalline phases, thermal transitions, glass transition temperature, melting, crystallization, Fibre structure models, fiber structure models, fringed-micelle, fringed-fibril, and folded chain models.</p> <p><b>Structure investigation.:</b> Investigation of physical structure of fibres, X-ray diffraction, Differential scanning calorimetry (DSC), Thermo-Gravimetric Analysis (TGA), Fourier Transform Infrared Spectroscopy (FTIR), Sonic modulus, Scanning electron microscopy (SEM), Optical microscopy with hot stage, density gradient columns</p>	9
II	<p><b>Moisture absorption:</b> Moisture regain and content, relation between relative humidity and regain, moisture absorption and desorption in fibres, heat of sorption, measurement, quantitative theories of moisture absorption, hysteresis, rate of absorption of moisture, retention of liquid water, swelling</p> <p><b>Fibre friction:</b> Technological importance. Static and Kinetic Friction, Nature of Friction, Fibre on Fibre Friction and Fibre on other material Friction.</p>	8



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	Measurement of friction. Factors affecting Coefficient of friction, Effect of load and area of contact, Lubrication.	
<b>III</b>	<p><b>Mechanical Properties:</b> Load-elongation and stress-strain curves, elastic recovery, dynamic tests, Factors influencing results of tensile experiment, Weak link effect theory. Elastic recovery. Effect of test conditions on recovery, Cyclic testing. Fibre fracture and fatigue.</p> <p><b>Viscoelastic Properties:</b> Viscoelastic models, Maxwell model, Kelvin Model, creep and stress relaxation, mechanical conditioning, Bending and torsional properties of fibre. Structural effect on extension behaviour.</p>	<b>9</b>
<b>IV</b>	<p><b>Electrical Properties:</b> Basic concept of Electrical conductivity, Electrical conductivity of polymer fibres, effect of different factors on the electrical resistance of fibres. Static electricity: Introduction and significance. Measurement of static electricity. Explanation of static phenomena. Anti-Static treatment. Dielectric properties: Definition and effect of different parameters on dielectric properties</p> <p><b>Optical properties:</b> Polarization and Light, Refractive index and birefringence. Birefringence and orientation of fiber. Reflection and lustre, Absorption, and dichroism</p>	<b>8</b>

#### **COURSE OUTCOMES:-**

**At the end of the course, the student will be able to**

- CO1** Analyze fiber structure and properties using advanced techniques
- CO2** Investigate moisture absorption and its effects on fibers.
- CO3** Evaluate mechanical, viscoelastic, electrical, and optical fiber properties
- CO4** Apply knowledge to predict and interpret fiber behaviors.

#### **TEXT BOOKS**

1. Fundamental of fibre Science, Zhang X, DEStech Publications, Inc 2014.
2. Physical properties of Textile Fibres by W. E. Morton & J. W. S. Hearle, Woodhead Publishing, 2008
3. Gupta V B and Kothari V K, —Manufactured Fibre Technology, 1st Ed., Chapman and Hall, London (1997)
4. Hearle J W S, —Polymers and their properties”, Vol. I, John Wiley and Sons, NY (1982)

#### **REFERENCE BOOKS**

1. Introduction to Polymers - Robert J. Young and P A Lovell., 2011
2. Handbook of Fibre Chemistry by M. Lewin, CRC Press, 2006.
3. Structure Formation in Polymeric Fibre by D. R. Salem, Hanser Publishers, 2000.
4. Polymer Viscoelasticity: Stress and Strain in Practice by E. Riande, R. Diaz-Calleja, M. Prolongo and R. Masegosa, Marcel Dekker, 1999.

  
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YARN MANUFACTURE – I (TEPC-313)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	MaximumMarks:40	MaximumMarks:60	100	3 Hours
				MinimumMarks:16	MinimumMarks:24	40	

### INSTRUCTIONS TO THE QUESTION PAPER SETTER:


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**COURSE OBJECTIVES:** To teach the design, constructional features and working principles of spinning preparation machines – ginning machinery, blowroom, card, drawframe and to educate on the processing of different types of fibres and their blends according to the specifications and needs of the customers.

### COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<p><b>Introduction:</b> Introduction to the terms ‘Textiles’, ‘Fibres’, ‘Filaments’, ‘Yarns’ and ‘Fabrics’; Understanding various properties of fibres and assessing the essential and desirable properties of fibres required for staple yarn preparation; Basic operations involved in yarn production – a brief conception. Process flowchart for carded and combed yarn manufacturing. Yarn numbering systems and their conversion; A brief idea about Yarn classifications.</p> <p><b>Ginning:</b> Impurities in cotton fibres and their removal during pre-baling operation, objective of ginning, study of ginning machineries, Pre and post ginning, baling of fibers, latest developments.</p>	9
II	<p><b>Blow room:</b> Basics of Opening, cleaning, mixing and blending and their sequential implementation in yarn preparatory stage; Objectives of blowroom; Basic operations in blowrooms; Sequence of opening and cleaning machineries in conventional and modern blowroom, Various types of opening elements in blowroom, fibre opening in blowroom, Principles of cleaning at blowroom, influence of process parameters, grid bar adjustment, Processing of natural and</p>	8

  
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	synthetic fibres in blowroom. <b>Blow room Performance:</b> Process Performance of blowroom machines for such as cleaning efficiency, Degree of Opening etc.; Production calculation, and fiber waste in blowroom.	
III	<b>Carding:</b> Objectives and functions of carding machine; Mechanism of feeding into a card; Principles of actions in different zones of carding and concept of card clothing, wire geometry at different regions of card, rotation of flats, stationary flats; Web formation in card, tension draft. Autoleveller in card, Transfer efficiency of card- a brief idea, Mechanism of hooks formation in carding. Modern developments in carding machines. <b>Carding Performance:</b> Process performance of carding viz. cleaning efficiency, wastes, nep formation, sliver unevenness etc. Actual and mechanical draft, Draft and production calculations of card	9
IV	<b>Drawframe:</b> Principles of equalizing (doubling) and drafting processes; A idea of drafting theory; Different types drafting arrangements; Zone-wise study of a draw frame machines viz. creel section, drafting zone, dust removal region, material condensing and delivery sections. Mass variations of fibrous assembly and their monitoring and control; Basic principle of auto-levelers; Classifications of Auto-leveller. Modern developments in drawframe. <b>Drawframe Performance:</b> Process performance of Draw frame viz. U%, Imperfection etc. Draft and Production calculations of draw frame machines.	8

### COURSE OUTCOMES:

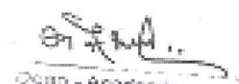
At the end of the course, the student will be able to

- CO1 Analyze fiber properties and yarn production processes
- CO2 Evaluate ginning, blow room, carding, and draw frame operations.
- CO3 Apply principles of cleaning, mixing, and drafting in yarn preparation.
- CO4 Assess process performance and efficiency metrics.
- CO5 Implement production calculations for optimized yarn manufacturing

### TEXTBOOKS

1. The Technology of Short Staple Spinning' by W. Klein. The Textile Institute Publication, Manual of Cotton Spinning, Short Staple Spinning Series;
2. A Practical Guide to Opening & Carding, W. Klein. The Textile Institute Publication, Manual of Cotton Spinning, Short Staple Spinning Series;
3. A Practical Guide to Combing & Drawing by W. Klein, The Textile Institute Publication, Manual of Cotton Spinning, Short Staple Spinning Series;
4. The characteristics of Raw Cotton' by P. Lord. The Textile Institute Publication, Manual of Cotton Spinning, vol. II, Part-I;
5. Opening & Cleaning' by C. Shirley, The Textile Institute Publication, Manual of Cotton

  
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- Spinning, vol. II, Part-II;
6. The Principle of Roller Drafting & The Irregularity of Drafted Materials' by G. A. R. Foster,
  7. Fundamentals of spun yarn technology' by Carl A. Lawrence;
  8. Cotton Ginning' – Textile Progress, The Textile Institute Publication;
  9. Spun Yarn Technology' (Vol-1 & Vol-2) by A Venkatasubramani;
  10. Blow room and Carding' – Training Programme conducted by NCUTE, IIT, Delhi.
  11. Essential Calculations of Practical Cotton Spinning' by T.K. Pattabhiraman

**REFERENCE BOOKS**

1. Salhotra K R, "Spinning of Man Made Fibres and Blends on Cotton Spinning Systeml, The Textile Association, Mumbai (1989).
2. Khare A R, —Elements of Blowroom, Carding and Drawframe", Sai book Centre, Mumbai (1999).

  
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FABRIC MANUFACTURE-I (TEPC-314)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	MaximumMarks:40	MaximumMarks:60	100	3 Hours
				MinimumMarks:16	MinimumMarks:24	40	

### INSTRUCTIONS TO THE QUESTION PAPER SETTER:

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**COURSE OBJECTIVES:** To educate about the basic principle of weaving and to teach the design, constructional features and working principles of machine and methods used for weaving preparatory process and the primary motions of weaving.

### COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Introduction to various fabric manufacturing process flow chart, methods, weaving, knitting, nonwoven and braiding, Warp, weft, crimp, fabric cover, porosity, GSM and related concepts with some basic calculations. Doubling: Objective and types, TFO: Objectives, machine parameters, properties of TFO yarn. <b>Winding:</b> Objectives of winding, types of packages, types of winding machines: drum and precision, terms related to winding: wind, wind per double traverse, angle of wind, expressions of winding speed, angle of wind and traverse ratio. Winding machine zones: Unwinding, Tensioning and clearing, winding, problems in winding, Patterning: Reasons and remedies. Yarn path with different traverse ratio, gain, Conditions for uniform building of cheese and cones, Auto winders Autoconer: Objective, machine parameters, Yarn fault classifying systems: Classimat faults, Pirn winding: principles, build of the pirn; Calculations related to winding.	9
II	<b>Warping:</b> objectives of warping, warping creels, efficiency of warping; Beam	8

  
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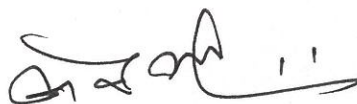
  
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	<p>warping, machines, passage of warp, yarn tension in warping, leasing and beaming, control systems in warping; Sectional warping, objectives, passage of warp, angle of cone and traverse of warp band; derivation for volume of yarn to be stored on beam, factors effecting warp quality on beam Calculations related to beam and sectional warping.</p> <p><b>Sizing:</b> Objectives, sizing-weaving curve, Sizing machine: creel, size box configurations, squeeze rollers, factors influencing the size pick-up, viscosity of size paste and its measurement, Drying systems. Sizing ingredients, size preparation, control points. Modern trends: single-end sizing, prewetting, hot melt, solvent and cold sizing; Quality of sized yarns; Performance assessment and calculations.</p>	
III	<p><b>Drawing In:</b> Importance, manually and automatic drawing process, design with its drawing and lifting plan. Calculation of heald and reed count. Weaving: History of weaving with manual and automatic loom, and modern loom revolutions. Different motions of looms: Primary, secondary and auxiliary motions.</p> <p><b>Shedding:</b> Objective, Different types of shedding: Tappet, dobby, jacquard with advantage and disadvantages. Tappet shedding: its limitations, positive and negative shedding, types of shed, early and late shedding, distinct and indistinct shed, shed timing, Reversing mechanisms, importance of bending factor.</p>	9
IV	<p><b>Picking:</b> Types of conventional picking: over picking and under picking with its mechanism, advantages and disadvantages, different picking accessories and their functions, Calculation of shuttle velocity and derivation for energy of picking, picking force. Nominal and actual displacement, Loom timing, shuttle velocity and loom speed, loom width and rate of weft insertion, expression for power required for picking.</p> <p><b>Beat up:</b> Expressions of sley displacement, velocity and acceleration Sley eccentricity, effects of sley eccentricity; Beat up force, weaving resistance, bumping conditions, temples.</p>	8

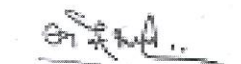
### COURSE OUTCOMES:

**At the end of the course, the student will be able to**

- CO1. Identify factors influencing yarn quality for weaving.
- CO2. Understand the significance of preparatory processes in fabric manufacturing.
- CO3. Relate machine components in winding, warping, and sizing to fabric properties.
- CO4. Illustrate the importance of primary motion in fabric production.
- CO5. Design operational sequences for woven fabric production considering fabric quality factors and production.



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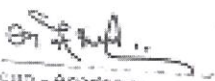
## TEXTBOOKS

1. Talukdar M K, Srirammulu P K and Ajgaokar D B, —*Weaving – Machine, Mechanism and Management*ll, Mahajan Publisher Private Ltd., Ahmedabad, India (1998).
2. Mark R, Robinson A T C, —*Principles of Weaving*, The Textile Institute, Manchester (1986).
3. Weaving: Conversion of Yarn to Fabric by P. R. Lord and M. H. Mohamed, Woodhead Publishing (1982).
4. Principles of Woven Fabric Manufacturing by A. Majumdar, CRC Press (2016).

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1. Booth J E, —*Textile Mathematics”, Part III*, Textile Institute, Manchester (1977).
2. Dr. Sabit Adanur, —*Hand book of weaving*ll Technomic Publishing Company Inc Lancaster, Basel, UK (2001)
3. *Winding*, BITRA Monograph Series, Bombay Textile Research Association, Bombay (1981).
4. *Warping and Sizing*, BTRA Monograph Series, Bombay Textile Research Association, Bombay (1981).
5. Principles of Fabric Formation by P. K. Banerjee, CRC Press (2015).
6. Textile Sizing by B. C. Goswami, R. Anandjiwala and Hall, Woodhead Publisher

  
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THEORY OF TEXTILE MACHINES (TEPC-315)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	MaximumMarks:40	MaximumMarks:60	100	3 Hours
				MinimumMarks:16	MinimumMarks:24	40	


### INSTRUCTIONS TO THE QUESTION PAPER SETTER:

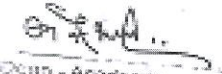
Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus

**COURSE OBJECTIVES:** The objective of this course is to introduce the students to the basic mechanisms and motion transmission systems used in machines so that they can follow and analyze various components of machines used in textile industry.

### COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	<b>Basic concepts:</b> Kinematics of machine, machine and structure, kinematics link and their different type, types of kinematics pair, degree of freedom, kinematics chain, types of joints in kinematic chain, mechanism and inversion of four bar chain, single slider and double slider crank mechanism. Analysis of four-bar sley motions in shuttle loom.	8
II	<b>Belt, rope and chain drive:</b> Types of belt drives, velocity ratio, law of belting, concept of slip and creep, length of belt, ratio of driving tensions for flat belt and v-belt, power transmitted, effect of centrifugal tension on power transmission, condition for maximum power transmission, initial tension in the belt, relative advantage and disadvantage of chain and belt drives. Applications of belt, chain and rope drives in textile machines.	8
III	<b>Gears:</b> Classification of gears, terminology used in gear, law of gearing, forms of teeth, construction, properties and comparison of an involute and cycloidal teeth, length of path of contact, arc of contact, number of pairs of teeth in contact, interference, minimum number of teeth on the pinion and wheel to avoid	9

  
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	interference, minimum number of teeth on the pinion for involute rack to avoid interference, undercutting, terminology of helical and worm gears. <b>Gear trains:</b> Definition, types: simple, compound, reverted and epicyclic gear trains, velocity ratio of epicyclic and compound epicyclic gear trains. Selection and applications of gears in textile machines, planetary gear trains in speedframe and comber.	
<b>IV</b>	<b>Cams and follower:</b> Types of cams and followers, cam terminology, types of motion of the follower, radial and offset cam designing for uniform velocity, SHM, and uniform acceleration and retardation motion of the follower, Design of cams for ring rail movement in ring spinning, belt shifting in speed frame and shedding in shuttle loom.	<b>9</b>

#### COURSE OUTCOMES:

**At the end of the course, the student will be able to**

- CO1** Understand the basic principles of different mechanism applicable in textile machines.
- CO2** Proficient in the use of mathematical methods to design linkage with belt, chain and rope.
- CO3** Analyse gear and gear train for textile applications.
- CO4** Apply cam terminologies for design of cam profiles

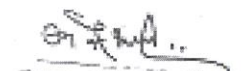
#### TEXT BOOKS:

1. Khurmi R.S and Gupta —*Theory of Machine*|| S. Chand Publisher, New Delhi.
2. Bansal R K, —*A text book of Theory of Machines*||, Laxmi Publication Pvt. Ltd, New Delhi.
3. Rattan S S, —*Theory of Machines*||, Tata Mc Graw Hill, New Delhi, 2001.

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1. Ghosh A and Mallik A K, —*Theory of mechanism and machines*||, Affiliated East West Press Pvt. Ltd, New Delhi, 198
2. Bevan T, —*The Theory of Machines*||, CBS Publishers and Distributors, New Delhi, 2002.
- 3., R. S. Rengasamy- **Mechanics of Spinning Machines**, NCUTE, New Delhi, 2002

  
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TEXTILE FIBRE LABORATORY (TEPC-311P)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks:20	50	3 Hours
				Minimum Marks:12	Minimum Marks:8	20	

### COURSE OBJECTIVES

- To demonstrate various fibre and blend identification methods.
- To analyse physical and chemical structure of fibre.
- To instruct students in the standard test procedures for various tests.

At least 10 experiments are to be performed by each student

### LIST OF EXPERIMENTS

**Physical and Chemical identification of following Textile fibre(s)**

1. Identification of Cotton
2. Identification of Wool
3. Identification of Silk
4. Identification of Bast fibres
5. Identification of Polyester
6. Identification of Nylon
7. Identification of Acrylic
8. Identification of Polypropylene

**Identification of fibres in blend and % fibre content in blend:**

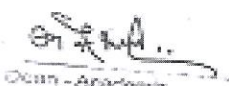
9. Analysis of P/C blended fabric
10. Analysis of P/V blended fabric
11. Analysis of P/W blended fabric
12. Estimation of fibre/filament fineness using projection microscope.
13. Determine the thermal behaviour of fibre by using DSC and TGA.
14. Structural analysis of fibre using XRD and SEM.
15. Identification of chemical structure of fibre by FTIR spectroscopy.

### COURSE OUTCOMES:

At the end of the course, the student will be able to

- CO1** Acquire requisite laboratory skills and become familiar with the use of various fibre identification methods.
- CO2** Evaluate the results using various types of fibers and yarns and utilize feedback from evaluations to modify project work, ensuring a quality result.
- CO3** Analyze the physical and chemical structure of fibre.

  
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YARN MANUFACTURE-1 LABORATORY (TEPC-313P)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks:20	50	3 Hours
				Minimum Marks:12	Minimum Marks:8	20	

### COURSE OBJECTIVES

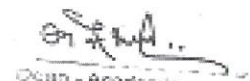
- To help students understand spinning techniques and yarn formation principles.
- To explore yarn path mechanisms in various machines used in yarn manufacture.
- To gain practical skills in yarn formation, quality control, and testing methods.

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

### LIST OF EXPERIMENTS

1. Introduction to the knowhow of spinning process, sequence, machineries (carded/ combed) used in yarn manufacturing (short and long staple system) including explanation of objects of each machine and their feed as well as delivery materials.
2. Preparation of a flowchart of conventional and modern Blow room line along with machine positioning.
3. Study of following in Shirley trash analyser machine.
  - Chief organs.
  - Gearing arrangements.
  - Teeth inclination and teeth per inch
4. Determination of trash content and analysis of waste by using trash analyzer machine. Calculate the cleaning efficiency.
5. Study of different machines in Blow room operation viz. Bale opener, course and fine cleaning machines, Mixer, De-dusting machines etc.
6. Study and sketch the working mechanism of a card zone wise (viz. Feeding, stripping, carding, transfer, web collection and delivery, waste collection) with respect to flow of material and their dimensions.
7. Study or gearing system of carding machine and calculation of rotational speeds and surface speeds of various components of card.
8. Determination of drafts at various regions of card and draft constant of a carding machine.
9. Different settings and maintenance of a carding machines.
10. Identification and analysis of different types of neps in card web.
11. Study and sketch the working mechanism with respect to flow of material along with dimension zone-wise of a draw frame machine.
12. Study or gearing system and determination of draft constant of draw frame. Determination of individual and total draft, tension draft and calculation of productions of drawframe machines.
13. Study of orientation of fibres in card and drawframe sliver using Lindsley technique.

  
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14. Maintenance and overhauling of draw frame machine.
15. Study of Auto-levellers used on Card and Draw frame machines.

**COURSE OUTCOMES:**

- CO1 Understand spinning machinery and yarn manufacturing processes.
- CO2 Analyze Blow room operations and Shirley trash analyzer functions.
- CO3 Evaluate carding and drawframe machines for fiber orientation and drafting.



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FABRIC MANUFACTURE-I LABORATORY (TEPC-314P)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks:20	50	3 Hours
				Minimum Marks:12	Minimum Marks:8	20	

### COURSE OBJECTIVES


- To show the working principle of various preparatory machine-like winding, warping, sizing, drawing in.
- To demonstrate the need of primary motions in a loom.
- Plan a sequence of machines required to manufacture a fabric considering EPI, PPI, count, cover.

**At least 10 experiments are to be performed by each student**

### LIST OF EXPERIMENTS

1. Analysis of fabric sample to determine the EPI, PPI, weave, fabric sett and crimp.
2. Study of working principle of TFO machine and silent features of machine with yarn characteristics.
3. Study of the motion transmission system in winding machine.
4. Study all the different zones of the winding machine.
5. Calculation of winding speed on grooved drum winding system and study of anti-patterning system incorporated to it.
6. Study of precision winding machine and mechanism of package building.
7. Study of the motion transmission system in Pirn winding machine
8. Study of working of Autoconer automatic winding machine with its machine elements.
9. Study of the sectional warping machine and planning the width of a section according to pattern of the given striped fabric.
10. To study the passage of yarn on a sizing machine and the features of various parts/ mechanism of the sizing machine.
11. To select the proper reed and heald for a weaver's beam keeping in mind the beam, loom size and fabric construction.
12. Analysis of various fabric design with its drafting and lifting plan.
13. Study of shedding mechanism of shuttle loom and cam positioning with respect to loom cycle.
14. Study of picking mechanism of shuttle loom with picker movement in relation with crank shaft rotation and calculation of average velocity of shuttle.

  
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15. Study of sley movement, construction and calculation of sley eccentricity.


**COURSE OUTCOMES:**

At the end of the course, the student will be able to

- CO1** Develop requisite laboratory skills and become familiar to the machine and its parts.
- CO2** Understand and demonstrate the working of preparatory process of weaving and primary motions in various types of loom.
- CO3** Work with machine for troubleshoot interactions between the mechanism and machine parts.



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THEORY OF TEXTILE MACHINES LABORATORY (TEPC-315P)							
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L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks:20	50	3 Hours
				Minimum Marks:12	Minimum Marks:8	20	

### COURSE OBJECTIVES

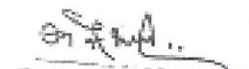
- To identify basic mechanisms and motion transmission systems used in textile machines.
- To analyse various components of machines used in textile industry.
- To practice designing of belts, gears & gear trains and cam & followers for textile machines.

**At least 10 experiments are to be performed by each student**

### LIST OF EXPERIMENTS

1. To study various types of kinematic links, pairs, and kinematic chains.
2. To analyze four-bar sley motions in shuttle loom.
3. To study various kinds of belts drives.
4. To study various types of chain and rope drives.
5. To find the length of the belt required and the angle of contact between the belt and given pulley for open and crossed belt drives on mentioned textile machine.
6. To study and derive an expression for the ratio of driving tensions for given flat belt drive.
7. To study different types of gears used in textile machines.
8. To study and derive an expression for the minimum number of teeth required on a given pinion to avoid interference when it gears with a rack on mentioned textile machine.
9. Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel on mentioned textile machine.
10. To study different types of gear trains used in textile machines.
11. To study planetary gear trains in speedframe and comber.
12. To study various types of cam and follower arrangements used in textile industry.
13. To plot follower displacement Vs cam rotation graph for various cam follower arrangements.
14. Design an offset and radial cam for a given textile machine, with a given minimum cam radius, rotating clockwise at a uniform speed.
15. A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion: i) Follower to move outwards through a distance of 30 mm during 120° of cam rotation ii) Follower to dwell for 60° of cam rotation; iii) Follower to return to its initial position during 90° of cam rotation; and iv) Follower to dwell for the remaining

  
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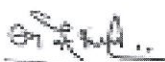
90° of cam rotation. The minimum radius of the cam is 45 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return strokes. Draw the cam profile.

**COURSE OUTCOMES:**

At the end of the course, the student will be able to

- CO1** Acquire requisite laboratory skills and become familiar with basic mechanisms and motion transmission systems used in textile machines
- CO2** Analyse various components of machines used in textile industry.
- CO3** Design belts, gears & gear trains and cam & followers for textile machines.

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