ANNA UNIVERSITY, CHENNAI

UNDERGRADUATE CURRICULUM (UNIVERSITY DEPARTMENTS)

Campus : Alagappa College of Technology

Department : Textile Technology

Programme : B.Tech. Textile Technology

Regulations : 2023 (Revised 2024), with effect from the AY 2024 – 25 to all the students of UG Programme.

OVERVIEW OF CREDITS

Sem	PCC	PEC	ESC	HSMC	ETC	OEC	SDC	UC	SLC	Total
I	-	-	10	11	-	-	-	1	-	**23**
II	-	-	-	14	-	-	7	1	-	**22**
III	16.5	-	-	4	-	-	-	2	-	**22.5**
IV	17.5	-	-	3	-	-	2	3	-	**25.5**
V	12	3	-	-	3	-	7	-	-	**25**
VI	-	9	-	-	3	3	3	5	1	**24**
VII	9	6	-	3	-	3	3	-	-	**24**
VIII	-	-	-	-	-	-	8	-	-	**8**
Total	55	18	10	35	6	6	30	12	1	**174**
% of Category	31.6	10.3	6.3	20.1	3.4	3.4	17.2	6.9	0.6	**100**

CATEGORY OF COURSES

PCC – Professional Core Course

PEC – Professional Elective Course

ETC – Emerging Technology Course

OEC – Open Elective Course

SLC – Self Learning Course

ESC – Engineering Science Course

HSMC – Humanities Science and Management Course

SDC – Skill Development Course

UC – University Course

For Honours & Minor Degree, please refer the Regulations 2023 (Revised 2024).

SEMESTER – I									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1	EN23C01	Foundation English	LIT	2	0	2	4	3	HSMC
2	MA23C01	Matrices and Calculus	T	3	1	0	4	4	HSMC
3	CY23C01	Engineering Chemistry	LIT	3	0	2	5	4	HSMC
4	CS23C02	Computer Programming in Python	LIT	3	0	2	5	4	ESC
5	EE23C03	Basics of Electrical and Electronics Engineering	LIT	2	0	2	4	3	ESC
6	ME23C03	Engineering Mechanics	T	3	1	0	4	4	ESC
7	UC23H01	தமிழர் மரபு /Heritage of Tamils	T	1	0	0	1	1	UC
8	-	NCC/NSS/NSO/YRC	L	0	0	2	2	-	UC
TOTAL CREDITS								**23**	

SEMESTER – II									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	EN23C02	Professional Communication	LIT	2	0	2	4	3	HSMC
2.	MA23C02	Ordinary Differential Equations & Transform Techniques	T	3	1	0	4	4	HSMC
3.	PH23C01	Engineering Physics	LIT	3	0	2	5	4	HSMC
4.	ME23C01	Engineering Drawing & 3D Modelling	LIT	2	0	4	6	4	SDC
5.	ME23C04	Makerspace	LIT	1	0	4	5	3	SDC
6.	CY23C03	Chemistry for Technologists	T	3	0	0	3	3	HSMC
7.	UC23H02	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	T	1	0	0	1	1	UC
TOTAL CREDITS								**22**	

SEMESTER – III									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	MA23C05	Probability and Statistics	T	3	1	0	4	4	HSMC
2.	TT23301	Characteristics of Textile Fibres	LIT	3	0	2	5	4	PCC
3.	TT23302	Technology of Pre-Spinning Process	LIT	3	0	3	6	4.5	PCC
4.	TT23303	Woven Fabric Manufacture	LIT	3	0	3	6	4.5	PCC
5.	TT23304	Chemical Processing of Textile Materials I	LIT	2	0	3	5	3.5	PCC
6.	UC23U01	Universal Human Values	LIT	1	0	2	3	2	UC
7.	-	Audit Course – I	T	-	-	-	-	-	UC
TOTAL CREDITS								**22.5**	

SEMESTER – IV									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	TT23U02	Sustainability Related course	T	2	0	0	2	2	UC
2.	TT23C09	Technology of Manufactured Fibre Production	T	3	0	0	3	3	PCC
3.	TT23401	Technology of Yarn Spinning	LIT	3	0	2	5	4	PCC
4.	TT23C01	Fundamentals of Economics and Management	T	3	0	0	3	3	HSMC
5.	TT23402	Chemical Processing of Textile Materials II	LIT	2	0	2	4	3	PCC
6.	TT23C02	Fabric Structure	LIT	3	0	2	5	4	PCC
7.	TT23403	Fibre and Yarn Quality Evaluation	LIT	2	0	3	5	3.5	PCC
8.	TT23U01	Standards – Textile Technology	T	1	0	0	1	1	UC
9.	-	Skill Development Course I	-	-	-	-	-	2	SDC
TOTAL CREDITS								**25.5**	

SEMESTER – V (PREFERENCE FOR FOREIGN EXCHANGE)									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	TT23C08	Technology of Knitting and Non-woven	T	3	0	0	3	3	PCC
2.	TT23C15	Garment Technology	LIT	2	0	2	4	3	SDC
3.	TT23501	Mechanics of Textile Machinery	T	2	1	0	3	3	PCC
4.	TT23C05	Fabric and Garment Quality Evaluation	LIT	2	0	2	4	3	PCC
5.	TT23C18	Financial Management for Textile Industry	T	2	1	0	3	3	PCC
6.	-	Professional Elective - I	LIT	-	-	-	-	3	PEC
7.	-	Emerging Technology Course I	LIT	3	0	0	3	3	ETC
8.	-	Industry Oriented Course- I	-	-	-	-	-	1	SDC
9.	TT23502	Internship I/Training I*	-	0	0	0	0	1	SDC
10	-	Skill Development Course II	-	-	-	-	-	2	SDC
			TOTAL CREDITS					**25**	
COURSES FOR HONOURS DEGREE									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	TT23D01	Capstone Design Project – Level I	CDP	0	0	12	12	6	SDC
(OR)									
1.		Honours Elective – I						3	PEC
2.		Honours Elective – II						3	PEC
COURSES FOR MINOR DEGREE									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.		Minor Elective – I						3	PEC
2.		Minor Elective – II						3	PEC

SEMESTER – VI (PREFERENCE FOR FOREIGN EXCHANGE)									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	-	Professional Elective -II	LIT	-	-	-	-	3	PEC
2.	-	Professional Elective -III	LIT	-	-	-	-	3	PEC
3.	-	Professional Elective -IV	LIT	-	-	-	-	3	PEC
4.	-	Open Elective – I	T	3	0	0	3	3	OEC
5.	UC23E01	Engineering Entrepreneurship Development	LIT	2	0	2	4	3	UC
6.	-	Industry Oriented Course- II	-	-	-	-	-	1	SDC
7.	-	Emerging Technology Course II	LIT	3	0	0	3	3	ETC
8.	-	Skill Development Course III	-	-	-	-	-	2	SDC
9.	TT23L01	Self-Learning Course	-	-	-	-	-	1	SLC
10.	-	Audit Course – II	T	-	-	-	-	-	UC
			TOTAL CREDITS					**22**	
COURSES FOR HONOURS DEGREE									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	TT23D02	Capstone Design Project – Level II	CDP	0-0-12			12	6	SDC
(OR)									
1.		Honours Elective – III						3	
2.		Honours Elective – IV						3	
COURSES FOR MINOR DEGREE									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.		Minor Elective – III						3	
2.		Minor Elective – IV						3	

SEMESTER – VII									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	TT23701	Structural Mechanics of Yarns and Fabrics	LIT	2	1	0	3	3	PCC
2.	TT23C04	Compliances in Textile Industry	T	3	0	0	3	3	PCC
3.	TT23C11	Total Quality Management for Textile Industry	T	3	0	0	3	3	HSMC
4.	TT23702	Technical Textiles	T	3	0	0	3	3	PCC
5.	-	Professional Elective -V	T	3	0	0	3	3	PEC
6.	-	Professional Elective -VI	T	3	0	0	3	3	PEC
7.	-	Open Elective – II	T	3	0	0	3	3	OEC
8.	-	Industry Oriented Course- III	-	-	-	-	-	1	SDC
9.	TT23703	Internship II / Training II*	-	0	0	0	0	2	SDC
			TOTAL CREDITS					**24**	
COURSES FOR HONOURS DEGREE									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	TT23D03	Capstone Design Project – Level III	CDP	0-0-12			12	6	SDC
(OR)									
1.		Honours Elective – V						3	
2.		Honours Elective – VI						3	
COURSES FOR MINOR DEGREE									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.		Minor Elective – V						3	
2.		Minor Elective – VI						3	

SEMESTER – VIII									
S. NO.	**COURSE CODE**	**COURSE NAME**	**COURSE TYPE#**	**PERIODS / WEEK**				**CREDITS**	**CATEGORY**
				L-T-P			**TCP***		
1.	TT23801	Project Work / Internship cum Project Work	L	0	0	16	16	8	SDC
TOTAL CREDITS								**8**	

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I	VERTICAL II	VERTICAL III	VERTICAL IV	VERTICAL V	VERTICAL VI
FIBRE SCIENCE	**TEXTILE MANUFACTURING**	**TEXTILE CHEMICAL PROCESSING**	**GARMENT TECHNOLOGY**	**TECHNICAL TEXTILES**	**TEXTILE AND APPAREL MANAGEMENT**
Polymer Chemistry	Theory of Drafting and Twisting	Colour Science	Garment Production Machinery	Automotive, Industrial and Filtration Textiles	Statistics for Textile Industry
Polymer Physics	Long Staple Spinning Technology	Advances in Pre-Treatment and Dyeing	Advanced Pattern Making Laboratory	Geo Textiles	Energy Management in Textile Industry
Polymer Rheology	Process Control in Spinning	Textile Chemicals and Auxiliaries	Apparel Production and Planning	Medical Textiles	Operations Research for Textile Industry
Characterization of Textile Polymers	Process Control in Fabric Manufacturing	Advances in Textile Finishing	Apparel Marketing and Merchandising	Textile Reinforced Composites	Textile Costing
High Performance Fibres	Advances in Knitting Technology	Denim Manufacturing	Industrial Engineering in Apparel Industry	Smart Textiles and Garments	Logistics and Supply Chain Management for Apparel Industry
Technology of Melt Spun Fibres	Special Textile Structures	Eco Friendly Dyes, Chemicals and Processing	Computer Aided Garment Designing	Protective Textiles	Entrepreneurship in Apparel Industry
Technology of Solution Spun Fibres		Management of Textile Effluents		Sports Textile	Project Management in Textile Industry
Textured Yarn Technology		Coated and Laminated Textiles		Nano Technology in Textiles	Industry 4.0
Sustainable Textiles		Advances in Textile Printing		Home Textiles	Digital marketing and e-business
		Coloration of Synthetic Fibres		Clothing Comfort	ERP for Apparel Industry
					Business Analytics

VERTICAL I: FIBRE SCIENCE						
S. NO.	COURSE CODE	COURSE NAME	COURSE TYPE#	PERIODS / WEEK		CREDITS
				L-T-P	TCP*	
1	TT23001	Polymer Chemistry	T	3-0-0	3	3
2	TT23002	Polymer Physics	T	3-0-0	3	3
3	TT23003	Polymer Rheology	T	3-0-0	3	3
4	TT23004	Characterization of Textile Polymers	T	3-0-0	3	3
5	TT23005	High Performance Fibres	T	3-0-0	3	3
6	TT23006	Technology of Melt Spun Fibres	T	3-0-0	3	3
7	TT23007	Technology of Solution Spun Fibres	T	3-0-0	3	3
8	TT23008	Textured Yarn Technology	T	3-0-0	3	3
9.	TT23009	Sustainable Textiles	T	3-0-0	3	3

VERTICAL II: TEXTILE MANUFACTURING						
S. NO.	COURSE CODE	COURSE NAME	COURSE TYPE#	PERIODS / WEEK		CREDITS
				L-T-P	TCP*	
1	TT23010	Theory of Drafting and Twisting	T	3-0-0	3	3
2	TT23011	Long Staple Spinning Technology	T	3-0-0	3	3
3	TT23012	Process Control in Spinning	T	3-0-0	3	3
4	TT23013	Process Control in Fabric Manufacturing	T	3-0-0	3	3
5	TT23014	Advances in Knitting Technology	T	3-0-0	3	3
6	TT23C17	Special Textile Structures	T	3-0-0	3	3

VERTICAL III: TEXTILE CHEMICAL PROCESSING						
S. NO.	COURSE CODE	COURSE NAME	COURSE TYPE#	PERIODS / WEEK		CREDITS
				L-T-P	TCP*	
1	TT23015	Colour Science	T	3-0-0	3	3
2	TT23016	Advances in Pre-Treatment and Dyeing	T	3-0-0	3	3
3	TT23017	Textile Chemicals and Auxiliaries	T	3-0-0	3	3
4	TT23C03	Advances in Textile Finishing	T	3-0-0	3	3
5	TT23018	Denim Manufacturing	T	3-0-0	3	3
6	TT23019	Eco Friendly Dyes, Chemicals and Processing	T	3-0-0	3	3
7	TT23020	Management of Textile Effluents	T	3-0-0	3	3
8	TT23021	Coated and Laminated Textiles	T	3-0-0	3	3

VERTICAL III: TEXTILE CHEMICAL PROCESSING						
S. NO.	COURSE CODE	COURSE NAME	COURSE TYPE#	PERIODS / WEEK		CREDITS
				L-T-P	TCP*	
9	TT23022	Advances in Textile Printing	T	3-0-0	3	3
10	TT23023	Coloration of Synthetic Fibres	T	3-0-0	3	3

VERTICAL IV: GARMENT TECHNOLOGY						
S. NO.	COURSE CODE	COURSE NAME	COURSE TYPE#	PERIODS / WEEK		CREDITS
				L-T-P	TCP*	
1.	TT23C06	Garment Production Machinery	T	2-0-2	4	3
2.	TT23024	Advanced Pattern Making and Garment Construction Laboratory	T	0-0-6	6	3
3.	AT23C01	Apparel Production and Planning	T	2-1-0	3	3
4.	AT23C02	Apparel Marketing and Merchandising	T	3-0-0	3	3
5.	AT23C04	Industrial Engineering in Apparel Industry	T	2-1-0	3	3
6.	TT23025	Computer Aided Garment Designing	T	0-0-6	6	3

VERTICAL V: TECHNICAL TEXTILES						
S. NO.	COURSE CODE	COURSE NAME	COURSE TYPE#	PERIODS / WEEK		CREDITS
				L-T-P	TCP*	
1	TT23026	Automotive, Industrial and Filtration Textiles	T	3-0-0	3	3
2	TT23027	Geo Textiles	T	3-0-0	3	3
3	TT23C19	Medical Textiles	T	3-0-0	3	3
4	TT23028	Textile Reinforced Composites	T	3-0-0	3	3
5	TT23C16	Smart Textiles and Garments	T	2-1-0	3	3
6	TT23029	Protective Textiles	T	3-0-0	3	3
7	TT23030	Sports Textile	T	3-0-0	3	3
8	TT23031	Nano Technology in Textiles	T	3-0-0	3	3
9	TT23C14	Home Textiles	T	3-0-0	3	3
10	TT23032	Clothing Comfort	T	3-0-0	3	3

VERTICAL VI: TEXTILE AND APPAREL MANAGEMENT						
S. NO.	COURSE CODE	COURSE NAME	COURSE TYPE#	PERIODS / WEEK		CREDITS
				L-T-P	TCP*	
1	TT23C10	Statistics for Textile Industry	T	2-1-0	3	3
2	TT23033	Energy Management in Textile Industry	T	3-0-0	3	3
3	TT23C07	Operations Research for Textile Industry	T	3-0-0	3	3
4	TT23034	Textile Costing	T	2-1-0	3	3
5	AT23C03	Logistics and Supply Chain Management for Apparel Industry	T	3-0-0	3	3
6	TT23035	Entrepreneurship in Apparel Industry	T	2-1-0	3	3
7	TT23036	Project Management in Textile Industry	T	3-0-0	3	3
8	TT23037	Industry 4.0	T	3-0-0	3	3
9	TT23C13	Digital Marketing and e-Business	T	3-0-0	3	3
10	TT23038	Enterprise Resource Planning for Apparel Industry	T	0-0-6	6	3
11	TT23C12	Business Analytics	T	3-0-0	3	3

LIST OF EMERGING TECHNOLOGY COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	TT23E01	Web Designing for Textiles	ETC	3	0	0	3	3
2.	TT23E02	UX & UI Designing for Textiles	ETC	3	0	0	3	3
3.	TT23E03	Digital Printing	ETC	2	0	2	4	3
4.	TT23E04	3D Weaving	ETC	3	0	0	3	3
5.	TT23E05	Artificial Intelligence and Machine Learning Fundamentals	ETC	2	0	2	4	3
6.	TT23E06	IoT Concepts and Applications	ETC	2	0	2	4	3
7.	TT23E07	Data Science Fundamentals	ETC	2	0	2	4	3
8.	TT23E08	Augmented Reality /Virtual Reality	ETC	2	0	2	4	3

LIST OF SKILL BASED COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	TT23S01	Computer Aided Fabric Designing	SDC	0	0	4	4	2
2.	TT23S02	Professional Development	SDC	0	0	4	4	2
3.	TT23S03	Fashion Photography	SDC	0	0	4	4	2
4.	TT23S04	Surface Ornamentation of Apparels	SDC	0	0	4	4	2
5.	TT23S05	Composite Making and Testing	SDC	0	0	4	4	2
6.	TT23S06	Repurposing of Textile Materials	SDC	0	0	4	4	2

COURSES OFFERED AS OPEN ELECTIVE

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	TT23901	Basics of Textile Technology	OEC	3	0	0	3	3

COURSES OFFERED FOR LATERAL ENTRY/B.Sc. STUDENTS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME23C03	Engineering Mechanics	ESC	3	1	0	4	4
2.	ME23C01	Engineering Drawing & 3D Modelling	SDC	2	0	4	6	4

COURSES OFFERED FOR LATERAL ENTRY/DIPLOMA STUDENTS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME23C03	Engineering Mechanics	ESC	3	1	0	4	4
2.	CY23C03	Chemistry for Technologists	HSMC	3	0	0	3	3

EN23C01 **FOUNDATION ENGLISH** **L T P C**
2 0 2 3

OBJECTIVES:

- To develop students' foundational skills in reading, writing, grammar and vocabulary to enable them to understand and produce various forms of communication.
- To enhance students' proficiency in reading comprehension, narrative and comparative writing.
- To comprehend and analyse descriptive texts and visual images
- To articulate similarities and differences in oral and written forms.
- To improve students' proficiency in reading and writing formal letters and emails.

UNIT I BASICS OF COMMUNICATION 6

Reading - Telephone message, bio-note; Writing – Personal profile; Grammar – Simple present tense, Present continuous tense, wh-questions, indirect questions; Vocabulary – Word formation (Prefix and Suffix).

LAB ACTIVITY: 6

Listening – Telephone conversation; Speaking Self-introduction; Telephone conversation – Video conferencing etiquette

UNIT II NARRATION 6

Reading – Comprehension strategies - Newspaper Report, An excerpt from an autobiography; Writing – Narrative Paragraph writing (Event, personal experience etc.); Grammar – Subject-verb agreement, Simple past, Past continuous Tenses; Vocabulary – One-word substitution

LAB ACTIVITY: 6

Listening – Travel podcast; Speaking – Narrating and sharing personal experiences through a podcast

UNIT III DESCRIPTION 6

Reading – A tourist brochure, Travel blogs, descriptive article/excerpt from literature, visual images; Writing –Descriptive Paragraph writing, Grammar – Future tense, Perfect tenses, Preposition; Vocabulary – Descriptive vocabulary

LAB ACTIVITY: 6

Listening – Railway / Airport Announcements, Travel Vlogs; Speaking – Describing a place or picture description

UNIT IV COMPARE AND CONTRAST 6

Reading – Reading and comparing different product specifications - Writing – Compare and Contrast Essay, Coherence and cohesion; Grammar – Degrees of Comparison; Vocabulary – Transition words (relevant to compare and contrast)

LAB ACTIVITY: 6

Listening – Product reviews, Speaking – Product comparison based on product reviews - similarities and differences

UNIT V EXPRESSION OF VIEWS 6

Reading – Formal letters, Letters to Editor ; Writing – Letter writing/ Email writing (Enquiry / Permission, Letter to Editor); Grammar – Compound nouns, Vocabulary – Synonyms, Antonyms

LAB ACTIVITY: 6

Listening – Short speeches; Speaking – Making short presentations (JAM)

TOTAL: 60 PERIODS

TEACHING METHODOLOGY

Interactive lectures, role plays, group discussions, listening and speaking labs, technology enabled language teaching, flipped classroom.

EVALUATION PATTERN

Internal Assessment

Written assessments

Assignment

Lab assessment

Listening

Speaking

External Assessment

End Semester Examination

LEARNING OUTCOMES

By the end of the courses, students will be able to

- Use appropriate grammar and vocabulary to read different types of text and converse appropriately.
- Write coherent and engaging descriptive and comparative essay writing.
- Comprehend and interpret different kinds of texts and audio visual materials
- Critically evaluate reviews and articulate similarities and differences
- Write formal letters and emails using appropriate language structure and format

TEXT BOOKS:

1. “English for Engineers and Technologists” Volume I by Orient Blackswan, 2022

2. “English for Science & Technology - I” by Cambridge University Press, 2023

REFERENCES

1. “Interchange” by Jack C.Richards, Fifth Edition, Cambridge University Press, 2017.

2. “English for Academic Correspondence and Socializing” by Adrian Wallwork, Springer, 2011.

3. “The Study Skills Handbook” by Stella Cortrell, Red Globe Press, 2019

4. www.uefap.com

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										√		√
CO2										√		
CO3										√		√
CO4										√		
CO5										√		√

MA23C01	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques in solving practical problems.
- To familiarize the student with functions of several variables.
- To solve integrals by using Beta and Gamma functions.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.
- To acquaint the students with the concepts of vector calculus which naturally arise in many engineering problems.

UNIT I MATRICES **9+3**

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors- Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form.

UNIT II FUNCTIONS OF SEVERAL VARIABLES **9+3**

Limit, continuity, partial derivatives – Homogeneous functions and Euler's theorem - Total derivative – Differentiation of implicit functions – Jacobians -Taylor's formula for two variables - Errors and approximations – Maxima and Minima of functions of two variables – Lagrange's method of undermined multipliers.

UNIT III INTEGRAL CALCULUS **9+3**

Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions-Properties – Evaluation of single integrals by using Beta and Gamma functions..

UNIT IV MULTIPLE INTEGRALS **9+3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals-
Evaluation of double and triple integrals by using Beta and Gamma functions.

UNIT V VECTOR CALCULUS **9+3**

Gradient of a scalar field, directional derivative – Divergence and Curl – Solenoidal and Irrotational vector fields - Line integrals over a plane curve - Surface integrals – Area of a curved surface – Volume Integral - Green's theorem, Stoke's and Gauss divergence theorems (without proofs)– Verification and applications in evaluating line, surface and volume integrals.

TOTAL: 60 PERIODS

Laboratory based exercises / assignments / assessments will be given to students wherever applicable from the content of the course.

General engineering applications / branch specific applications from the content of each units wherever possible will be introduced to students.

Suggested Laboratory based exercises / assignments / assessments :

Matrices

1. Finding eigenvalues and eigenvectors
2. Verification of Cayley-Hamilton theorem
3. Eigenvalues and Eigenvectors of similar matrices
4. Eigenvalues and Eigenvectors of a symmetric matrix
5. Finding the powers of a matrix
6. Quadratic forms

Functions of Several Variables

1. Plotting of curves and surfaces
2. Symbolic computation of partial and total derivatives of functions

Integral Calculus

1. Evaluation of beta and gamma functions
2. Computation of error function and its complement

Multiple Integrals

1. Plotting of 3D surfaces in Cartesian and Polar forms

Vector Calculus

1. Computation of Directional derivatives
2. Computation of normal and tangent to the given surface

COURSE OUTCOMES:

CO 1 :Use the matrix algebra methods for solving practical problems.
CO 2 :Use differential calculus ideas on several variable functions.
CO 3 :Apply different methods of integration in solving practical problems by using Beta and Gamma functions.
CO 4 :Apply multiple integral ideas in solving areas and volumes problems.
CO 5 :Apply the concept of vectors in solving practical problems.

TEXT BOOKS:

1. Joel Hass, Christopher Heil, Maurice D.Weir "'Thomas' Calculus", Pearson Education., New Delhi, 2018.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 45th Edition, New Delhi, 2020.
3. James Stewart, Daniel K Clegg & Saleem Watson "Calculus with Early Transcendental Functions", Cengage Learning, 6th Edition, New Delhi,2023.

REFERENCES:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Pvt Ltd., New Delhi, 2018.
2. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5th Edition, New Delhi, 2017.
4. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012.
6. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

Course Articulation Matrix:

Course Outcomes	PROGRAMME OUTCOMES											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1 :	3	3	2	3	1	2	1	1	1	1	1	3
CO2 :	3	3	2	3	1	2	1	1	1	1	1	3
CO3 :	3	3	2	3	1	2	1	1	1	1	1	3
CO4 :	3	3	2	3	1	2	1	1	1	1	1	3
CO5 :	3	3	2	3	1	2	1	1	1	1	1	3

CY23C01 ENGINEERING CHEMISTRY L T P C

3 0 2 4

UNIT I WATER TECHNOLOGY

Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD, BOD, and heavy metals. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, Calgon, and carbonate treatment. External conditioning – demineralization. Municipal water treatment (screening, sedimentation, coagulation, filtration, disinfection-ozonolysis, UV treatment, chlorination), Reverse Osmosis – desalination.

PRACTICAL:

- Estimation of HCl using Na_2CO_3 as the primary standard
- Determination of alkalinity in the water sample.
- Determination of hardness of water by EDTA method.
- Determination of DO content of water sample by Winkler's method.

UNIT II NANOCHEMISTRY

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical, magnetic and catalytic). Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro-spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Applications of nanomaterials – medicine including AYUSH, automobiles, electronics, and cosmetics.

PRACTICAL:

- Preparation of nanoparticles by Sol-Gel method/sonication method.
- Preparation of nanowire by Electrospinning.
- Study of morphology of nanomaterials by scanning electron microscopy

UNIT III CORROSION SCIENCE

Introduction to corrosion – chemical and electrochemical corrosions – mechanism of electrochemical and galvanic corrosions – concentration cell corrosion-soil, pitting, inter-granular, water line, stress and microbiological corrosions-galvanic series-factors influencing corrosion- measurement of corrosion rate. Electrochemical protection – sacrificial anodic protection and impressed current cathodic protection. Protective coatings-metallic coatings (galvanizing, tinning), organic coatings (paints). Paints: Constituents and functions.

PRACTICAL:

- Corrosion experiment-weight loss method.
- Salt spray test for corrosion study.
- Corrosion prevention by electroplating.
- Estimation of corroded Iron by Potentiometry/UV-visible spectrophotometer

UNIT IV ENERGY SOURCES

Electrochemical cell, redox reaction, electrode potential – oxidation and reduction potential. Batteries – Characteristics; types of batteries; primary battery (dry cell), secondary battery (lead acid, lithium-

ion battery) and their applications. Emerging energy sources – metal hydride battery, hydrogen energy, Fuel cells – H_2-O_2 fuel cell. Supercapacitors –Types and Applications, Renewable Energy: solar heating and solar cells. Recycling and disposal of batteries.

PRACTICAL:

- Study of components of Lead acid battery.
- Measurement of voltage in a photovoltaic cell.
- Working of H_2 – O_2 fuel cell

UNIT V POLYMER CHEMISTRY

Introduction: Functionality-degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces). Mechanism of free radical addition polymerization. Properties of polymers: Tg, tacticity, molecular weight-number average, weight average, viscosity average and polydispersity index (Problems). Techniques of polymerization: Bulk, emulsion, solution and suspension. Compounding and Fabrication Techniques: Injection, Extrusion, Blow and Calendaring. Polyamides, Polycarbonates and Polyurethanes – structure and applications. Recycling of polymers.

PRACTICAL:

- Determination of molecular weight of a polymer using Ostwald viscometer.
- Preparation of a polymer.
- Determination of molecular weight by Gel Permeation Chromatography.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

CO1: To demonstrate knowledge of water quality in various industries and develop skills in analyzing water quality parameters for both domestic and industrial purposes.

CO2: To identify and apply fundamental concepts of nanoscience and nanotechnology for engineering and technology applications, and to develop skills in synthesizing nanomaterials and studying their morphology.

CO3: To apply fundamental knowledge of corrosion protection techniques and develop skills to conduct experiments for measuring and preventing corrosion.

CO4: To study the fundamentals of energy storage devices and develop skills in constructing and experimenting with batteries.

CO5: To recognize and apply basic knowledge of different types of polymeric materials and develop skills in preparing and determining their applications for futuristic material fabrication needs.

TEXT BOOKS:

1. Jain P. C. & Monica Jain., “Engineering Chemistry”, 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. Dara S.S., “A Textbook of Engineering Chemistry”, Chand Publications, 2004.
4. Laboratory Manual - Department of Chemistry, CEGC, Anna University (2023).

REFERENCES:

1. Schdeva M.V., “Basics of Nano Chemistry”, Anmol Publications Pvt Ltd, 2011.
2. Friedrich Emich, “Engineering Chemistry”, Medtech, 2014.
3. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, “Polymer Science” New AGE International Publishers, 2009.
4. Vogel’s Textbook of Quantitative Chemical Analysis (8th edition, 2014).

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	3	-	-	-	-	-
CO2	3	-	2	-	2	-	3	-	-	-	-	-
CO3	3	3	2	-	2	-	3	-	-	-	-	-
CO4	3	3	-	-	-	-	3	-	-	-	-	-
CO5	3	-	-	-	-	-	3	-	-	-	-	-
Avg	3	3	2	-	2	-	3	-	-	-	-	-

1’ = Low; ‘2’ = Medium; ‘3’ = High

CS23C02 **COMPUTER PROGRAMMING IN PYTHON**

L	T	P	C
3	0	2	4

OBJECTIVES:

- To understand fundamental structural programming concepts and problem-solving process.
- To solve problems using modular programming and decomposition techniques.
- To solve problems using data structures and abstraction techniques.
- To create programming solutions using libraries and packages.
- To design solutions to domain problems using programming problem-solving techniques.

UNIT I – STRUCTURED PROGRAMMING **9+6**

Problem-Solving Strategies. Basic Problem-Solving Tools: Flowcharts, Pseudocode. Introduction to Programming Languages and Development Environments. Programming. Basic Concepts and Syntax: Variables, Identifiers, Data Types: Primitive Types and Strings, Statements, Operators, Expressions and its evaluation, Operator Precedence, Basic Arithmetic Operations. Principles of Structured Programming – Control Structures: Sequence, Selection, Iteration and Branching.

PRACTICALS:

- Design algorithms for simple computational problems
- Create Pseudo-code and Flow charts for simple computational problems
- Create Python programs using simple and nested selective control statements
- Create Python programs using simple and nested sequence & iterative control statements
- Create Python programs to generate series/patterns using control statements

UNIT II – MODULARITY AND DECOMPOSITION **9+6**

Principles of Modular and Decomposition. Functions: Defining functions –Argument types – Function Name-spaces – Scoping: Global and Non-local. Principles of Recursion: Base case and Recursive cases – Develop and Analyze Recursive functions: Factorial, Fibonacci. Principles of First-Class and Higher-Order functions: Lambda functions – Functions as arguments.

PRACTICALS:

- Create Python programs using functions
- Create python program using recursion
- Create Python programs using lambda functions
- Create Python programs using first-class functions
- Create Python programs using higher-order functions

UNIT III – DATA STRUCTURES AND ABSTRACTIONS **9+6**

Principles of Data Structures and Abstractions. String Methods and Manipulations,.Lists: List Operations and Methods, List comprehensions, Nested List comprehensions, Matrix operations using Lists. Tuples and sequences. Sets and Operations. Dictionaries: Dictionary operations, Dictionary comprehensions, Nested Dictionary comprehensions. Comparing Data Structures. Search and Sort Data Structures. Principle of Functional Programming and Tools : map, filter, and reduce.

PRACTICALS:

- Create Python programs for strings manipulations.
- Design Python programs using Lists, Nested Lists and Lists comprehensions
- Create Python programs using Tuples, Nested Tuples, and Tuple comprehensions
- Create Python programs creating Sets and performing set operations
- Create Python programs using Dictionary, Nested Dictionary and comprehensions
- Create Python programs by applying functional programming concepts

UNIT IV – LIBRARIES AND MODULES **9+6**

Exceptions: Syntax errors, Exceptions, Exception types, Handling exceptions, Raising exceptions. Files: File Path, Type of files, opening modes, Reading and Writing text files, Handling other format Data files. Modules: Creating Modules, import and from statements, Executing modules as scripts, Standard modules. Packages and Importing from packages

PRACTICALS:

- Design Python programs to handle errors and exceptions
- Create, import, and use pre-defined modules and packages
- Create, import, and use user-defined modules and packages
- Create Python programs to perform various operations on text files
- Create Python programs to perform various operations on other data file formats.

UNIT V – SIMPLE PROBLEM SOLVING TECHNIQUES IN PROGRAMMING **9+6**

Data Structures for Problem Solving: Stack, Queue. Principles of Divide and Conquer: Binary Search. Principles of Greedy Algorithms: Minimum Coin Change Problem. Case studies on programming application of problem-solving techniques in different fields of engineering.

PRACTICALS:

- Create python programs to implement stack and queue.
- Create python programs to implement binary search.
- Create python programs to solve minimum coin change problem.
- Case study on developing python solution to a domain specific problems.

TOTAL = 45 + 30 = 75 PERIODS

COURSE OUTCOMES

1. Understand fundamental structural programming concepts and problem-solving process.
2. Solve problems using modular programming and decomposition techniques.
3. Solve problems using data structures and abstraction techniques.
4. Create programming solutions using libraries and packages.
5. Design solutions to domain problems using programming problem-solving techniques.

TEXT BOOKS

1. Reema Thareja, Python Programming using Problem Solving Approach, Oxford University
   Press, First Edition, 2017.
2. S. Sridhar, J. Indumathi, V. M. Hariharan, Python Programming, Pearson Education, First Edition, 2023

REFERENCE BOOKS

1. Paul Deitel, Harvey Deitel, Python for Programmers, Pearson Education, 2020.
2. John V Guttag. Introduction to Computation and Programming Using Python, With Application to Computational Modeling and Understanding Data. Third Edition, The MIT Press, 2021
3. Mark Lutz, Learning Python, 5th Edition, O'Reilly Media, Inc.
4. Python official documentation and tutorial, https://docs.python.org/3/
5. Numerical Python official documentation and tutorial, https://numpy.org/

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	POS	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2		2		1								1	1	
2	2		2		1								1	1	
3	2	1	2		1								1	1	
4	2	1	2	1	1								1	1	
5	2	1	2	1	1								1	1	
Avg	2	1	2	1	1								1	1	

1 - low, 2 - medium, 3 - **high,** '-' - **no correlation**

EE23C03	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		2	0	2	3

UNIT-I BASIC ELECTRICAL CIRCUITS **6**

Basic Elements: R,L,C- DC Circuits: Ohm's Law - Kirchhoff's Laws –Mesh and Nodal Analysis(Only Independent Sources). AC Circuits: Average Value, RMS Value, Impedance Instantaneous Power, Real Power, Reactive Power and Apparent Power, Power Factor-Steady state Analysis of RL,RC and RLC circuits.

UNIT II AC AND DC MACHINES 6

Magnetic Circuit Fundamentals -DC Machines - Construction and Working Principle, Types and Application of DC generator and Motor, EMF and Torque Equation.
AC Machines: Principle, Construction, Working and Applications of Transformer -Three phase Alternator - Three Phase Induction Motor.

UNIT III ANALOG AND DIGITAL ELECTRONICS 6

Operation and Characteristics of electronic devices: PN Junction Diodes, Zener Diode and BJT Applications: Diode Bridge Rectifier and Shunt Regulator.
Introduction to Digital Electronics: Basics Logic Gates-Flip Flops.

UNIT IV SENSORS AND TRANSDUCERS 6

Solenoids, electro-pneumatic systems, proximity sensors, limit switches, Strain gauge, LVDT, Piezo electric transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

UNIT V MEASUREMENTS AND INSTRUMENTATION 6

Functional Elements of an Instrument, Operating Principle of Moving Coil and Moving Iron Instruments,Power Measurement, Energy Meter, Instrument Transformers - CT and PT, Multimeter-DSO - Block Diagram Approach.

TOTAL 30

LAB COMPONENET:

1. Verification of ohms and Kirchhoff's Laws.
2. Load test on DC Shunt Motor.
3. Load test on Single Phase Transformer.
4. Load test on 3 Phase Induction Motor.
5. Uncontrolled diode bridge Rectifiers.
6. Application of Zener diode as shunt regulator.
7. Verification of truth table of logic gates and flip flops.
8. Characteristics of LVDT.
9. Three phase power measurement using two wattmeter method.
10. Study of DSO.

COURSE OUTCOMES:

Students will be able to

CO1 Compute the electric circuit parameters for simple circuits.

CO2 Understand the working principles and characteristics of electrical machines.

CO3 Understand the basic electronic devices.

CO4 Understand the basic operating principles of sensors and transducer.

CO5 Understand the operating principles measuring devices

TEXT BOOKS:

1. Kotharai DP and Nagarath IJ, “Basic Electrical and Electronics Enigneering”, McGraw Hill Education, Second Edition, 2020.
2. Bhattacharya SK, “Basic Electrical and Electronics Engineering”, Pearson Education, Second Edition, 2017.

REFERENCES:

1. Mehta V.K. & Mehta Rohit, “Principles of Electrical Engineering and Electronics”, McGraw Hill Education, Second Edition, 2020.
2. Mehta V.K. & Mehta Rohit, “Principles of Electrical Machines”, S. Chand Publishing, second edition 2006.
3. Albert Malvino & David Bates, “Electronic principles”, McGraw Hill Education, Seventh Edition, 2017.

Course Articulation Matrix:

COs	Pos												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1														
CO2	2	1														
CO3	2	1														
CO4	2	1														
CO5	2	1														
Avg	2	1														

ME23C03 **ENGINEERING MECHANICS** **L T P C**

3 1 0 4

OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Determining the resultant forces acting on a particle in 2D and 3D and for applying methods of equilibrium on a particle in 2D and 3D.
- Evaluating the reaction forces for bodies under equilibrium, for determining the moment of a force, moment of a couple, for resolving force into a force-couple system and for analyzing trusses
- Assessing the centroids of 2D sections / center of gravity of volumes and for calculating area moments of inertia for the sections and mass moment of inertia of solids.
- Evaluating the frictional forces acting at the contact surfaces of various engineering systems and for applying the work-energy principles on a particle.
- Determining kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I STATICS OF PARTICLES 9+3

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES AND TRUSSES 9+3

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections – Analysis of Trusses – Method of Joints and Method of Sections.

UNIT III DISTRIBUTED FORCES 9+3

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION AND WORK PRINCIPLES 9+3

The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction. Rolling Resistance, Ladder friction. Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy,

Principle of Impulse and Momentum, Impact, Method of Virtual Work - Work of a Force, Potential Energy, Potential Energy and Equilibrium.

UNIT V DYNAMICS OF PARTICLES AND RIGID BODIES 9+3

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods – Kinematics of Rigid Bodies and Plane Kinetics.

TOTAL : 60 Periods

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

1. To determine the resultant forces acting on a particle in 2D and 3D and to apply methods of equilibrium on a particle in 2D and 3D.
2. Evaluate the reaction forces for bodies under equilibrium, to determine moment of a force, moment of a couple, to resolve force into a force-couple system and to analyze trusses
3. Assess the centroids of 2D sections / center of gravity of volumes and to calculate area moments of inertia for the sections and mass moment of inertia of solids.
4. Evaluate the frictional forces acting at the contact surfaces of various engineering systems and apply the work-energy principles on a particle. evaluate the kinetic and kinematic parameters of a particle.
5. Determine kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12th Edition, 2019.

2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

Course Articulation Matrix:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	3									3		
2	3	3	2	3									3		
3	3	3	2	3									3		
4	3	3	2	3									3		
5	3	3	2	3									3		
Avg	3	3	2	3									3		

UC23H01	*தமிழர் மரபு*	L	T	P	C
		1	0	0	1

அலகு I **மொழி மற்றும் இலக்கியம்** **3**

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை** **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III ***நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்*:** **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV ***தமிழர்களின் திணைக் கோட்பாடுகள்*:** **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V ***இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு*:** **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCEBOOKS

1. *தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை* (*வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்*).
2. *கணினித் தமிழ் – முனைவர் இல. சுந்தரம்.* (*விகடன் பிரசுரம்*).
3. *கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்* (*தொல்லியல் துறை வெளியீடு*)
4. *பொருநை – ஆற்றங்கரை நாகரிகம்.* (*தொல்லியல் துறை வெளியீடு*)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

UC23H01 **HERITAGE OF TAMILS** **L T P C**
1 0 0 1

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India-Dravidian Languages–Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - TamilEpicsandImpactofBuddhism&JainisminTamilLand-BakthiLiteratureAzhwarsandNayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyarand Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts-Art of temple car making - Massive Terracotta sculptures, Villagedeities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments-Mridhangam,Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAICONCEPTOFTAMILS 3

Flora and Fauna of Tamils&AhamandPuramConceptfromTholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import duringSangamAge -Overseas Conquestof Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils toIndian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - RoleofSiddhaMedicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCEBOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

NCC Credit Course Level 1*

UC23P01	(ARMY WING) NCC Credit Course Level - I	L	T	P	C
		2	0	0	2

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour 'Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

NCC Credit Course Level 1*

UC23P02	(NAVAL WING) NCC Credit Course Level – I	L	T	P	C
		2	0	0	2

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

NCC Credit Course Level 1*

UC23P03	**(AIR FORCE WING) NCC Credit Course Level – I**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**2**

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

EN23C02 PROFESSIONAL COMMUNICATION L T P C
2 0 2 3

OBJECTIVES:

- To read and comprehend different forms of official texts.
- To develop students' writing skills in professional context.
- To actively listen, read and understand written and oral communication in a professional context.
- To comprehend and analyse the visual content in authentic context.
- To write professional documents with clarity and precision

UNIT I CAUSE AND EFFECT 6

Reading – Newspaper articles on Social and Environmental issues; Writing – Instructions, Cause and effect essay; Grammar - Modal verbs; Vocabulary – Cause and effect, Idioms

LAB ACTIVITY: 6

Listening and Speaking – Listen to news reports and summarise in oral form.

UNIT II CLASSIFICATION 6

Reading – An article, social media posts and classifying based on the content; Writing – Definition, Note making, Note taking (Cornell notes etc.) and Summarising; Grammar – Connectives; Vocabulary – Phrasal verbs

LAB ACTIVITY: 6

Listening and speaking: Social interaction (Conversation including small talk)

UNIT III PROBLEM AND SOLUTION 6

Reading – Visual content (Tables/charts/graphs) for comprehension; Writing - Problem and Solution Essay; Grammar – If conditionals; Vocabulary – Sequential words.

LAB ACTIVITY: 6

Listening – Group discussion; Speaking – Participating in a group discussion

UNIT IV REPORT 6

Reading – Formal report on accidents (industrial/engineering); Writing – Industrial Accident report; Grammar – Active and passive voice, Direct and Indirect speech; Vocabulary – Numerical adjectives.

LAB ACTIVITY: 6

Listening / watching – Television documentary and discussing its content, purpose etc.

UNIT V JOB APPLICATION AND INTERVIEW 6

Reading - Job advertisement and company profile; Writing – Job application (cover letter and CV) Grammar – Mixed Tenses; Vocabulary – Collocations related to work environment

LAB ACTIVITY: 6

Listening – Job interview; Speaking – Mock interviews

TOTAL: 60 PERIODS

TEACHING METHODOLOGY

Interactive lectures, role plays, group discussions, listening and speaking labs, technology enabled language teaching, flipped classroom.

EVALUATION PATTERN

Internal Assessment

Written assessments

Assignment

Lab Assessment

Group discussion (Peer assessment)

Listening

External Assessment

End Semester Examination

LEARNING OUTCOMES

By the end of the courses, students will be able to

- To apply appropriate language structure and vocabulary to enhance both spoken and written communication in formal contexts.
- Comprehend different forms of official documents
- Write professional documents coherently and cohesively.
- Interpret verbal and graphic content in authentic context
- Analyse and evaluate verbal and audio visual materials.

TEXT BOOKS:

1. “English for Engineers and Technologists” Volume 2 by Orient Blackswan, 2022

2. “English for Science & Technology - II” by Cambridge University Press, 2023.

REFERENCES:

1. “Communicative English for Engineers and Professionals” by Bhatnagar Nitin, Pearson India, 2010.

2. ”Take Off – Technical English for Engineering” by David Morgan, Garnet Education, 2008. 3. “Advanced Communication Skills” by Mathew Richardson, Charlie Creative Lab, 2020.

4. www.uefap.com

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										√		√
CO2										√		√
CO3										√		√
CO4										√		√
CO5										√		√

MA23C02	ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To acquaint the students with Differential Equations which are significantly used in engineering problems.
- To make the students to understand the Laplace transforms techniques.
- To develop the analytic solutions for partial differential equations used in engineering by Fourier series.
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic.
- To develop Z- transform techniques in solving difference equations.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 9+3

Homogeneous linear ordinary differential equations of second order -superposition principle - general solution- Particular integral - Operator method - Solution by variation of parameters - Method of undetermined coefficients - Homogeneous equations of Euler–Cauchy and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II LAPLACE TRANSFORMS 9+3

Existence theorem - Transform of standard functions – Transform of Unit step function and Dirac delta function – Basic properties - Shifting theorems - Transforms of derivatives and integrals – Transform of periodic functions - Initial and Final value theorem - Inverse Laplace transforms- Convolution theorem (without proof) – Solving Initial value problems by using Laplace Transform techniques.

UNIT III FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Computation of harmonics.

UNIT IV FOURIER TRANSFORMS 9+3

Fourier integral theorem – Fourier transform pair - Fourier sine and cosine transforms – Properties – Transform of elementary functions – Inverse Fourier Transforms - Convolution theorem (without proof) – Parsevals's identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9+3

Z-transform – Properties of Z-transform – Inverse Z-transform – Convolution theorem – Evaluation of Inverse Z transform using partial fraction method and convolution theorem - Initial and final value theorems – Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

Laboratory based exercises / assignments / assessments will be given to students from the content of the course wherever applicable.

Branch specific / General Engineering applications based on the content of each units will be introduced to students wherever possible.

Suggested Laboratory based exercises / assignments / assessments :

Ordinary differential equations

1. Symbolic computation of linear ordinary differential equations
2. Solving System of simultaneous linear differential equations using ODE SOLVER

Laplace transforms

1. Symbolic computation of Laplace transform and Inverse Laplace transform
2. Plotting Laplace transforms

Fourier Series

1. Symbolic computation of Fourier Coefficients
2. Computation of harmonics
3. Plotting truncated Fourier Series

Fourier Transform

1. Symbolic computation of Fourier Transforms
2. Plotting truncated Fourier Transforms

Z – transform

1. Symbolic computation of Z-Transforms

TEXT BOOKS:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, 45th Edition, New Delhi, 2020.

2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Pvt Ltd., New Delhi, 2018

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008

2. Greenberg M.D., “Advanced Engineering Mathematics”, Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
3. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”,Narosa Publications, 5 th Edition, New Delhi, 2017.
4. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012.
5. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

COURSE OUTCOMES:

CO1 :Solve higher order ordinary differential equations which arise in engineering applications.
CO2 :Apply Laplace transform techniques in solving linear differential equations.
CO3 :Apply Fourier series techniques in engineering applications.
CO4 :Understand the Fourier transforms techniques in solving engineering problems.
CO5 :Understand the Z-transforms techniques in solving difference equations.

Course Articulation Matrix:

Course Outcomes	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO 1 :	3	3	2	3	1	2	1	1	1	1	1	3
CO 2 :	3	3	2	3	1	2	1	1	1	1	1	3
CO 3 :	3	3	2	3	1	2	1	1	1	1	1	3
CO 4 :	3	3	2	3	1	2	1	1	1	1	1	3
CO 5 :	3	3	2	3	1	2	1	1	1	1	1	3

PH23C01	ENGINEERING PHYSICS	L	T	P	C
	(Common to all branches of B.E/B.Tech Programmes)	3	0	2	4

OBJECTIVES

- To familiarize with crystal structure, bonding and crystal growth.
- To impart knowledge on Mechanics of Materials.
- To impart knowledge of oscillations, sound and Thermal Physics
- To facilitate understanding of optics and its applications, different types of Lasers and fiber optics.
- To introduce the basics of Quantum Mechanics and its importance.

UNIT I CRYSTAL PHYSICS 9+6

Crystal Bonding – Ionic – covalent – metallic and van der Walls's/ molecular bonding. Crystal systems - unit cell, Bravais lattices, Miller indices - Crystal structures - atomic packing density of BCC, FCC and HCP structures. NaCl, Diamond, Graphite, Graphene, Zincblende and Wurtzite structures - crystal imperfections- point defects - edge and screw dislocations – grain boundaries. Crystal Growth – Czocharalski method – vapor phase epitaxy – Molecular beam epitaxy- Introduction to X-Ray Diffractometer.

1. Determination of Lattice parameters for crystal systems.
2. Crystal Growth – Slow Evaporation method
3. Crystal Growth Sol – Gel Method

UNIT II MECHANICS OF MATERIALS 9+6

Rigid Body – Centre of mass – Rotational Energy - Moment of inertia (M.I)- Moment of Inertia for uniform objects with various geometrical shapes. Elasticity –Hooke's law - Poisson's ratio - stress-strain diagram for ductile and brittle materials – uses- Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young's modulus determination - I shaped girders –Twisting couple – Shafts. Viscosity – Viscous drag – Surface Tension.

1. Non-uniform bending -Determination of Young's modulus of the material of the beam.
2. Uniform bending -Determination of Young's modulus of the material of the beam
3. Viscosity – Determination of Viscosity of liquids.

UNIT III OSCILLATIONS, SOUND AND THERMAL PHYSICS 9+6

Simple harmonic motion - Torsional pendulum –- Damped oscillations –Shock Absorber -Forced oscillations and Resonance –Applications of resonance.- Waves and Energy Transport –Sound waves – Intensity level – Standing Waves - Doppler effect and its applications - Speed of blood flow. Ultrasound – applications - Echolocation and Medical Imaging. Thermal Expansion – Expansion joints – Bimetallic strip – Seebeck effect – thermocouple -Heat Transfer Rate – Conduction – Convection and Radiation.

1. Torsional pendulum-Determination of rigidity modulus of wire and moment of inertia of the disc
2. Melde's string experiment - Standing waves.
3. Ultrasonic interferometer – determination of sound velocity and liquids compressibility

UNIT IV OPTICS AND LASERS 9+6

Interference - Thin film interference - Air wedge- Applications -Interferometers–Michelson Interferometer –– Diffraction - CD as diffraction grating – Diffraction by crystals -Polarization - polarizers –– Laser – characteristics – Spontaneous and Stimulated emission- population – inversion - Metastable states - optical feedback - Nd-YAG laser, CO_2 laser, Semiconductor laser - Industrial and medical applications -

Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication – Fiber sensors – Fiber lasers.

1. Laser - Determination of the width of the groove of the compact disc using laser.
   Laser Parameters
   Determination of the wavelength of the laser using grating
2. Air wedge -Determination of the thickness of a thin sheet/wire
3. Optical fibre - Determination of Numerical Aperture and acceptance angle
   -Determination of bending loss of fibre.
4. Michelson Interferometer (Demonstration)

UNIT V QUANTUM MECHANICS 9+6

Black body radiation (Qualitative) – Planck's hypothesis – Einstein's theory of Radiation - Matter waves– de Broglie hypothesis - Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Meaning and Physical significance of wave function - Normalization - Particle in an infinite potential well-particle in a three-dimensional box - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope.

1.Photoelectric effect – Determination of Planck's constant.
2.Black Body Radiation (Demonstration)
3.Electron Microscope (Demonstration)

TOTAL: 75 PERIODS

COURSE OUTCOMES:

After completion of the course, the students will be able to

CO1: Understand the significance of crystal structure and bonding. Learn to grow crystals.
CO2: Obtain knowledge on important mechanical and thermal properties of materials and determine them through experiments.
CO3: Conceptualize and visualize the oscillations and sound.
CO4: Grasp optical phenomenon and their applications in real life.
CO5: Appreciate and evaluate the quantum phenomenon.
CO6 Develop skill set to solve engineering problems and design experiments.

TEXT BOOKS:

1. Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2013.
2. D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley & Sons, 10th Edition, 2015.
3. N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer-Verlag, 2012.
4. Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, 2012.

REFERENCES:

1. R. Wolfson, Essential University Physics. Volume 1 & 2. Pearson, 2016.
2. D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 2017.

Course Articulation Matrix:

	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO 12
CO1	3	2	1		1							
CO2	3	2	1	1								
CO3	3	2	1	1								
CO4	3	2	1	1	1							
CO5	3	2	1	1	1							
CO6	3	2	1	2								

ME23C01	ENGINEERING DRAWING AND 3D MODELING	L	T	P	C
		2	0	4	4

INTRODUCTION

Manual drawing tools (Mini Drafter, Set Squares, Protractor, Compass, and different grades of pencil). **'**BIS' specifications and rules of Engineering Drawing – Arrows (2H thin line body, HB Filled head and L:W = 3:1 ratio), lettering (Digital fonts, font sizes pertaining to usage and representation), types of line and their syntax (Drawing based – Continuous thin & thick, dashed, dashed dotted and Application based – extension, dimensioning, construction, projection, reference, axis, section, hatching, and break lines), scaling (up, down and equal), and dimensioning. Placing and positioning the 'A3' size drawing sheet over the drawing table. Principal planes and projection, Division of line and circle in to equal parts, and construction of polygons

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UNIT 1: ENGINEERING CURVES, PROJECTION OF POINTS AND LINES

Construction of conic curves with their tangent and normal – ellipse, parabola, and hyperbola by eccentricity method

Construction of special curves with their tangent and normal – cycloid, epicycloid, and involute

Projection of points and I angle projection of lines inclined to both principal planes by rotating line method and trapezoidal rule – marking their traces.

Lab exercises: Study exercise – Introduction to Sketching (or) Drawing, and modification tools in CAD software (AutoCAD, CREO, CATIA, Solid Works, Inventor, Fusion 360)

(6+12 = 18 Hours)

Activities based learning: Identification of the curves used in the application given in the flash card, demonstration of the instantaneous centre of rotation of governors with respect to angle of inclination of the arms of the governors

UNIT 2: PROJECTION OF SURFACES & SOLIDS, AND 2D MODELING

Projection of surfaces inclined to both the principal planes – polygonal, trapezoidal, rhomboidal and circular

Projection of solids – prisms, pyramids, and axisymmetric solids when the axis inclined to both the principal planes – freely hanging – contour resting condition on either of the planes by rotating object method

Lab exercises: Construction of basic sketches – lines, circle, polygon, spline curves, coils, along with dimensioning. Familiarizing with geometric constraints and their types

(6+12 = 18 Hours)

Activities based learning: Making the solids using cardboards, shadow mapping and contour drawing at different orientation of the solids using torches

UNIT 3: 3D PROJECTION OF SOLIDS AND 3D MODELING OF SIMPLE PARTS

Free hand sketching – I & III angle projections of engineering parts and components

Isometric projection of combination of solids – prisms, pyramids, axisymmetric solids, frustum

Perspective projection of prisms, pyramids and axisymmetric solids by visual ray method

Lab exercises: 3D Modeling and 2D drafting of machine parts

(6+12 = 18 Hours)

Activities based learning: Flipped classroom for Free hand sketching, Jig saw activity for Isometric projection, arts and crafts for perspective view

UNIT 4: SECTION OF SOLIDS AND SECTIONED DRAFTING OF ASSEMBLED COMPONENTS

Section of simple and hollow solids – prisms, pyramids and axisymmetric solids, solids with holes/ slots when the section plane perpendicular to one principal plane and inclined to other principal plane ('On the axis' and 'from the axis' conditions)

Application based – section of beams (I, T, L, and C), section of pipe bracket, wood joints, composite walls, shells, flange of a coupling and other similar applications

Lab exercises: Assembly of parts with respect to engineering constraints, and sectioned drafting of assembled components

(6+12 = 18 Hours)

Activities based learning: Making of mitered joint in wood, sectioning the beams in different angles of orientation and identifying the true shape

UNIT 5: LATERAL SURFACE DEVELOPMENT AND SHEET METAL DESIGN

Lateral surface development of sectioned solids when the section plane perpendicular to VP and inclined to HP.

Application based – construction of funnel, chimney, dish antenna, door latch, trays, AC vents, lamp shade, commercial packaging boxes with respect to sectioning conditions and other similar applications

Lab exercises: Sheet metal design and drafting, drafting of coils, springs and screw threads

(6+12 = 18 Hours)

Activities based learning: Fabrication of funnels, chimney, lamp shade, boxes using card boards, ply woods, acrylics

Total: 90 Hours

Note: Activities based learning should not be covered in the regular class hours. It should be given as assignments to the group of maximum 3 members

COURSE OBJECTIVES

After successful completion of this course, the students will be able to:

1. Understand and use the engineering curves in engineering applications and projection techniques to construct conic curves, points and lines.
2. Develop skills in projecting surfaces and solids and create 2D models using CAD software.
3. Develop skills in 3D projection and 3D modeling of simple parts manually as well as using CAD software.
4. Understand and apply sectioning techniques to solids and assemble components.
5. Develop skills in lateral surface development and sheet metal design.

COURSE OUTCOMES

After successful completion of the course, the students will be able to:

CO1: Construct and identify different types of conic curves and special curves, and project the points and lines pertaining to engineering applications

CO2: Project and visualize surfaces and solids in different orientations and utilize the CAD tools for designing.

CO3: Create and draft accurate 3D models and 2D drawings of machine parts manually as well as using CAD software

CO4: Determine the true shape of a sectioned solid and draft the assembled parts accordingly

CO5: Develop lateral surfaces of sectioned solids and design sheet metal components

Text book

1. “Engineering Drawing” by N S Parthasarathy and Vela Murali, Oxford University Press; UK ed. Edition, 2015.
2. “Engineering Drawing + Auto CAD” by Venugopal K, V. Prabhu Raja, New Age International Publishers, Sixth edition (1 January 2022).

References

1. "Basic Engineering Drawing: Mechanical Semester Pattern" by Mehta and Gupta, Charotar Publishing House, 2nd edition, 2018.
2. "Engineering Drawing" by Basant Agrawal and C M Agrawal, Vikas Publishing House, 3rd edition, 2020.
3. "Engineering Drawing With Auto CAD" by B V R Gupta, McGraw Hill Education, 4th edition, 2019.
4. "Engineering Drawing" by P S Gill, Tata McGraw Hill Education, 5th edition, 2018.
5. "Engineering Drawing with an Introduction to AutoCAD" by Dhananjay Jolhe, Cengage Learning, 2nd edition, 2020.
6. "Engineering Drawing" by M B Shah, Charotar Publishing House, 3rd edition, 2019
7. "Fundamentals of Engineering Drawing" by Imtiaz Hashmi, Pearson Education, 2nd edition, 2018.
8. "Computer Aided Engineering Drawing" by S Trymbaka Murthy, Scitech Publications, 3rd edition, 2020.
9. "CAED: Computer Aided Engineering Drawing for I/II Semester BE/Btech Courses" by Reddy K B, CBS Publishers & Distributors, 2nd, 2019.
10. "Computer-Aided Engineering Drawing" by Subrata Pal, Oxford University Press, 2nd, 2020.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2		1				3	1		3	3	3	2
2	3	3	2		2				3	2		3	3	3	2
3	3	3	3	1	2				3	3		3	3	3	2
4	3	3	3	1	3				3	3		3	3	3	2
5	3	3	3	1	3				3	3		3	3	3	2

ME23C04	MAKERSPACE	L	T	P	C
		1	0	4	3

OBJECTIVES:

1. To practice the usage of various tools towards assembly and dis-assembly of different items / equipment.
2. To make simple part / component using welding processes.
3. To train on the basic wiring practices of boards, machines, etc.
4. To provide a hands-on experience on the use of electronic components, equipment, sensors and actuators.
5. To expose to modern computer tools and advanced manufacturing / fabrication processes.

LIST OF ACTIVITIES **1L,4P**

(A). Dis-assembly & Assembly Practices

i. Tools and its handling techniques.
ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.
iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.
iv. Dis-assembly and assembly of a Bicycle.

(B). Welding Practices

i. Welding Procedure, Selection & Safety Measures.
ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.
iii. Hands-on session of preparing base material & Joint groove for welding.
iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Stell plates / pipes, for fabrication of a simple part.

(C). Electrical Wiring Practices

i. Electrical Installation tools, equipment & safety measures.
ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box,
iii. Hands-on session of electrical connections for Lightings, Fans, Calling Bells.
iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.

(D). Electronics Components / Equipment Practices

i. Electronic components, equipment & safety measures.
ii. Dis-assembly and assembly of Computers.
iii. Hands-on session of Soldering Practices in a Printed Circuit Breaker.
iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier.

v. Hands-on session of integration of sensors and actuators with a Microcontroller.
vi. Demonstration of Programmable Logic Control Circuit.

(E).Contemporary Systems

i. Demonstration of Solid Modelling of components.
ii. Demonstration of Assembly Modelling of components.
iii. Fabrication of simple components / parts using 3D Printers.
iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.

TOTAL: 75 Periods (15 Lecture + 60 Practical)

COURSE OUTCOMES:

Upon the successful completion of the course, students will be able to:

CO1: Assemble and dis-assemble various items / equipment.

CO2: Make simple parts using suitable welding processes.

CO3: Setup wiring of distribution boards, machines, etc.

CO4: Utilise the electronic components to fabricate a simple equipment, aided with sensors and actuators.

CO5: Take advantage of modern manufacturing practices.

REFERENCES:

1. Stephen Christena, Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics, Crestline Books, 2014.
2. H. Lipson, Fabricated - The New World of 3D Printing, Wiley, 1st edition, 2013.
3. Code of Practice for Electrical Wiring Installations (IS 732:2019)
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Oxford University Press, 7th ed. (Indian edition), 2017.
5. Mazidi, Naimi, Naimi, AVR Microcontroller and Embedded Systems: Using Assembly and C, Pearson India, 1st edition 2013.
6. Visualization, Modeling, and Graphics for Engineering Design, D.K. Lieu, S.A. Sorby, Cengage Learning; 2nd edition.

CY23C03 CHEMISTRY FOR TECHNOLOGISTS L T P C
3 0 0 3

OBJECTIVE

- The students will be imparted the knowledge on Boiler feed water requirements, water treatment techniques, Applications of oil and its properties, principles of different chemical analysis and students also be provided with the knowledge on important dyes and their applications, they will be taught to prepare bleaching powder, sodium hypochlorite and hydrogen peroxide for the bleaching of fabrics in industries.

UNIT I WATERTECHNOLOGY 9

Water quality parameters- hardness -definition - units of hardness - determination of hardness (EDTA method).Alkalinity - definition - determination of alkalinity. TDS, BOD, COD and iron and their significance. Softening – zeolite and demineralization processes. Boiler troubles (scale, sludge, boiler corrosion, caustic embrittlement and carry over) and remedies – removal of oils and silica, internal conditioning.Desalination by electro-dialysis and reverse
osmosis.

UNIT II OILS,FATS,SOAPS & LUBRICANTS 9

Chemical constitution, chemical analysis of oils and fats – free acid, saponification and iodine values, definitions, determinations and significance.Soaps and detergents – cleaning action of soap. Lubricants - definition, characteristics, types and properties – viscosity,viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Solid lubricants – graphite and molybdenum disulphide.

UNIT III CHEMICAL ANALYSIS – AN ANALYTICAL INSIGHT 9

Gravimetric analysis – principles – method – applications. redox titrations – principle – method – applications. Thin layer chromatography – principles – techniques – applications. Principles underlying the estimations of nitrogen in nitrogeneous fertilizers, phenol and aniline.

UNIT IV DYE CHEMISTRY 9

Witt's theory and modern theory of colors – synthesis of methyl red, methyl orange, congo red, malachite green, p-rosaniline, phenolphthalein, fluorescence, eosin dyes.

UNIT V CHEMICALS AND AUXILIARIES 9

Preparations of bleaching powder, sodium hypochlorite, hydrogen peroxide, chlorine dioxide – estimation of available chlorine in hypochlorite – determination of strength of hydrogen
peroxide.

TOTAL: 45 PERIODS

COURSE OUTCOME

After completion of this course, the student is expected to
CO1. Analyze the boiler feed water and assess the method of purification techniques.
CO2 Classify oil, fat and soap and its properties and gain the knowledge about lubricants
CO3. Understand the principles of different chemical analysis and to estimate the amount of nitrogen and aniline
CO4. Classify the dyes and to prepare various dyes used in textile industries.
CO5. Explain and prepare the chemical auxiliaries required for dyeing

TEXT BOOKS

1. Jain & Jain, "Engineering Chemistry", 16th Edition, 2014,DhanpatRai Publishing Company, New Delhi.
2. Sharma B.K, "Industrial Chemistry", 16th Edition, 2014, GOEL Publishing House, Meerut.

REFERENCE BOOKS

1. Dara SS, Umare SS, "A Textbook of Engineering Chemistry", S. Chand & Company Ltd., New Delhi, 2010.
2. Puri BR, Sharma LR, Pathania S, "Principles of Physical Chemistry", 42nd Edition, 2008, Vishal Publishing Co., Jalandhar.
3. Morrison RT, Boyd RN, Bhattacharjee SK, “Organic Chemistry”, 7th Edition, Pearson India, 2011.

UC23H02 **தமிழரும் தொழில்நுட்பமும்** **L T P C**
1 0 0 1

அலகு I **நெசவு மற்றும் பானைத் தொழில்நுட்பம்**: **3**

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II **வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**: **3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு-சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III **உற்பத்தித் தொழில் நுட்பம்**: **3**

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV **வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்**: **3**

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V **அறிவியல் தமிழ் மற்றும் கணித்தமிழ்**: **3**

அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil

Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

UC23H02 TAMILS AND TECHNOLOGY L T P C
1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age -Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period -Type study (Madurai Meenakshi Temple)- Thirumalai NayakarMahal -ChettiNadu Houses, Indo-Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies -Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stonebeads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE ANDIRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of KumizhiThoompuof Chola Period,Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing -KnowledgeofSea -Fisheries – Pearl - Conche diving - Ancient Knowledge ofOcean -KnowledgeSpecificSociety.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCEBOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

MA23C05	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand the basics of random variables with emphasis on the standard discrete and continuous distributions.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the Central Limit theorem.
- To understand the basic concepts of sampling distributions and statistical properties of point and interval estimators.
- To apply the small/ large sample tests through Tests of hypothesis.
- To understand the concept of analysis of variance and use it to investigate factorial dependence.

UNIT I ONE-DIMENSIONAL RANDOM VARIABLES 9+3

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III ESTIMATION THEORY 9+3

Sampling distributions – Characteristics of good estimators – Method of Moments – Maximum Likelihood Estimation – Interval estimates for mean, variance and proportions.

UNIT IV TESTS OF SIGNIFICANCE 9+3

Type I and Type II errors – Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances –χ^2 test for goodness of fit – Independence of attributes.

UNIT V DESIGN OF EXPERIMENTS 9+3

Completely Randomized Design – Randomized Block Design – Latin Square Design – 2^2 factorial design.

TOTAL: 60 PERIODS

Laboratory based exercises / assignments / assessments will be given to students from the content of the course wherever applicable.

Branch specific / General Engineering applications based on the content of each units will be introduced to students wherever possible.

SUGGESTED LAB EXERCISES

1. Data exploration using R
2. Visualizing Probability distributions graphically
3. Evaluation of correlation coefficient
4. Creating a Linear regression model in R

5. Maximum Likelihood Estimation in R
6. Hypothesis testing in R programming
7. Chi square goodness of fit test in R
8. Design and Analysis of experiments with R

COURSE OUTCOMES:

CO1: Can analyze the performance in terms of probabilities and distributions achieved by the determined solutions.

CO2: Will be familiar with some of the commonly encountered two dimensional random variables and be equipped for a possible extension to multivariate analysis.

CO3: Provides an estimate or a range of values for the population parameter from random samples of population.

CO4: Helps to evaluate the strength of the claim/assumption on a sample data using hypothesis testing.

CO5: Equips to study the influence of several input variables on the key output variable.

TEXT BOOKS:

1. Irwin Miller and Marylees Miller, "John E. Freund's Mathematical Statistics with pplications", Pearson India Education, Asia, 8th Edition, 2014.
2. Walpole, R.E., Myers R.H., Myres S.L., and Ye, K. "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2024.

REFERENCES:

1. Richard A. Johnson, Irwin Miller, John Freund "Miller & Freund's Probability and Statistics for Engineers", Person Education, 8th Edition, 2015.
2. Ross, S.M. "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier, New Delhi, 5th Edition, 2014.
3. Spiegel, M.R., Schiller, J., Srinivasan, R.A. and Goswami, D. "Schaum's Outline of Theory and Problems for Probability and Statistics", McGraw Hill Education, 3rd Edition, Reprint, 2017.
4. Devore, J.L. "Probability and Statistics for Engineering and the Sciences", Cengage Learning, 9th Edition, 2016.

Course Articulation Matrix:

COURSE OUTCOMES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1 :	3	3	2	3	1	2	1	1	1	1	1	3
CO2 :	3	3	2	3	1	2	1	1	1	1	1	3
CO3 :	3	3	2	3	1	2	1	1	1	1	1	3
CO4 :	3	3	2	3	1	2	1	1	1	1	1	3
CO5 :	3	3	2	3	1	2	1	1	1	1	1	3

TT23301 CHARACTERISTICS OF TEXTILE FIBRES

L	T	P	C
3	0	2	4

OBJECTIVES:

To enable the students to learn the

- Structure and morphology of textile fibres
- Physical characteristics of textile fibres and analysis of fibres

UNIT I STRUCTURE AND PROPERTIES OF FIBRES 9+14

Classification of fibres; cultivation of cotton, jute and silk; study of morphological structures of fibers; physical properties of fibres; identification of fibres and blend analysis; molecular conformations — planar zig-zag, helical, lamellar and spherulite conformations

Practicals

1. Identification of natural, regenerated and synthetic fibres
2. Determination of denier of synthetic fibres
3. Determination of the blend proportion of binary and tertiary blends

UNIT II MOISTURE CHARACTERISTICS 9+2

Theories of moisture sorption; moisture absorption behavior of natural and man-made fibres; determination of moisture regain; influence of fibre structure, humidity and temperature on the moisture absorption; conditioning of fibres – mechanism of conditioning and factors influencing conditioning; moisture diffusion in fibres; heat of sorption — integral and differential, their relation; factors influencing heat of sorption; measurement of heat of sorption

Practicals

1. Determination of moisture regain and moisture content of fibres

UNIT III TENSILE AND ELONGATION CHARACTERISTICS 9+4

Tensile characteristics – strength, elongation, work of rupture, initial modulus, work factor, yield point and determination of yield point; stress-strain relations of natural and manmade fibres; influence of fibre structure, humidity and temperature on tensile characteristics; time effects- study of creep phenomena; elastic recovery and its relation to stress and strain of fibres; mechanical conditioning of fibres and its influence on elastic recovery; load cycling and extension cycling-their effect on properties; introduction about torsional and flexural rigidity of fibres

Practicals

1. Analysis of stress strain graph and determination of yield point for various fibres

UNIT IV OPTICAL, FRICTIONAL, AND THERMAL CHARACTERISTICS 9+4

Reflexion and lustre - objective and subjective methods of measurement; refractive index andits measurement; birefringence, factors influencing birefringence; absorption and dichroism; friction – static, limiting and kinetic friction, its measurement, comparison of fibres, directional friction in wool; thermal transitions of fibres – thermal conductivity, thermal expansion and contraction, first and second order transition temperatures; static electricity in textile fibres

Practicals

1. Analysis of Thermograms of fibers
2. Analysis of DSC spectra of fibres

UNIT V STRUCTURE INVESTIGATION TECHNIQUES **9+6**

Transmission and Scanning electron microscopes, X - ray diffractometer, Thermo Gravimetric Analyser, Differential Scanning Calorimetry, Fourier Transform Infra-Red Spectrometer - principle and analysis of fibres; dichroism techniques; chemical element and end group analysis; molecular orientation – estimation methods

Practicals

1. Analysis of FTIR spectrograms of fibres
2. Analysis of XRD patterns of various fibres

TOTAL: 45 PERIODS +30 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Classify and describe the fibre structure and properties

CO2: Analyse the structural features of fibres

CO3: Describe and explain about the moisture properties of fibres

CO4: Analyse and discuss about tensile and elongation properties of fibres

CO5: Discuss about the optical, thermal and frictional characteristics of fibres

TEXTBOOKS

1. Morton W.E., and Hearle J.W.S., “Physical Properties of Textile Fibres”, The Textile Institute, Washington D.C., 2008, ISBN978-1-84569-220-95
2. Mishra S. P. “Fibre science and Technology”, New age international publisher, 2010

REFERENCES

1. Mukhopadhyay S. K., “Advances in Fibre Science”, The Textile Institute,1992, ISBN: 1870812379
2. MeredithR., “Mechanical Properties of Textile Fibres”, North Holland, Amsterdam, 198 6, ISBN: 1114790699, ISBN-13:9781114790698
3. Hearle J.W.S., “Polymers and Their Properties: Fundamentals of Structures and Mechanics Vol1”, Ellis Horwood, England, 1982, ISBN:047027302X|ISBN-13:9780470273029
4. Greaves. P. H., and Saville B.P., “Microscopy of Textile Fibres”, Bios Scientific, U.K., 1995, ISBN: 1872748244 | ISBN-13:9781872748245
5. Hearle J. W. S., and Peters. R. H., “Fibre structure”, Elsevier Ltd, 1963, ISBN: 1483212211 | ISBN-13:9781483212210

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	1	1	2	2	1	2	1	2	1	2	2	1	2	3
2	2	1	2	3	3	1	1	1	2	1	1	2	1	1	3
3	2	1	3	2	2	2	2	1	2	1	2	2	2	1	2
4	2	2	2	1	2	1	2	1	1	1	1	2	2	1	3
5	2	2	2	2	2	1	1	1	1	1	1	2	2	1	2
Overall CO	2	1.4	2	2	2.2	1.2	1.6	1	1.6	1	1.4	2	1.6	1.2	2.6

TT23302 TECHNOLOGY OF PRE-SPINNING PROCESS

L	T	P	C
3	0	3	4.5

OBJECTIVES

To enable the students to learn

- The theory of various operations carried out at different stages of pre-spinning processes
- The construction and working of machinery used for preparatory
- Learn material passage in the spinning preparatory machines
- Identify the parts of machine and carryout production, draft and twist calculations

UNIT I INTRODUCTION TO SPINNING AND GINNING MACHINE 9+3

Sequence of spinning machinery for producing carded, combed and blended yarns in short staple spinning system; numbering systems for textile materials and conversions; description and working of different types of gins; ginning performance on yarn quality

Practicals

1. Construction details and material passage in ginning machine

UNIT II BLOWROOM MACHINERY 9+12

Blow room - objectives, principle and description of opening and cleaning, blending machines, scutcher, chute feed, metal detectors, foreign matter detectors; cleaning efficiency, production calculations

Practicals

1. Construction details and material passage in blow room machines
2. Gearing arrangement, calculation of rotating speed of working elements, cleaning efficiency and production of blow room machines
3. Study of piano feed regulator and calculation of beating intensity

UNIT III CARDING MACHINE 9+9

Objectives and principle of carding operations; study of carding machine; autolevelling; card clothing and its maintenance; draft and production calculation

Practicals

1. Construction details, material passage, wire point arrangements and settings of carding machine
2. Draft and production calculations in the carding machine

UNIT IV COMBER 9+6

Study of comber preparatory machines; objectives and principles of combing; sequence of combing operation; study of combing machine; combing efficiency and production calculation

Practicals

1. Construction details and material passage of comber
2. Combing cycle, draft and production calculations of comber

UNIT V DRAWFRAME AND ROVING FRAME 9+15

Draw frame — objectives, construction of machine; drafting systems used in modern draw frames; autolevelling; draft and production calculation; objectives of roving frame; working of roving frame; bobbin builder mechanism; draft, twist and production calculations; safety measures at pre-spinning processes – equipments used, safety practices

Practicals

1. Construction details, material passage, draft and production calculations of drawing machine
2. Construction details, material passage, draft, twist and production calculations of roving machine
3. Study of builder mechanism of roving machine
4. Determination of actual roller speed, eccentricity of roller and top arm loading
5. Production of sample roving

TOTAL: 45 PERIODS +45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Comprehend and analyse about the processes involved in the conversion of fibre to yarn

CO2: Explain the functioning of ginning and blowroom machinery**;** trace the drive arrangement and determine the speed and production rate

CO3: Explain and analyse the carding process; trace the drive arrangement and calculate the draft and production

CO4: Demonstrate the process of comber preparatory and combing; trace the drive arrangement and calculate the draft, production and combing efficiency

CO5: Explain the functioning of drawframe and roving frame; trace the drive arrangement and calculate the draft, twist and production

TEXTBOOKS

1. Klein W., “The Rieter Manual of Spinning, Vol.1-Technology of short staple spinning”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN 10 3-9523173-1-4 / ISBN 13 978-3-9523173-1-0.
2. Klein W., “The Rieter Manual of Spinning, Vol.2-Blowroom & carding”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN 10 3-9523173-2-2 / ISBN 13 978-3-9523173-2-7.
3. Klein W., “The Rieter Manual of Spinning, Vol.3-Spinning preparation”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN 10 3-9523173-3-0 / ISBN 13 978-3-9523173-3-4.

REFERENCES

1. Carl A. Lawrence., “Fundamentals of Spun Yarn Technology”, CRC press, 2003,ISBN 1-56676-821-7
2. Eric Oxtoby, “Spun Yarn Technology “, Butterworth, Boston, London, 1987, **ISBN:** 0408014644 9780408014649
3. Lord P.R., “Yarn Production: Science, Technology and Economics”, The Textile Institute, Manchester, 1999.
4. Iredale John A., “Yarn Preparation: A Handbook”, Intermediate Technology, London,1992, ISBN:1853390429.

5. Doraiswamy I., Chellamani P., and Pavendhan A., “Cotton Ginning, TextileProgress”, The Textile Institute, Manchester, 1993

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	3	2	1	2	1	1	1	2	3	3	3	3
2	3	3	2	3	2	1	2	1	1	1	2	3	3	3	3
3	3	3	2	3	2	1	2	1	1	1	2	3	3	3	3
4	3	3	2	3	2	1	2	1	1	1	2	3	3	3	3
5	3	3	2	3	2	1	2	1	1	1	2	3	3	3	3
Overall CO	3	3	2.2	3	1.8	1	2	1	1.2	1.2	2	2.8	3	3	3

TT23303 **WOVEN FABRIC MANUFACTURE**

L	T	P	C
3	0	3	4.5

OBJECTIVES:

To enable the students to learn the

- Basics of weaving machine and important motions of looms
- Selection and control of process variables during fabric formation

UNIT I PREPARATION OF YARN FOR WEAVING 9+6

Objectives of winding; principles of cheese and cone winding machines; uniform build of yarn package; control of balloons; Package defects and control; Classification of yarn faults and its removal; concepts in yarn clearing – mechanical, optical and electronic clearers; knotters and splicers

Practicals:

1. Measurement and analysis of yarn faults
2. Determination of package density of cones

UNIT II PREPARATION OF BEAM FOR WEAVING 9+3

Objectives of warping; types and working of warping machines; warping defects and control; objectives of sizing; size recipe for different types of fibres and filaments; sizing machines; control concepts in modern sizing; sizing defects and control; production calculations; need for drawing-in operation; manual and automatic drawing- in; selection and care of reeds, healds and drop pins

Practicals:

1. Study of warping machine

UNIT III SHEDDING 9+12

Shed geometry and shedding requirement; types of shed; shedding mechanisms - positive and negative; principles of tappet, dobby and jacquard shedding mechanisms; reversing mechanisms; limitations of various shedding mechanisms; conventional and modern dobby and jacquard mechanism

Practicals:

1. Study of tappet shedding mechanism
2. Study of dobby shedding mechanism
3. Study of jacquard shedding mechanism

UNIT IV PICKING AND BEAT UP 9+9

Shuttle picking and checking mechanisms, shuttle flight and timing; weft feeder – types, principles of weft insertions in shuttle - less looms; mechanism of weft insertion by projectile, rapier loom and jet looms – air and water; multi-phase weaving systems; yarn quality requirements for high speed automatic shuttle and shuttle - less looms, beat-up mechanism in modern looms

Practicals:

1. Study of picking mechanism
2. Calculation of shuttle speed and sley eccentricity

UNIT V SECONDARY AND AUXILARY MOTIONS 9+15

Take - up and let - off motions used in plain power looms and modern looms; warp protector; warp and weft stop motion; pirn changing and shuttle changing mechanisms; drop box mechanism; weft accumulators; selvedges – types and principle of formation; quick style change.

Practicals:

1. Study of let-off mechanisms
2. Study of take-up mechanisms
3. Study of weft replenishment mechanism in shuttle looms
4. Method of achieving the required colour patterns in 4 X 1 drop box motion
5. Study of warp stop motion, warp protector, weft fork mechanisms

TOTAL: 45 PERIODS+45 PERIODS

COURSE OUTCOMES

Upon completion of this course, the student shall be able to

CO1: demonstrate the working of winding machines

CO2: analyse the need of warping, sizing and drawing-in machines

CO3: distinguish the working of tappet, dobby and Jacquard shedding mechanism

CO4: build knowledge on principle of weft insertion in shuttle and shuttlel-ess weaving and demonstrate the working of beat-up mechanism

CO5: demonstrate the working mechanism of secondary and auxiliary motions

TEXTBOOKS

1. Baneerjee.P.K., “Principles of Fabric Formation”, CRC Press, London, 2014, ISBNNumber:13:978-1-4665-5445-0.
2. Abhijit Majumdar, Apurba Das, R.Alagirusamy and V.K.Kothari., “Process Control in Textile Manufacturing”, Wood Head Publishing Limited, Oxford, 2013, ISBN: 978-0- 85709-027-0.

REFERENCES

1. John A. Iredale “Yarn Preparation: A Hand Book”, Textile Institute, Manchester,1992, ISBN:1853390429.
2. Ormerod A. and Sondhelm W. S., “Weaving: Technology and Operations”, Textile Institute,1995, ISBN: 187081276X.
3. MilindVasudeoKoranne, “Fundamentals of Yarn Winding”, Woodhead Publishing,India, 2013,ISBN: 978-1-78242-068-2.
4. Goswami B.C., Anadjiwala R.D. and Hall D.M.., “Textile Sizing”, Marcel Dekker, NewYork, 2004,ISBN: 0-8247-5053-5.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	1	1	1	1	1	2	2	2	3	2	3
2	3	3	2	2	2	1	1	1	1	2	1	2	3	3	2
3	3	3	3	2	1	1	1	1	1	2	2	2	3	2	3
4	3	3	2	2	2	1	1	1	1	2	1	2	3	3	2
5	2	2	3	2	1	1	1	1	1	2	1	1	3	1	2
6	3	3	2	2	2	2	2	2	3	2	2	2	3	3	3
Overall CO	2.8	2.8	2.5	2.0	1.5	1.2	1.2	1.2	1.3	2.0	1.5	1.8	3.0	2.3	2.5

TT23304 CHEMICAL PROCESSING OF TEXTILE MATERIALS I

L	T	P	C
2	0	3	3.5

OBJECTIVES:

- To enable the students to learn about chemical structure of fibres, preparatory and finishing process of textile materials in wet processing industry.
- To train students in pre-treating and finishing the given textile materials.

UNIT I PREPARATORY PROCESS- I **6+9**

Chemical structure of fibres; action of light and chemicals on fibres; natural and added impurities in textiles; singeing; chemistry of sizing agents; desizing of cotton- hydrolytic, oxidative, and enzymatic desizing; assessment of desizing; preparation of synthetic fibres and blends, heat setting of fabric

PRACTICALS

1. Desizing of cotton using acid
2. Desizing of cotton using enzyme

UNIT II PREPARATORY PROCESS -II **6+9**

Scouring- alkali, solvent and enzyme; assessment of scouring-sink test, drop test, measurement of weight loss, protein content, residual wax content, methylene blue absorption, copper number assessment; bleaching – types, method of bleaching of cotton, wool, silk; assessment of bleaching; mercerization of cotton; assessment of mercerization; carbonization of wool; degumming of silk; combined preparatory processes; chemistry and application of Optical whitening agents

PRACTICALS

1. Scouring and bleaching of cotton
2. Scouring of silk and wool
3. Degumming of silk

UNIT III MACHINERIES FOR PREPARATORY PROCESS **6+6**

Loose stock machine; Hank and package processing machines; Singeing machines for yarn, woven and knitted fabric; stretching devices; kiers; mangles; jigger; winch; jet and soft flow machines; mercerizers; continuous scouring and bleaching machines; hydro extractors; detwisters; dryers; stenters

PRACTICALS

1. Study on laboratory sample processing machines

UNIT IV COLOUR SCIENCE AND MEASUREMENT **6+9**

Definition of colour and its classification; Beer-Lambert’s law; colour order systems; theories and principles of colour measurement; whiteness and yellowness indices; techniques of computer colour matching; application of the Kubelka- Munk theory to colour matching; prediction of colour recipe; limitations of computer colour matching

PRACTICALS

1. Measurement of whiteness and yellowness index
2. Determination of concentration of dye solution using spectrophotometer
3. Determination of colour strength of dyed materials using spectrophotometer

UNIT V BASICS OF DYEING 6+12

Dyeing equilibrium; dye-fibre interaction; thermodynamics of dyeing; basic characteristics of dyes and pigments; classification of dyes; principle of application of direct, reactive, disperse, acid, basic, vat dyes on textile substrate; sustainable aspects in textile dyeing; textile effluent treatment; assessment of textile dyes and toxic chemicals

PRACTICALS

1. Dyeing of silk with acid dye
2. Dyeing of cotton with vat dye
3. Dyeing of cotton with reactive dyes
4. Dyeing of polyester with HTHP machine

TOTAL: 30 PERIODS+45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to
CO1: Comprehend about the chemistry of fibre and action of chemicals
CO2: Differentiate the preparatory process for natural and synthetic fibres
CO3: Recognize about textile preparatory machineries
CO4: Distinguish about assessment of various pre-treatment process
CO5: Explain about various finishing process of textile material

TEXTBOOKS

1. Trotman E. R., “Dyeing and Chemical Technology of Textile Fibres”, B.I Publishing Pvt. Ltd., New Delhi, 1994.
2. Menachem Lewin and Eli M. Pearce, “Handbook of Fibre Chemistry: Second Edition, Revised and Expanded, Marcel Dekker, Inc., 1998.

REFERENCS

1. Menachem Lewin and Stephen B. Sello., “Handbook of Fibre Science and Technology: Volume I: Chemical Processing of Fibres and Fabrics-Fundamentals and Preparation Part A”, Marcel Dekker, Inc., 1983.
2. Karmakar S. R., “Chemical Technology in the Pre-treatment Process of Textiles”, Elsevier sciences B.V., 1999.
3. Choudhury A. K. R., “Textile Preparation and Dyeing”, SDC India Region,2011.
4. Bhagwat R. S., “Handbook of Textile Processing”, Colour Publication, Mumbai. 1999.
5. Cavaco-Paulo A. and Gubitz G. M., “Textile Processing with enzymes”, Woodhead Publication Ltd., 2003.
6. Schindler W.D and Hauser P., “Chemical Finishing of Textiles”., Wood head Publications, ISBN: 1855739054
7. Heywood D,“Textile Finishing”, Wood head Publishing Ltd., 2003, ISBN 090195681.

8. Yin-Ling Lam , Chi-Wai Kan& Chun-Wah Marcus Yuen, " Developments in functional finishing of cotton fibres – wrinkle-resistant, flame retardant and antimicrobial treatments", Textile Progress, Vol. 44, Nos. 3-4, September-December 2012, 175–249

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	3	-	-	3	3	2	2	-	2	3	2	3
2	3	3	3	3	-	-	3	3	2	2	-	2	3	2	3
3	3	3	3	3	-	-	3	3	2	2	-	2	3	2	3
4	3	3	3	3	-	-	3	3	2	2	-	2	3	2	3
5	3	3	3	3	-	-	3	3	2	2	-	2	3	2	3
Overall CO	3	3	3	3	-	-	3	3	2	2	-	2	3	2	3

UC23U01 **UNIVERSAL HUMAN VALUES** **L T P C**
1 0 2 2

OBJECTIVES:

The objective of the course is four-fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Module I: Introduction **(3L,6P)**

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration– Its content and process; 'Natural acceptance' and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Practical Session: *Include sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking*

Module II: Harmony in the Human Being **(3L,6P)**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

Practical Session: *Include sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.*

Module III: Harmony in the Family and Society **(3L,6P)**

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Practical Session*: Include sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as*

a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module IV: Harmony in the Nature and Existence (3L,6P)

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.

Practical Session: *Include sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.*

Module V: Implications of Harmony on Professional Ethics (3L,6P)

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up.

Practical Session: *Include Exercises and Case Studies will be taken up in Sessions E.g. To discuss the conduct as an engineer or scientist etc.*

TOTAL: 45 (15 Lectures + 30 Practicals) PERIODS

COURSE OUTCOME:

By the end of the course, the students will be able to:

1. Become more aware of themselves, and their surroundings (family, society, nature);
2. Have more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Have better critical ability.
4. Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

REFERENCES:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 3rd revised edition, 2023.
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. Small is Beautiful - E. F Schumacher.
7. Slow is Beautiful - Cecile Andrews.
8. Economy of Permanence - J C Kumarappa

9. Bharat Mein Angreji Raj - PanditSunderlal
10. Rediscovering India - by Dharampal
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

Web URLs:

1. Class preparations: https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php
2. Lecture presentations: https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php
3. Practice and Tutorial Sessions: https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						1	1	1	3			3
CO2						1	1	1	3			3
CO3						3	3	2	3		1	3
CO4						3	3	2	3		1	3
CO5						3	3	3	3		2	3

TT23U02	PERSPECTIVES OF SUSTAINABLE DEVELOPMENT – TEXTILE TECHNOLOGY	L T P C 2 0 0 2

MODULE I – INTRODUCTION **6**

Principles & Historical perspectives, Importance and need for sustainability in engineering and technology, impact and implications. United Nations Sustainability Development Goals (SDG), UN summit – Rio & outcome, Sustainability and development indicators.

MODULE II – ENVIRONMENTAL SUSTAINABILITY **6**

Climate change, Biodiversity loss, Pollution and waste management, Renewable vs. non-renewable resources, Water and energy conservation, Sustainable agriculture and forestry. National and international policies, Environmental regulations and compliance, Ecological Footprint Analysis

MODULE III – SOCIAL & ECONOMIC SUSTAINABILITY **9**

Equity and justice, Community development, Smart cities and sustainable infrastructure, Cultural heritage and sustainability, Ethical considerations in sustainable development.

Triple bottom line approach, Sustainable economic growth, Corporate social responsibility (CSR), Green marketing and sustainable product design, Circular economy and waste minimization, Green accounting and sustainability reporting.

MODULE IV – SUSTAINABILITY IN TEXTILE & APPAREL **9**

SDGs, carbon and water footprints – fibre production, conversion from fibre to garment usage; recycling concepts

TOTAL: 30 PERIODS

REFERENCES:

1. Allen, D., & Shonnard, D. R. (2011). Sustainable engineering: Concepts, design and case studies. Prentice Hall.

2. Munier, N. (2005). Introduction to sustainability (pp. 3558-6). Amsterdam, The Netherlands: Springer.

3. Blackburn, W. R. (2012). The sustainability handbook: The complete management guide to achieving social, economic and environmental responsibility. Routledge.

4. Clini, C., Musu, I., & Gullino, M. L. (2008). Sustainable development and environmental management. Published by Springer, PO Box, 17, 3300.

5. Bennett, M., James, P., & Klinkers, L. (Eds.). (2017). Sustainable measures: Evaluation and reporting of environmental and social performance. Routledge.

6. Seliger, G. (2012). Sustainable manufacturing for global value creation (pp. 3-8). Springer Berlin Heidelberg.

7. Stark, R., Seliger, G., & Bonvoisin, J. (2017). Sustainable manufacturing: Challenges, solutions and implementation perspectives. Springer Nature.

8. Davim, J. P. (Ed.). (2013). Sustainable manufacturing. John Wiley & Sons.

SEMESTER IV

TT23C09 TECHNOLOGY OF MANUFACTURED FIBRE PRODUCTION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make the students learn different methods of production of manmade fibres and post spinning operations

UNIT I POLYMER PREPARATION 9

Synthetic fibres – Monomers, source of monomers- structural principles of polymeric fibres; Polymer rheology-Newtonian and non-Newtonian fluids – shear flow, caplillary flow and elongational flow behaviour. Synthesis of polymers for fibre production-techniques, advantages- polyester, nylon, PP and acrylic

UNIT II MELT SPINNING 9

Melt Spinning- polymer selection and preparation, fibre spinning- process variables; structure formation, polyester, polyamide and polypropylene fibres; integrated processes; post spinning operations, properties and applications of fibres; process control; gel spinning; dope dyeing

UNIT III SOLUTION SPINNING 9

Solution spinning- polymer selection and preparation; principle of fibre spinning- wet spinning, dry spinning, dry jet wet spinning, electrospinning and process variables, structure and morphology; post spinning operations, properties and applications of acrylic, polyurethane and regenerated cellulose fibres; process control

UNIT IV DRAWING AND SPIN FINISH 9

Draw behaviour of thermoplastic polymers; Neck drawing, drawing systems, influence of drawing on structure and properties of various fibres; orientation and stretching; spin finish – requirements, compositions and methods of application

UNIT V HEAT SETTING AND TEXTURING 9

Heat setting, nature of heat set- temporary and permanent; influencing parameters on heat setting, influence of heat setting on various fibre properties; texturizing principles- thermal, chemical, mechanical and thermos-mechanical; properties and evaluation of textured yarns; applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the student shall know about the

CO1: Synthesis of polymers and flow behaviour of polymers

CO2: Melt spinning of polymers and influencing factors

CO3: Solution spinning of polymers and structure formation

CO4: Drawing and spin finish application of fibres and filaments

CO5: Heat setting and its influence on fibre properties and principles of texturising process

TEXTBOOKS:

1. Kothari V. K., “Textile Fibres: Development and Innovations”, Vol. 2, Progress in Textiles, IAFL Publications, New Delhi, 2000, ISBN: 81-s901033-0-X.

2. Gupta V. B., and Kothari V. K., (Editors), “Manufactured Fibre Technology”, Kluwer Academic Publishers, 1997, ISBN 0412-54030-4.

REFERENCES:

1. Vaidya A. A., “Production of Synthetic Fibres”, Prentice Hall of India Pvt. Ltd., New Delhi, 1988.ISBN: 0876925786 / ISBN: 9780876925782.
2. Hearle J W S, Hollick L, Wilson D K., “Yarn Texturing Technology”, Woodhead publishing, 2001, ISBN: 978-1-85573-575-0
3. Cook J. G., “Handbook of Textile Fibres: Vol. 2: Man Made Fibres”, The Textile Inst., 5th Ed., 1984, ISBN: 1855734850.
4. Srinivasa Murthy H. V., “Introduction to Textile Fibres”, Textile Association, India, 1987.
5. Nakasjima (English edition, edited by Kajiwara K. and McIntyre J. E.), “Advanced Fibre Spinning Technology”, Wood head Publication Ltd., England, 1994, ISBN:1855731827

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2	1	1	3	3	2	3	1	3	3	2	2	3	3
2	1	2	1	1	3	3	2	3	1	3	3	2	2	3	3
3	1	2	1	1	3	3	2	3	1	3	3	2	2	3	3
4	1	2	1	1	2	3	-	3	1	3	3	2	2	3	2
5	1	2	1	1	2	3	-	3	1	3	3	2	2	3	2
Overall CO	1	2	1	1	2.6	3	2	3	1	3	3	2	2	3	2.6

TT23401 TECHNOLOGY OF YARN SPINNING

L	T	P	C
3	0	2	4

OBJECTIVES:

To enable the students to learn

- Theory of yarn formation by different spinning systems
- Construction of yarn spinning machines and prepare yarn using ring and rotor spinning machine

UNIT I RING SPINNING - I 9+9

Principle of yarn formation in ring frame - drafting, twisting and winding; mechanism of cop building, top arm loading; calculations of draft, twist, production; influence of fibre characteristics on yarn quality and machine performance

Practicals:

1. Material passage and construction details of ring spinning machine
2. Gearing arrangement and draft, twist and production calculations of ring spinning machine
3. Study of builder mechanism of ring spinning machine

UNIT II RING SPINNING – II 9+3

Design features of important machine elements of ring frame – ring, traveller, spindle, drive arrangement; automations; condensed yarn spinning – principle, different methods, properties; comparison with ring spun yarn; ring yarn defects – causes and remedies

Practicals:

1. Production of yarn using ring spinning machine

UNIT III ROTOR SPINNING 9+9

Principle of open end spinning; principle of yarn production by rotor spinning system; design features of important elements used in rotor spinning; techno economic study of rotor spinning; influence of fibre characteristics on yarn quality and machine performance; rotor yarn defects – causes and remedies

Practicals:

1. Material passage and construction details of rotor spinning machine
2. Draft, twist and production calculations in rotor spinning machine
3. Production of yarn using rotor spinning machine

UNIT IV OTHER SPINNING SYSTEMS 9

Friction, air-vortex, two nozzle air-jet, self-twist, core, wrap, adhesive, electrostatic, disc spinning systems – principle, raw material requirement, yarn structure, properties and applications

UNIT V PLYING AND FANCY YARN SPINNING 9+9

Merits of plying of yarns; methods followed for plying – TFO, ring twisting; selection of twist level for plying; calculation of resultant count of plied yarns; fancy yarns- types, method of production; property requirements and production of sewing threads; safety measures in spinning mill

Practicals:

1. Material passage and construction details in TFO machine
2. Twist, production and ply yarn count calculation in TFO
3. Production of doubled yarn using TFO

TOTAL: 45 PERIODS+30 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Describe the theory of yarn formation andconstruction of ring spinning system; calculate draft, twist and production of ring spinning

CO2: Design and analyse the features and importance of different elements of ring spinning; explain the principle of compact spinning system

CO3: Explain the mechanism of yarn formation and design features of important elements in rotor spinning; calculate draft, back doubling, twist and production

CO4: Distinguish principle and mechanism of yarn formation of different spinning system; analyse production limitations, structure and properties of yarns

CO5: Differentiate the concept and production of ply yarns and fancy yarns

TEXTBOOKS

1. Klein W., and Stalder H., “The Rieter Manual of Spinning, Vol.4”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN: 10 3-9523173-4-9 / ISBN: 13 978-3-9523173-4-1.
2. Stalder H., “The Rieter Manual of Spinning, Vol.5”, Rieter Machine Works Ltd.,Winterthur,2014, ISBN: 10 3-9523173-5-7 / ISBN: 13 978-3-9523173-5-8.

REFERENCES

1. Stalder H., “The Rieter Manual of Spinning, Vol.6”, Rieter Machine Works Ltd.,Winterthur,2014, ISBN: 10 3-9523173-6-5 / ISBN: 13 978-3-9523173-6-5.
2. Oxtoby E., “Spun Yarn Technology”, Butterworth Publications, London, 1987.
3. James Brayshaw., and Everett Backe., “Short-staple Ring Spinning, Textile Progress”, TheTextile Institute, Manchester, 1999, ISBN: 0890898979 | ISBN-13:9780890898970
4. Iredale J., “Yarn Preparation: A Handbook”, Intermediate Technology, 1992, ISBN:5. 1853390429 | ISBN-13: 9781853390425
6. Lawrence C. A., “Advances in Yarn Spinning Technology”, Wood Head publishing, 2010,ISBN:1845694449 | ISBN-13: 9781845694449

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	3	2	1	1	1	2	2	2	2	3	3	3
2	3	3	3	3	2	1	1	1	2	2	2	2	3	3	3
3	3	3	3	3	2	1	1	1	2	2	2	2	3	3	3
4	3	3	3	3	2	1	1	1	2	2	2	2	3	3	3
5	3	3	3	3	2	1	1	1	2	2	2	2	3	3	3
Overall CO	3	3	3	3	2	1	1	1	2	2	2	2	3	3	3

TT23C01 FUNDAMENTALS OF ECONOMICS AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To enable the students to understand the principles of economics relevant to managing an organization, to describe principles of economics to have the understanding of economic environment of business.
- Learn the Evolution, Functions and Principles of Management.

UNIT I BASIC CONCEPTS OF ECONOMICS AND MARKET 9

Definition, scope of economics; fundamental concepts; demand, supply, equilibrium; theoryof production, cost; forms of market; concepts of revenue; pricing in perfect and imperfect competition.

UNIT II NATIONAL INCOME AND MONEY 9

National income - concept, measurement, economic welfare; concept of consumption, saving and investment; economic growth - measurement, fluctuation, control; Money-theory, exchange - Demand and supply of money.

UNIT III INFLATION AND GOVERNMENT POLICY 9

Inflation - causes, effect, control; Inflation Vs Unemployment, Philips curve; Government policies, Fiscal and Monitoring Policy, planning - economic growth and public welfare.

UNIT IV MANAGEMENT PRINCIPLES AND ORGANIZATIONS 9

Definition of Management - Science or Art - Manager vs. Entrepreneur - Types of Managers Managerial Roles and Skills - Evolution of Management - Scientific, Approaches of Management - Types of Business Organization - Sole Proprietorship, Partnership, Company - public and Private Sector Enterprises - Organization Culture and Environment.

UNIT V FUNCTIONS OF MANAGEMENT 9

Planning - Nature and Purpose, Objectives, Strategies, Policies and Planning Premises, Decision Making; Organizing - Nature and Process, Premises - Departmentalization - Line and Staff - Decentralization - Organizational culture; Staffing - Selection and training - Placement - Performance appraisal - Career Strategy - Leadership – Communication; Controlling - Process of Controlling - Controlling techniques, productivity and operations management - Preventive control, Industrial Safety.

TOTAL:45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, Students are expected to become familiar with
CO1: Principles of economics and market
CO2: Concepts of consumption and national income
CO3: Government policy and economic growth
CO4: Management principles and business organisation
CO5: performing managerial functions like planning, organizing, staffing, leading & controlling

REFERENCES :

1. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall of India, 10th Edition,2009.
2. JAF Stoner, Feeman R.E and Daniel R Gilbert "Management", Pearson education, 6th Ed.2004.
3. Stephen A. Robbins, David A. Decenzo and Mary Coulter, "Fundamentals of Management"
4. Pearson Education, Seventh Edition, 2011.
5. Pau. A. Samuelson, William D., Nordhaus, Sudip Chaudhuri and Anindya Sen,Economics,
6. 19th eidtion, Tata McGraw Hill, New Delhi, 2010.
7. Richard Lipsey & Alec Charystal, Economics, 12th ed., Oxford University Press, New Delhi,2011.
8. Kari E. Case and Ray C.fair, "Principles of Economics", 6th ed., Pearson, Education Asia, ND,2002.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2	1	1	2	3	-	3	-	3	3	2	2	3	-
2	1	2	1	1	2	3	-	3	-	3	3	2	2	3	-
3	1	2	1	1	2	3	-	3	-	3	3	2	2	3	-
4	1	2	1	1	2	3	-	3	-	3	3	2	2	3	-
5	1	2	1	1	2	3	-	3	-	3	3	2	2	3	-
Overall CO	1	2	1	1	2	3	-	3	-	3	3	2	2	3	-

TT23402 CHEMICAL PROCESSING OF TEXTILE MATERIALS II L T P C
2 0 2 4

OBJECTIVES:

- To enable the students to learn about theory of colour measurement.
- To enable the students to learn fundamentals of dyeing and printing; quality control in textile wet processing industry.
- To train the students in dyeing, printing and testing of textile materials.

UNIT I BASICS OF PRINTING 6+6

Printing with paste - methods and styles of printing; Chemistry of printing ingredients; Printing with direct, reactive, acid, disperse dyes; Characteristics of pigment and method of pigment printing; Printing machineries; Other special printing; After Treatments: Steam ager and curing process

PRACTICALS

1. Printing of cotton with different styles of printing

UNIT II TRANSFER PRINTING AND INKJET PRINTING 6

Mechanism of sublimation transfer printing; Methods; Transfer prints on both man-made fibres and natural fibres; Principle of Ink jet printing; Inks used for printing; Pre-treatment and post treatment of substrates

UNIT III FUNCTIONAL FINISHES -I 6+12

Introduction and classification of finishing; Essential fabric finishes: calendaring, softening, shrink proofing, crease proofing; chemistry of functional finish and its interaction with fabric: water repellent and water proof finish, soil release finish, oil repellent finish; Standard test methods and assessment for all types of finishes

PRACTICALS

1. Finishing of cotton with water repellent chemicals and its assessment
2. Finishing of cotton with crease proofing chemicals and its assessment

UNIT IV FUNCTIONAL FINISHES-II 6+6

chemistry of functional finish and its interaction with fabric: flame retardant , UV finish, anti-microbial; wool finishing; plasma treatment and ozone finishing; Application of nano technology in finishing; garment washing; Standard test methods and assessment for all types of finishes;

PRACTICALS

1.Finishing of cotton with flame retardant chemicals and its assessment

UNIT V QUALITY CONTROL IN CHEMICAL PROCESSING 6+6

Colour fastness to washing, rubbing, light, perspiration and others; Assessment of dimensional stability of fabric; Common causes and remedies of dyeing and printing defects

PRACTICALS

1. Determination of colour fastness to wash, rub, light and perspiration
2. Determination of shrinkage, bow and skew of given fabric

TOTAL: 30 PERIODS + 30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO1: Comprehend the theory of colour science and formulate recipe for colour matching of dyed materials with that of control
CO2: Recognize the basics of dyeing
CO3: Differentiate various methods and styles of printing using printing paste
CO4: Distinguish the features of transfer printing and inkjet printing
CO5: Interpret quality control aspects in chemical processing

TEXTBOOKS

1. Trotman E. R., “Dyeing and Chemical Technology of Textile Fibres”, B.I Publishing Pvt.Ltd. New Delhi, 1994 , ISBN: 0471809101 | ISBN-13: 9780471809104
2. Shenai V.A., “Chemistry of Dyes and Principles of Dyeing”, Sevak Publications,Mumbai, 1995.

REFERENCES

1. Shah H.S., and Gandhi R.S., “Instrumental Colour Measurement and Computer Aided Colour Matching for Textiles”, Mahajan Book Publication, 1990, ISBN: 8185401004 / ISBN: 9788185401003
2. Choudhury A.K.R., “Modern concepts of colour and Appearance”, Oxford and IBH publishing Ltd., 2000, ISBN: 1578080789 | ISBN-13: 9781578080786
3. Gulrajani M.L.(Ed.)., “Colour Measurement - Principles, advances and industrial applications'', Wood head Publishing Ltd, 2010, ISBN: 1845695593 | ISBN-13:9781845695590
4. Shenai V. A., “Technology of Printing”, Sevak Publications, Mumbai, 1996.
5. .Miles W. C., “Textile Printing”, Wood head Publication, 2003, ISBN 0 901956 76 1
6. AATCC Manual of International Test Methods and Procedures-2022
7. Tyler D, “Textile Digital Printing Technologies”, Textile Institute Publication UK,Vol.37 No.4, 2005
8. Ujiie, “Digital Printing of Textiles”, CRC, Wood Head Publishing Ltd, UK, 2006.

TT23C02	FABRIC STRUCTURE	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To enable the students to learn about different structures of woven fabric and design thestructure for different applications

UNIT I ELEMENTARY WEAVES 9+10

Introduction — methods of representing weave in point paper, construction of design, draftand lifting plan, types of draft, heald calculation, order of denting; elementary weaves – plain, twill, satin, sateen and their derivatives — loom requirements

Practicals

1) Identification of commercially available woven fabrics
2) Plain and its derivatives
3) Twill and its derivatives
4) Satin (regular and irregular)
5) Sateen (regular and irregular)

UNIT II SPECIAL WEAVES I 9+10

Ordinary and brighten honey comb; huck-a-back and its modifications; mock Leno; crepe weaves; colour and weaveeffects; Bedford cords - plain and twill faced, wadded; welts and piques, wadded piques; loom requirements

Practicals

1. Honeycomb (ordinary and brighton)
2. Huck-a-back
3. Crepe
4. Mock-leno
5. Bedford cord

UNIT III SPECIAL WEAVES II 9+4

Backed fabrics warp and weft, reversible and non-reversible fabrics; extra warp and extra weftfiguring - single and double colour — loom requirements

Practicals

1) Extra warp and extra weft figuring
2) Backed fabrics

UNIT IV PILE FABRICS AND VELEVTEENS 9+2

Pile fabrics; warp pile - wire pile, terry pile, loose backed; weft pile – plain back and twill back velveteen, lashed pile, corduroy, and weft plush – loom requirements

Practicals

1) Pile fabrics (warp and weft)

UNIT V SPECIAL FABRICS 9+4

Double cloth, types of stitches; Damasks; Gauze and Leno principles – loom requirements; trade name of popular structures

Practicals

1) Gauze and Leno
2) Double cloth
3) Tapestry

TOTAL: 45 PERIODS + 30 PERIODS

COURSE OUTCOMES:

Upon the completion of this course the student will be able to construct design, draft and peg plan and loom requirements for producing fabrics with

CO1: Plain, twill, satin and derivatives structures
CO2: Honey comb, crepe structures
CO3: Bedford cords, piques, backed fabrics, extra warp/weft figuring
CO4: Warp and weft pile structures
CO5: Double, damask, gauze and leno structures

TEXTBOOKS

1. Grosicki Z. J., “Watson’s Textile Design and Colour”, Vol.1, Wood head Publications, Cambridge England, 2004, ISBN: 1 85573 7701 24.
2. Grosicki Z. J., “Watson’s Advanced Textile Design and Colour”, Vol. II,Butterworths, London, 1989, ISBN-9781855739963

REFERENCES

1. Wilson J., “Handbook of Textile Design”, Textile Institute, Manchester, 2001, ISBN: 1 85573 5733.
2. Horne C.E., “Geometric Symmetry in Patterns and Tilings”, Textile Institute, Manchester, 2000, ISBN: 1 85573 4923.
3. Seyam A. M., “Structural Design of Woven Fabrics, Theory and Practice”, Textile Institute, Manchester, 2002, ISBN: 1 87037 2395.
4. GeornerD., “Woven Structure and Design, part 1: Single Cloth Construction”, WIRA, U.K., 1986, ISBN: 0900820179 | ISBN-13: 9780900820175
5. GeornerD., “Woven Structure and Design, Part 2: Compound Structures”, WIRA,U.K., 1989, ISBN: 090366951X | ISBN-13: 9780903669511
6. Jan Shenton., “Woven Textile Design”, Laurence King Publishing, 2014, ISBN: 178067337X | ISBN-13: 9781780673370.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	3	2	1	2	2	1	1	2	2	3	3	3
2	3	3	3	3	2	1	2	2	1	1	2	2	3	3	3
3	3	3	3	3	2	1	2	2	1	1	2	2	3	3	3
4	3	3	3	3	2	1	2	2	1	1	2	2	3	3	3
5	3	3	3	3	2	1	2	2	1	1	2	2	3	3	3
Overall CO	3	3	3	3	2	1	2	2	1	1	2	2	3	3	3

TT23403 FIBRE AND YARN QUALITY EVALUATION

L	T	P	C
2	0	3	3.5

OBJECTIVES:

- To enable the students to learn about the principle and method of working of equipment's used for testing of fibres and yarns
- To enable the students to evaluate and analyse the fibers and yarns properties

UNIT I FIBRE LENGTH, STRENGTH AND FINENESS 6+6

Fibre length and distribution, strength and fineness – importance, testing standards, sampling, principle of measurement, interpretation of results; norms; AFIS and HVI

Importance of fibre testing-length, strength, fineness, maturity and trash; statistical test; sampling methods; random and biased samples, squaring technique and zoning technique for fibre selection; yarn sampling; conditioning, standards and norms

Practicals

1. Fibre fineness, length and strength

UNIT II FIBRE MATURITY, COLOUR AND TRASH 6+6

Fibre maturity, colour, trash, neps, moisture content, honey dew – importance, testing standards, sampling, principle of measurement, interpretation of results; norms; nep count in web and sliver; AFIS and HVI; Fibre length and length uniformity- measuring techniques; tensile strength testing modes — CRT,CRE,CRL and strain gauge; fibre strength-importance, measurement techniques; standards and norms

Practicals

1. Fibre maturity
2. Fibre trash content

UNIT III YARN COUNT, TWIST AND STRENGTH 6+18

Determination of linear density and CV % for lap, sliver and roving; yarn count – direct and indirect systems, calculations; yarn twist measurement – importance, single and ply; yarn strength – importance, testing standards, sampling, principle of measurement – single and bundle, interpretation of results; norms; weak link theory

Practicals

1. Roving, sliver and yarn linear density
2. Single yarn and yarn lea strength
3. Yarn single and ply yarn twist
4. Yarn impact strength

UNIT IV YARN EVENNESS **6+6**

Sliver, roving and yarn evenness, imperfections and hariness- importance, testing standards, sampling, principle of measurement, interpretation of results; norms; importance and measurement techniques - yarn hariness and yarn friction; standards and norms

Practicals

1. Unevenness of yarn

UNIT V YARN FAULTS **6+9**

Random and periodic faults; yarn appearance black board analysis, diagram, spectrogram and variance length curve; index of irregularity; classification and analysis of yarn faults

Practicals

1. Assessment of yarn appearance
2. Classification of yarn faults

TOTAL: 30 PERIODS + 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Explain and analyse the measuring principles of fibre length and strength
CO2: Analyse the importance and measuring techniques for fibre fineness, maturity and trash
CO3: Determine the yarn count and discuss the principles and test procedures of yarn twist and strength
CO4: Explain the importance and measuring techniques for yarn evenness and surface quality
CO5: Explain and analyse the yarn faults

TEXTBOOKS

1. Booth J.E., “Principle of Textile Testing”, Butterworth Publications, London, 1989, ISBN: 0592063259 | ISBN-13: 9780592063256.
2. Kothari V. K., “Progress in Textiles: Science & Technology Vol 1 Testing & Quality Management”, IAFL Publications, New Delhi, 1999, ISBN: 819010330X | ISBN-13: 9788190103305

REFERENCES

1. Grover Elliot B, “Handbook of Textile Testing and Quality Control”, Wiley India Pvt. Ltd, ISBN: 9788126531752
2. Arindam Basu, ”Textile Testing, Fibre, Yarn & fabric”, South India Textile Research Association, 2006, ISBN-9788189139155
3. Seville B.P., “Physical Testing of Textiles”, Textile Institute, Manchester, 1999, ISBN: 1855733676 | ISBN-13: 9781855733671.

4. Slater K., “Physical Testing and Quality Control”, The Textile Institute, Vol.23, No.1/2/3 Manchester, 1993, ISBN: 187081245X | ISBN-13: 9781870812450

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	2	2	1	2	1	1	2	1	1	2	3	3
2	3	2	2	2	2	1	2	1	1	2	1	1	2	3	3
3	3	2	2	2	2	1	2	1	1	2	1	1	2	3	3
4	3	2	2	2	2	1	2	1	1	2	1	1	2	3	3
5	3	2	2	2	2	1	2	1	1	2	1	1	2	3	3
Overall CO	3	2	2	2	2	1	2	1	1	2	1	1	2	3	3

TT23U01	STANDARDS – TEXTILE TECHNOLOGY	L	T	P	C
		1	0	0	1

MODULE I – OVERVIEW OF STANDARDS **6**

Basic concepts of standardization; Purpose of Standardization, marking and certification of articles and processes; Importance of standards to industry, policy makers, trade, sustainability and innovation. Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/IEC Directives; WTO Good Practices for Standardization. Important Indian and International Standards.

MODULE II – STANDRARDS FOR TEXTILE TECHNOLOGY **9**

1. **FIBRE PROPERTIES**

IS 233-1 to 4 - Methods for Determination of Length Parameters of Cotton Fibres
IS 1377 - Methods for determination of mean fibre length of wool
IS 236 - Methods for determination of Cotton fibre maturity (by sodium hydroxide swelling method)
IS 235 - Textile Fibres - Tensile Characteristics of Individual Fibres - Methods for Determination [TXD 1: Physical Methods of Tests]
IS 3674 - Method for determination of micronaire value of cotton fibres

2. **FABRIC PROPERTIES**

IS 1969 - Tensile Properties of Fabrics
IS 6489 - Tear Properties of Fabrics
IS 15891 - Determination of Bending Length
IS 8357 - Method for Assessment of Fabric Drape
IS 4681: Method for determination of recovery from creasing of textile fabrics by measuring the angle of recovery
IS 10971 - Determination of fabric propensity to surface fuzzing and to pilling Part - 1 Pilling box method
IS 11056 - Method for determination of air permeability of fabrics
IS 1313 - Methods for Determination of Flammability and Flame Resistance of Textile Fabrics
IS 686 - Methods for Determination of Colour Fastness of Textile Materials to Daylight
IS 766- Method for Determination of colourfastness of Textile Materials to Rubbing
IS 765 - Method for determination of colour fastness of textile materials to washing

COURSE OUTCOMES

Upon the completion of the course students will be able to

CO 1: conduct and interpret tests on fibre properties, applying the relevant standards to assess the quality
CO 2: conduct and interpret tests on fabric properties, applying the relevant standards to assess the quality and performance of textiles

`Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO2	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
Overall	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2

SEMESTER V

TT23C08	TECHNOLOGY OF KNITTING AND NONWOVEN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to learn the fundamentals and types of knitting and nonwoven

UNIT I FUNDAMENTALS OF KNITTING 9

Comparison of fabric properties-woven, knitted and bonded fabrics; classification of knitting processes – weft knit & warp knit; yarn quality requirements for knitting; general definitions and principles of knitting; types of knitting needles – Bearded, Latch& Compound needle; elements of knitted loop structure

UNIT II WEFT KNITTING 9

Basic weft knitted structures and their production -plain, rib, interlock and purl; fundamentals of formation of knit, tuck and float stitches; analysis of various types of weft knitted structure; flat-bed knitting; weft knitted fabric defects

UNIT III WARP KNITTING 9

Basic principles; elements of warp knitted loop open and closed laps; tricot and raschel warp knitting machines; warp knitted fabrics–structures and end uses; warp knitted fabric defects

UNIT IV WEB PREPARATION FOR NONWOVEN 9

Introduction; principle, machines and processes for web preparation - dry laid, wet laid, air laid; quality control of webs; web preparation by polymeric solution

UNIT V BONDING OF NONWOVEN 9

Bonding methods- principles and machine; processes for mechanical, thermal and chemical bonding; process parameters; application; testing of nonwoven

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to
CO1: Explain and classify knitting process
CO2: Describe and design basic weft knitted structure
CO3: Explain, classify and design basic warp knitted structure
CO4: Discuss the nonwoven web formation
CO5: Differentiate nonwoven bonding techniques

TEXTBOOKS

1. Spencer D.J., “Knitting Technology”, III Ed., Textile Institute, Manchester, 2001, ISBN:1855733331.

2. Samuel Raz., “Flat Knitting: The new generation”, Meisenbach GmbH, Bamberg,1997, ISBN:3-87525-054-0.
3. 2.SamuelRaz., “Warp Knitting production”, Melliand Textilberichte, GmbH, Rohrbacher, 1987, ISBN:3-87529-022-4
4. Lunenschloss J., Albrecht W. and David Sharp., “Nonwoven Bonded Fabrics”, Ellis Horwood Ltd., New York, 1985, ISBN: 0-85312-636-4.
5. Mrstina V. and Feigl F., “Needle Punching Textile Technology”, Elsevier, New York, 1990,ISBN: 0444988041 | ISBN-13: 9780444988041

REFERENCES

1. Ajgaonkar D.B., “Knitting technology”, Universal Publishing Corporation, Mumbai,1998, ISBN:0818502738/ISBN:9780818502736
2. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach, “Circular Knitting”, Meisenbach GmbH, Bamberg, 1995, ISBN:3-87525-066-4.
3. Dharmadhikary R. K., Gilmore T. F., Davis H. A. and Batra S. K., “Thermal Bonding of Nonwoven Fabrics”, Textile Progress, Vol.26, No.2, Textile Institute Manchester, 1995, ISBN:1870812786.
4. Jirsak O. and Wadsworth L. C., “Nonwoven Textiles”, Textile Institute, Manchester,1999, ISBN: 0 89089 9788.
5. Russell S., “Hand Book of Nonwovens”, Textile Institute, Manchester, 2004, ISBN: 1855736039

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	3	-	-	3	2	2	1	-	2	3	2	3
2	3	3	3	3	-	-	3	2	2	1	-	2	3	2	3
3	3	3	3	3	-	-	3	2	2	1	-	2	3	2	3
4	3	3	3	3	-	-	3	2	2	1	-	2	3	2	3
5	3	3	3	3	-	-	3	2	2	1	-	2	3	2	3
Overall CO	3	3	3	3	-	-	3	2	2	1	-	2	3	2	3

TT23C15	GARMENT TECHNOLOGY	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To enable the students to understand the basics of pattern making, cutting and sewing. To expose the students to various problems and remedies during garment manufacturing

UNIT I PATTERN MAKING 6 +6

Anthropometry, specification sheet, pattern making – principles, basic pattern set drafting, grading, marker planning, spreading and cutting

Practicals:

1. Measuring the dress form – male, female and child and formulating the measurement charts
2. Drafting the basic blocks of male and female
3. Drafting patterns of sleeve variations
4. Drafting patterns of collars, cuffs, pocket variations
5. Pattern drafting for Kid's garment

UNIT II SEWING MACHINERY 6 + 6

Different types of seams and stitches; sewing machine - types, mechanism and accessories; needle – functions, special needles, needlepoint

Practicals:

1. Sewing practice of different stitch classes
2. Sewing practice of seam types – superimposed seam, lapped seam, bound seam and flat seam.

UNIT III TRIMS AND ACCESSORIES 6

Sewing thread-construction, material, thread size, packages, accessories - labels, linings, interlinings, fusing, wadding, lace, braid, elastic, hook and loop fastening, shoulder pads, eyelets and laces, zip fasteners, buttons,

UNIT IV GARMENT CONSTRUCTION 6 + 18

Operation breakdown and construction procedure – formal shirt, formal trouser, women's top and skirt, kid's garments

Practicals:

1. Sewing of different types of plackets
2. Sewing of different types of pockets
3. Sewing of different types of sleeves
4. Sewing of different types of collars and cuff
5. Sewing of different types of neckline finishes
6. Sewing of different types of pleats, tucks and gathers
7. Sewing of a kid's garment

UNIT V GARMENT FINISHING 6

Garment finishing, garment pressing - categories and equipment, packing; care labeling of apparels

TOTAL: 30 PERIODS + 30 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students shall be able to

CO1: prepare pattern, marker and cut components

CO2: distinguish types of seams, stitches and functions of needles

CO3: comprehend components and trims used in garment

CO4: design and develop men's and women's garment

CO5: demonstrate working of garment pressing, packing machines

TEXT BOOK:

1. Carr H., and Latham B., "The Technology of Clothing Manufacture", Blackwell Science Ltd., Oxford, 1994, ISBN: 0632037482.
2. Winifred Aldrich., "Metric Pattern Cutting", Blackwell Science Ltd., Oxford, 2004, ISBN: 1405102780 | ISBN-13: 9781405102780

REFERENCES:

1. Peggal H., "The Complete Dress Maker", Marshall Caverdish, London, 1985.
2. Gerry Cooklin., Steven George Hayes., and John McLoughlin, "Introduction to Clothing Manufacture", Blackwell Scientific Publications, London, 2006, ISBN: 0632058463 | ISBN-13: 9780632058464.
3. Jai Prakash., and Gaur R.K., "Sewing Thread", NITRA, 1994.
4. Ruth E. Glock., and Grace I. Kunz., "Apparel Manufacturing – Sewn Product Analysis" 4th Edition, Upper Sadle River Publications, New York, 2004. ISBN: 0131119826 | ISBN-13: 9780131119826
5. Pradip V. Mehta., "An Introduction to Quality Control for the Apparel Industry", J.S.N. Internationals, 1992, ISBN: B015X4YGIE.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2	2	-	2	1	1	2	2	2	2	2	2	2	-
2	1	2	2	-	2	1	1	2	2	2	2	2	2	2	-
3	1	3	2	-	2	1	1	2	2	3	2	2	2	2	-
4	2	2	2	-	2	1	2	2	3	3	3	2	2	2	-
5	1	2	2	-	2	1	1	2	2	2	2	2	2	2	-
Overall CO	1.2	2.2	2	-	2	1	1.2	2	2.2	2.4	2.2	2	2	2	-

TT23501 MECHANICS OF TEXTILE MACHINERY

L	T	P	C
2	1	0	3

OBJECTIVES:

To enable the students to learn

- different power transmission systems, variable speed drives used in textile machinery
- designing of machine elements including cams, drums of winders
- application of bearings, brakes and clutches

UNIT I POWER TRANSMISSION 6+3

Gear-nomenclature, types, construction, features; belts - types, construction, features; power transmission in textile machinery – rope, belt, chain, gear trains

UNIT II MOTION, FORCE, ENERGY AND POWER 6+3

Linear and circular motion, force, energy, power; energy stored in rotating masses; sley eccentricity and beat up force in weaving machine

UNIT III VARIABLE SPEED DRIVES 6+3

Variable speed drives –mechanical, electrical, principle, application in textile machinery; differential gear system; design of cone drums – piano feed regulation, roving machine builder mechanism; conical pulleys, stepped pulleys

UNIT IV FRICTION 6+3

Friction-static, dynamic, laws of friction; clutches and brakes – types, features, application in textile machinery; bearings types, features and application in textile machinery

UNIT V DESIGN 6+3

Design - drive transmitting shafts, drum used in winders; cams – types and profiles; design of tappets of weaving machine and cam used in ring frame builder motion; unbalance, balancing of rotating masses – single and two planes

TUTORIALS

Solving the problems using computer spread sheet

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students can

CO1: Explain the construction and application of different types of power transmission systems in textile machinery and use the knowledge for selection of suitable drives for different applications

CO2: Estimate the force, energy and power requirements for textile machinery and appraise the concept of sley eccentricity

CO3: Explain variable speed drives and design variable speed drive systems for textile machinery

CO4: Explain the construction and function of clutches and brakes and select clutches, brakes and bearings for different applications

CO5: Design drive transmitting shafts, drums of winding machine, tappets and cams used in textile machinery and balance the rotating masses

TEXT BOOKS:

1. Booth J. E., “Textile Mathematics”, Vol. 2&3, The Textile Institute, Manchester, 1975.
2. Rengasamy R. S., “Mechanics of Spinning Machines”, NCUTE, Ministry of Textiles, Govt. of India, 2000.

REFERENCES:

1. Slater K., “Textile Mechanics”, Vol. 1&2, The Textile Institute, Manchester, 1977.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	2	1	1	2	1	1	1	2	2	2	1
2	3	3	3	2	2	1	1	2	1	1	1	2	2	2	1
3	3	3	3	2	2	1	1	2	1	1	1	2	2	2	1
4	2	2	2	1	1	1	1	1	1	1	1	2	2	2	1
5	3	3	3	3	3	2	2	3	2	2	2	2	2	2	1
Overall CO	2.8	2.8	2.8	2	2	1.2	1.2	2	1.2	1.2	1.2	2	2	2	1

TT23C05	FABRIC AND GARMENT QUALITY EVALUATION	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To enable the students to learn about the constructional details of fabrics, evaluation of fabric properties and their importance and garment quality

UNIT I CONSTRUCTION CHARACTERISTICS 6

Basic fabric particulars – measurement of thread density, count of warp and weft, thickness, areal density (GSM), crimp, cover factor and cover fraction calculations; fabric sampling techniques; standards and norms

UNIT II STRENGTH CHARACTERISTICS 6+10

Tensile strength measurement – principles and methods; seam strength, seam slippage; principles and measurement of tear strength, bursting strength; standards and norms

Practicals:

Determination of fabric

1. tensile strength
2. tear strength
3. bursting strength
4. Seam strength
5. Seam slippage

UNIT III SURFACE CHARACTERISTICS 6+14

Principle and measurement of fabric stiffness, drapeability, crease recovery, wrinkle recovery, air permeability, water repellency, fabric shrinkage, fabric abrasion resistance, fabric pilling, soil resistance; standards and norms

Practicals:

Determination of fabric

1. bending modulus and flexural rigidity
2. crease recovery
3. wrinkle recovery
4. drape
5. abrasion
6. pilling resistance
7. Air permeability of fabrics

UNIT IV FABRIC HANDLE AND FUNCTIONAL CHARACTERISTICS 6

Objective measurement by KES-F – tensile, shear, bending, compression, surface roughness and friction - hysteresis measurements; principles and measurement by FAST, principle and measurements of fabric flame resistance, moisture and thermal properties; standards and norms.

UNIT V FABRIC INSPECTION AND GARMENT QUALITY 6+6

Fabric defects – inspection and grading, acceptable quality level; quality assessment of garments - cutting, sewing, pressing, finishing and packaging defects; durability characteristics of trims - zippers, buttons, snaps; buckles- abrasion, bursting and corrosiveness; standards and norms

Practicals:

Determination of

1. Button pulling test
2. Delamination test
3. Testing of sewing threads

TOTAL: 30 PERIODS +30 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students shall be able to

CO1 Analyse and evaluate the construction characteristics of fabric
CO2 Differentiate and explain measuring principles of strength characteristics of fabric
CO3 Evaluate and explain the surface characteristics of fabrics
CO4 Investigate and evaluate the low stress and functional characteristics of fabric
CO5 Evaluate and explain the fabric inspection and quality assessment of garments

TEXTBOOKS

1. Booth J.E., “Principle of Textile Testing”, Butterworth Publications, London, 1989
2. Saville B.P., “Physical Testing of Textiles”, Textile Institute, Manchester, 1998
3. Kothari V. K., “Testing and Quality Management”, Progress in Textile Technology Vol.1, IAFL Publications, New Delhi, 1999

REFERENCES:

1. Ruth clock and Grace Kunz., “Apparel Manufacture – Sewn Product Analysis”, Upper Sadle River Publications, New York, 2000
2. Pradip V. Mehta., “Managing Quality in the Apparel Industry”, NIFT Publication, India, 1998
3. Sara J. Kadolph, “Quality Assurance for Textiles and Apparels”, Fair Child Publications, New York, 1998
4. Slater K., “Physical Testing and Quality Control”, The Textile Institute, Vol.23, No.1/2/3 Manchester, 1993

Course Articulation Matrix:

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO2	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO3	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO4	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO5	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
Overall CO	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2

TT23C18 FINANCIAL MANAGEMENT FOR TEXTILE INDUSTRY

L	T	P	C
2	1	0	3

OBJECTIVES:

To enable the students to learn

- Costing of yarn, fabrics and garments and interpretation of financial statements
- Sources of financing and investment analysis

UNIT I BASICS OF COSTING 6

Costing-concepts, types; different methods of costing, classification of costs; preparation of cost sheet; cost profit volume analysis, break even analysis

UNIT II TEXTILE COSTING 6

Costing of yarn, fabrics and garments; tax structure

UNIT III CAPITAL STRUCTURE 6

Sources and cost of capital - equity and debt, capital structure; working capital management; budget, types of budgets, budgeting and control in textile industry

UNIT IV INVESTMENT ANALYSIS 6

Depreciation- methods of computing depreciation; investment analysis – payback period method, accounting rate of return, discounted cash flow methods - IRR, NPV, PI

UNIT V TOOLS FOR FINANCIAL ANALYSIS AND CONTROL 6

Interpretation - Profit and loss account, balance sheet, cash flow statement, illustrations from textile industry; financial ratio analysis

TUTORIALS – 15 PERIODS

Solving the problems using computer spread sheet

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students can

CO1: Explain types and different methods of costing; prepare the cost sheet; execute cost profit volume, break even analysis

CO2: Determine the cost of yarn, fabric and garment

CO3: Explain different sources of capital and evaluate the cost of capital; analyze the data and prepare the budget for textile firm

CO4: Determine depreciation by different methods and investigate investment appraisal by different methods

CO5: Analyze and interpret the financial statements and execute financial ratio analysis

TEXTBOOKS

1. Pandey I. M., “Financial Management”, Vikas Publishing House Pvt. Ltd., New Delhi,10th Edition, 2010
2. Kantwala D.N., “Costing and Cost Control –A Marginal Approach for Textile Industry”, Texcons, Bombay, 1977.

REFERENCES

1. Bhave P.V. and Srinivasan V., “Costing Accounting to Textile Mills”, ATIRA, Ahmadabad, 1976
2. Thukaram Rao M.E., “Cost Accounting and Financial Management” New Age International, Bangalore, 2004
3. Narang, G. B. S., and Kumar V., “Production and Costing”, Khanna Publishers, New Delhi, 1988
4. Hrishikes Bhattacharya., “Working Capital Management, Strategies and Techniques”, Prentice Hall of India Pvt. Ltd., New Delhi, 2014
5. Khan and Jain, “Basic Financial Management and Practice”, Tata McGraw Hill, New Delhi, 7th Edition, 2014

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	3	-	2	1	-	2	2	2	2	1	-	2	-
2	-	-	3	-	2	1	-	2	2	2	2	1	-	2	-
3	-	-	2	-	3	1	-	2	2	2	2	1	-	2	-
4	-	-	2	-	3	1	-	2	2	2	2	1	-	2	-
5	-	-	2	-	3	1	-	2	2	2	2	1	-	2	-
Overall CO	0	0	2.4	0	2.6	1	0	2	2	2	2	1	0	2	0

TT23502 **INTERNSHIP I / TRAINING I**

L	T	P	C
0	0	0	1

OBJECTIVES:

- To train the students in the field work so as to have a firsthand knowledge of practical problems related to textile technology in carrying out engineering tasks.

SYLLABUS:

The students individually undertake training in reputed textile industries during the summer vacation for a specified duration of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1: Acquire oral presentation skills in textile field

CO2: Acquire technical report writing abilities

CO3: Document various material, machine and process parameters

CO4: Analyze industry problems and their solutions

CO5: Comprehend organizational flow structure

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	2	2	2	3	3	2	3	3	2	1
2	3	3	3	2	2	1	2	2	3	3	2	2	3	2	2
3	3	3	3	2	2	3	3	3	3	2	3	3	3	3	3
4	3	3	3	2	2	3	3	3	3	2	3	3	3	3	3
5	3	3	3	2	2	1	2	2	3	2	3	2	2	2	1
Overall CO	3	3	3	2	2	2	2.1	2.1	3	2.4	2.6	2.6	2..8	2.4	2

UC23E01 ENGINEERING ENTREPRENEURSHIP DEVELOPMENT

L	T	P	C
2	0	2	3

OBJECTIVES:

1. Learn basic concepts in entrepreneurship, develop mind-set and skills necessary to explore entrepreneurship
2. Apply process of problem - opportunity identification and validation through human centred approach to design thinking in building solutions as part of engineering projects
3. Analyse market types, conduct market estimation, identify customers, create customer persona, develop the skills to create a compelling value proposition and build a Minimum Viable Product
4. Explore business models, create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture ideas & solutions built with domain expertise
5. Prepare and present an investible pitch deck of their practice venture to attract stakeholders

MODULE – I: ENTREPRENEURIAL MINDSET **4L,8P**

Introduction to Entrepreneurship: Definition – Types of Entrepreneurs – Emerging Economies – Developing and Understanding an Entrepreneurial Mindset – Importance of Technology Entrepreneurship – Benefits to the Society.

Case Analysis: Study cases of successful & failed engineering entrepreneurs - Foster Creative Thinking: Engage in a series of Problem-Identification and Problem-Solving tasks

MODULE – II: OPPORTUNITIES **4L,8P**

Problems and Opportunities – Ideas and Opportunities – Identifying problems in society – Creation of opportunities – Exploring Market Types – Estimating the Market Size, - Knowing the Customer and Consumer - Customer Segmentation - Identifying niche markets – Customer discovery and validation; Market research techniques, tools for validation of ideas and opportunities

Activity Session: Identify emerging sectors / potential opportunities in existing markets - Customer Interviews: Conduct preliminary interviews with potential customers for Opportunity Validation - Analyse feedback to refine the opportunity.

MODULE – III: PROTOTYPING & ITERATION **4L,8P**

Prototyping – Importance in entrepreneurial process – Types of Prototypes - Different methods – Tools & Techniques.

Hands-on sessions on prototyping tools (3D printing, electronics, software), Develop a prototype based on identified opportunities; Receive feedback and iterate on the prototypes.

MODULE – IV: BUSINESS MODELS & PITCHING **4L,8P**

Business Model and Types - Lean Approach - 9 block Lean Canvas Model - Riskiest Assumptions in Business Model Design – Using Business Model Canvas as a Tool – Pitching Techniques:

Importance of pitching - Types of pitches - crafting a compelling pitch – pitch presentation skills - using storytelling to gain investor/customer attention.

Activity Session: Develop a business model canvas for the prototype; present and receive feedback from peers and mentors - Prepare and practice pitching the business ideas- Participate in a Pitching Competition and present to a panel of judges - receive & reflect feedback

MODULE – V: ENTREPRENEURIAL ECOSYSTEM **4L,8P**

Understanding the Entrepreneurial Ecosystem – Components: Angels, Venture Capitalists, Maker Spaces, Incubators, Accelerators, Investors. Financing models – equity, debt, crowdfunding, etc, Support from the government and corporates. Navigating Ecosystem Support: Searching & Identifying the Right Ecosystem Partner – Leveraging the Ecosystem - Building the right stakeholder network

Activity Session: Arrangement of Guest Speaker Sessions by successful entrepreneurs and entrepreneurial ecosystem leaders (incubation managers; angels; etc), Visit one or two entrepreneurial ecosystem players (Travel and visit a research park or incubator or makerspace or interact with startup founders).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon the successful completion of the course, students will be able to:

CO1: Develop an Entrepreneurial Mind-set and Understand the Entrepreneurial Ecosystem Components and Funding types

CO2: Comprehend the process of opportunity identification through design thinking, identify market potential and customers

CO3: Generate and develop creative ideas through ideation techniques

CO4: Create prototypes to materialize design concepts and conduct testing to gather feedback and refine prototypes to build a validated MVP

CO5: Analyse and refine business models to ensure sustainability and profitability Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders

REFERENCES:

7. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition
8. Bill Aulet (2024). Disciplined Entrepreneurship: 24 Steps to a Successful Startup. John Wiley & Sons.
9. Bill Aulet (2017). Disciplined Entrepreneurship Workbook. John Wiley & Sons.
10. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business
11. Blank, S. G., & Dorf, B. (2012). The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch

12. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons

13. Marc Gruber & Sharon Tal (2019). Where to Play: 3 Steps for Discovering Your Most Valuable Market Opportunities. Pearson.

SEMESTER VII

TT23701	STRUCTURAL MECHANICS OF YARNS AND FABRICS	L	T	P	C
		2	1	0	3

OBJECTIVES:

To enable the students to learn

- geometry of spun, filament yarns and woven fabrics
- theory explaining the behaviour of yarns and fabrics

UNIT I GEOMETRY OF TWISTED YARNS 6+3

Idealized helical yarn structure; yarn count and twist factor, twist contraction and retraction; relationship between yarn parameters

UNIT II PACKING OF FIBRES AND FIBRE MIGRATION IN YARN 6+3

Idealized packing; packing of fibres in yarns; measurement of yarn diameter; measurement of packing density and radial packing density of yarn; ideal migration, tracer fibre technique, characterization of migration behaviour, mechanisms of migration in filament and spun yarn, effect of various parameters on migration behaviour

UNIT III THEORY OF TENSILE BEHAVIOUR OF YARN 6+3

Analysis of tensile behaviour of filament yarn - filament strain and yarn strain, prediction of breakage of filament yarn; analysis of tensile behaviour of spun yarn- deduction based on fibre obliquity and slippage; influence of fibre length, fineness and friction on tensile behaviour of spun yarn; strength prediction model for blended yarns - Hamburger's model

UNIT IV GEOMETRY OF WOVEN FABRIC STRUCTURE 6+3

Woven fabric geometry - Pierce model, jamming of threads, cover factor, crimp interchange; Olofssons model - form factor, degree of set

UNIT V MECHANICS OF WOVEN FABRIC DEFORMATION AND STRUCTURE Vs PROPERTY RELATIONSHIP 6+3

Mechanics of extension behaviour of woven fabric; mechanics of other fabric deformations - shear, buckling, bending and compression; structure-property relationship for yarns and fabrics

TUTORIALS

Solving the problems using spread sheet software

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students can

CO1. Explain the geometry of yarn; solve the relationship between different structural parameters of yarn

CO2. Explain packing of fibres and migration of filaments, fibres in yarn; measure packing density and fibre migration characteristics of yarn

CO3. Interpret the theory of tensile behaviour of filament and spun yarns and factors influencing it; predict the strength of yarn

CO4. Demonstrate models explaining the geometry of woven fabric

CO5. Interpret the mechanics of woven fabric deformation and relate the characteristics of woven fabric with the structure of yarn and fabrics

TEXTBOOKS

1. Hearle J. W. S., “Structural Mechanics of Fibers, Yarns and Fabrics”, Wiley-Interscience, NewYork, 1969.
2. Jinlian Hu, “Structure and Mechanics of Woven Fabrics”, Woodhead Publishing Ltd., 2004.

REFERENCES

1. Hassan M. B., “Effect of Mechanical and Physical Properties on Fabrics Hand”, Woodhead Publishing Ltd., 2005.
2. Hearle J. W. S., Thwaites J.J. and Amirbayat J., “Mechanics of Flexible Fibre Assemblies”, Springer Dordrecht, 2013.
3. Schwartz P., “Structure and Mechanics of Textile Fibre Assemblies”, Woodhead Publishing Ltd., 2008.
4. Goswami B.C., “Textile Yarns”, John Wiley & Sons, New York, 1987.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	2	1	1	-	2	2	3	1	1	1	2	1
2	3	3	2	2	2	1	-	1	1	2	1	1	1	2	1
3	2	3	2	2	1	1	-	2	1	2	1	1	1	2	1
4	2	3	2	2	1	1	-	1	2	2	1	1	1	2	1
5	2	3	2	2	1	1	-	1	2	2	1	1	1	2	1
Overall CO	2.4	3	2	2	1.2	1	-	1.4	1.6	2.2	1	1	1	2	1

TT23C04 COMPLIANCE IN TEXTILE INDUSTRY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart knowledge on the concepts of social compliance and provide insight on eco process and ethical practices

UNIT I SCOPE AND NEED OF SOCIAL COMPLIANCE 9

Social Compliance - concept, need, benefits for industry, workers, society; SA 8000 standard, Provisions and Certification Process, compliance in material procurement, production, supply chain management; social compliances applied to garment manufacturing and other textile industry; case studies

UNIT II HEALTH AND SAFETY 9

WRAP, FLA. Health and Safety Targets, Objectives, Standards, Practices and Performances. 12 key criteria and principles of WRAP; working hours-norms, code of conduct; remuneration-minimum wages, compensation - norms applicable in India; freedom of association, trade union, collective bargaining agreements, related laws in India; health and safety – norms and measures to be taken for safe working environment – Factories Act 1948 and amendments, Provisions of Health, Safety and Welfare

UNIT III SUSTAINABILITY 9

Circular economy, carbon and water foot print, carbon balance, Zero waste and 3R, SDGs - concept, significance, practices; RSL(Restricted Substance List) - definition, importance; Environment standards

UNIT IV ENVIRONMENT COMPLIANCE AND ECO-FRIENDLY SOLUTIONS 9

Environment and climate; Global Reporting Initiatives (GRI), sustainability reporting guide line; Organization for Economics Co-operation and Development (OECD) and provisions; Eco-friendly environment - ecofriendly dyes, ecofriendly process - bio scouring, biopolishing; recycling and up cycling concepts for fashion and accessories, ethical, standard practices for sourcing of sustainable fashion clothing and accessory. Eco-Mark – standards, benefits to customers and certifications; eco-labels – standards benefits to customers and certifications; Organic Products – Standards Benefits to customers and certifications

UNIT V ETHICAL TRADING AND INTERNATIONAL COMPLIANCE 9

Ethical Trading Initiative (ETI). National and international regulating organizations – GOTS, OSHA The Higg Facility Environmental Module (Higg FEM) - sustainability assessment tool & Standards to measure the Social and Environmental Impacts of companies and their environmental performance – Sustainable Apparel Coalition and their practices; HIGG INDEX, OEKO TEX, BLUE SIGN AND REACH – Standards, certification and benefits to customers; Corporate Governance - Corporate Social Responsibility (CSR) – mandatory requirements – benefits to company, labour and society

TOTAL:45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students can

CO1: comprehend about the scope and need for social compliance

CO2: discuss about the need for labour and wage compliance

CO3: apply the health and environmental compliance in relation to textile industry

CO4: analyse the potential hazards caused by banned and hazardous substances

CO5: explain the need for ethical trading and sustainability in the current business scenario

TEXTBOOKS

1. Rajesh Chhabara, “Social Accountability”, Avasoftech Pvt.Ltd.,2005
2. Claudia E. Henninger, Kirsi Niinimäki, Marta Blazquez, Celina Jones “Sustainable Fashion Management” routledge taylor and francis group first edition 2022

REFERENCES

1. Venkatesh Selvaraj, “Handbook for social compliance audit: a step by step approach”, Kindle Store, 2021
2. Muhammad Azizul Islam, “Social Compliance Accounting”, Springer, 2015
3. Rebocak Leifziger, “SA 8000: The first decade”, Greech Leaf Publishers, May2009.
4. Miraftab M and Horrocks A R, “Eco Textiles”, The Textile Institute, Woodhead Publication Ltd., Cambridge, 2007.
5. Susanna Benny and Janakiraman K P, “Eco parameters: Present Status”, Mill Control Report No.15, The South India, Textile Research Association, Coimbatore, 1998.
6. “Oko-tex Standard 100”, International Association for Research and Testing in the field of Textile Ecology (Oko- tex), Zurich, Switzerland, January, 1997.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	1	1	-	3	3	3	-	2	1	1	3	3	1
2	2	2	1	1	-	3	3	3	-	2	1	1	3	3	1
3	2	2	1	1	-	3	3	3	-	2	1	1	3	3	1
4	2	2	1	1	-	3	3	3	-	2	1	1	3	3	1
5	2	2	1	1	-	3	3	3	-	2	1	1	3	3	1
Overall CO	2	2	1	1	-	3	3	3	-	2	1	1	3	3	1

TT23C11 TOTAL QUALITY MANAGEMENT FOR TEXTILE INDUSTRY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to learn the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To acquire the TQM Principles for application.

UNIT I TQM PHILOSOPHIES AND PRINCIPLES IN TEXTILE INDUSTRY 9

Definition, need, evolution of quality; Concept of total Quality; Attitude and involvement of top management; customer focus, perception and retention; dimensions of product and service quality; Cost of quality; Quality Gurus - Crosby, Deming, Masaaki Imai, Feigenbaum, Ishikawa, Juran, Oakland, Shigeo Shingo, and Taguchi.

UNIT II PROCESS CONTROL IN TEXTILE INDUSTRY I 9

Concepts of Quality circle, Kaizan and 5S principles, PDSA and 8D methodology; TQM - culture, framework, benefits, awareness and obstacles; Employee involvement – Motivation, empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal; Supplier - Selection, Partnering, Supplier Rating.

UNIT III PROCESS CONTROL IN TEXTILE INDUSTRY II 9

Statistical Process Control (SPC) – Meaning, Significance. construction of control charts for variables and attributes. Process capability – meaning, significance and measurement. Six sigma- concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve. Total productive maintenance (TMP), Terotechnology. Business process Improvement (BPI) – principles, applications, reengineering process, benefits and limitations.

UNIT IV TQM TOOLS & TECHNIQUES I 9

Quality Tools - the seven traditional tools of quality, new management tools. lean principles, Six-sigma, Poka-yoke, failure mode effect analysis (FMEA) – reliability, failure rate, FMEA stages, design, process and documentation.

UNIT V TQM TOOLS & TECHNIQUES II 9

Quality Function Deployment (QFD) – benefits, house of quality. Taguchi - quality loss function, parameter and tolerance design, signal to noise ratio; Quality management systems – elements, documentation guidelines for performance improvements, Quality manuals, Quality Audits;

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students shall be able to

CO1: Understand TQM concepts

CO2: Apply TQM principles in a textile enterprise.

CO3: understand the importance of statistical process control in textile firm

CO4: Implement TQM tool in textile industry

CO5: Discuss the quality management system

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Bester field,MaryB.Sacre, Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013
2. Tapan Bose “Total Quality Management”, Pearson Education, 2011

REFERENCES:

1. Joel.E. Ross, “Total Quality Management – Text and Cases”,Routledge.,2017.
2. Kiran.D.R, “Total Quality Management: Key concepts and case studies, Butterworth Heinemann Ltd, 2016.
3. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition,2003.
4. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006

Course Articulation Matrix:

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2	2	-	2	1	1	2	2	2	2	2	2	2	-
2	1	2	2	-	2	1	1	2	2	2	2	2	2	2	-
3	1	3	2	-	2	1	1	2	2	3	2	2	2	2	-
4	2	2	2	-	2	1	2	2	3	3	3	2	2	2	-
5	1	2	2	-	2	1	1	2	2	2	2	2	2	2	-
Overall CO	1.2	2.2	2	-	2	1	1.2	2	2.2	2.4	2.2	2	2	2	-

TT23702	TECHNICAL TEXTILES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to learn functional requirement, material selection and construction of technical textiles

UNIT I INDUSTRIAL AND AUTOMOTIVE TEXTILES 9

Technical textiles – overview, scope, application areas; Industrial textiles - reinforcements in belts; conveyor belts, power transmission belts – functional requirement and construction; automotive textiles - pneumatic tyres, air bags, seat belts, head liner, battery separator, sound deadening materials, radiator hoses – material and construction

UNIT II TEXTILES FOR MEDICAL AND HYGIENE 9

Classification of medical textiles; biopolymers; hospital bedspreads, gowns for medical professionals, gloves - functional requirement and construction; antimicrobial textiles; mask and respirators - mechanism of filtration and construction; sutures and bandages

UNIT III PROTECTIVE TEXTILES 9

Functional requirements and construction - Ballistic textiles, extreme climate protective textiles, flame proof, UV-ray protection, water proof, protection against nuclear, biological, chemical hazards, EMI shielding, textiles for electrostatic protection

UNIT IV GEO AND AGROTEXTILES 9

Functions of geotextiles; types and application of geosynthetics; fibres and fabric selection criteria for geotextile applications; agro textiles – different applications, functional requirements and construction

UNIT V TEXTILES IN MISCELLANEOUS APPLICATIONS 9

Textiles for tents, awnings, scaffolding nets, packaging, sound insulation, banner and flags, canvas cover and tarpaulins, fish nets – material and construction; sport wear textiles

TOTAL:45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students can

CO1: comprehend about the functional requirement and construction of textile materials used in Industrial and automotive textiles

CO2: explain about the functional requirement and construction of textile materials used in medical and hygiene applications

CO3: analyse the need for developing textiles for protective applications

CO4: design products for geo and agro applications

CO5: design the products used for packaging, tents, fish nets and sport wears

TEXT BOOKS:

1. Horrocks A.R. and Anand S.C., “Handbook of Technical Textiles”, The Textile Institute, Manchester, 2000, ISBN:1855733854.
2. Adanur S., “Wellington Sears Handbook of Industrial Textiles”, Technomic Publishing Co. Inc.,1995, ISBN:1–56676–340–1.

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1. Mukhopadhyay S.K. and PartridgeJ.F., “Automotive Textiles”, Textile Progress, Vol.29,

No1/2, 1999, ISBN:1870372212.
2. Scott.R.A., “Textiles for Protection”, Wood head Publishing Limited, Cambridge, UK,2005,ISBN1-85573-921-6.
3. Long.A.C, “Design and Manufacture of Textile Composities”, Woodhead Publishing Ltd,Cambridge, UK, 2005, ISBN1-85573-744-2.
4. Fung.W, “Coated and Laminated Textiles”, Woodhead Publishing Ltd., Cambridge, UK, 2002, ISBN1-85573-576-8.
5. Anand.S.C, Kennedy.J.F, Miraftab.M and Rajendran.S., “Medical Textiles and Biomaterials for Health Care”, Wood head Publishing Ltd, Cambridge, UK, 2006, ISBN1-85573-683-7.
6. Fung.W and Hard castle, “Textiles in Automotive Engineering”, Woodhead Publishing Ltd.,Cambridge, UK, 2001, ISBN1-85573-493-1.
7. John.N.W.M, “GeoTextile” ,Blackie and Sons Ltd., London, UK., 1987, ISBN0-412-01351-7
8. Sarsby R.W., “Geosynthetics in civil engineering”, Woodhead Publishing, Cambridge, U.K.,2006, ISBN:9781855736078.131

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2	3	3	-	2	2	2	1	2	3	3	2	3	3
2	2	1	3	3	-	2	2	2	1	2	3	3	2	3	3
3	1	1	3	3	-	3	2	2	1	2	3	3	2	3	3
4	2	1	3	3	-	3	2	2	1	2	3	3	2	3	3
5	2	1	3	3	-	3	2	2	1	2	3	3	2	3	3
Overall CO	1.6	1.2	3	3	-	2.6	2	2	1	2	3	3	2	3	3

SEMESTER VIII

		L	T	P	C
TT23801	**PROJECT WORK /SEMESTER LONG INTERNSHIP**	**0**	**0**	**16**	**8**

OBJECTIVES:

- To solve the identified problem based on the formulated methodology.
- To develop skills to analyze and discuss the test results, and make conclusions.

SYLLABUS:

Project:

The student should carryout literature survey and experimental works on selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

Semester Long Internship:

The students individually undertake training in reputed textile industries and have to find solution for the industrial problems during the internship. At the end of training, a detailed report on the work done should be submitted and will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 120 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to analyse, design and develop the products in

CO1: Spinning and weaving
CO2: Fibre science and processing
CO3: Knitting and Nonwovens
CO4: Nanotechnology application in textiles
CO5: Textile structural composites

Course Articulation Matrix:

Course Outcomes	ProgramOutcome												Program Specific Outcome		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	SO2	PSO3
1	3	3	3	3	1	1	1	2	2	2	2	1	3	2	3
2	3	3	3	3	1	1	1	2	2	2	2	1	3	2	3
3	3	3	3	3	1	1	1	2	2	2	2	1	3	2	3
4	3	3	3	3	1	1	1	2	2	2	2	1	3	2	3
5	3	3	3	3	1	1	1	2	2	2	2	1	3	2	3
Overall CO	3	3	3	3	1	1	1	2	2	2	2	1	3	2	3

TT23703 **INTERNSHIP / TRAINING**

L	T	P	C
0	0	0	2

OBJECTIVES:

- To train the students in the field work so as to have a firsthand knowledge of practical problems related to textile technology in carrying out engineering tasks.

SYLLABUS:

The students individually undertake training in reputed textile industries during the summer vacation for a specified duration of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1: Acquire oral presentation skills in textile field

CO2: Acquire technical report writing abilities

CO3: Document various material, machine and process parameters

CO4: Analyze industry problems and their solutions

CO5: Comprehend organizational flow structure

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	SO2	PSO3
1	3	3	3	2	2	2	2	2	3	3	2	3	3	2	1
2	3	3	3	2	2	1	2	2	3	3	2	2	3	2	2
3	3	3	3	2	2	3	3	3	3	2	3	3	3	3	3
4	3	3	3	2	2	3	3	3	3	2	3	3	3	3	3
5	3	3	3	2	2	1	2	2	3	2	3	2	2	2	1
Overall CO	3	3	3	2	2	2	2.1	2.1	3	2.4	2.6	2.6	2..8	2.4	2

VERTICAL I

FIBRE SCIENCE

TT23001	POLYMER CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students to learn the

- Various polymerization techniques
- Fibre forming polymer characteristics and evaluation techniques
- Synthesis of polymers

UNIT I CHEMISTRY OF POLYMERISATION 9

Introduction to monomers and source of monomers; natural and synthetic polymers; terms and fundamental concepts; Chemistry of polymerisation - step polymerization, Chain growth polymerization, miscellaneous polymerisation

UNIT II POLYMERISATIONTECHNIQUES 9

polymerisation techniques; Kinetics of polymerisation - free radical polymerization, cationic polymerisation, anionic polymerisation, polycondensation; termination, chain transfer, Mayo's equation, cage effect, auto acceleration inhibition and retardation

UNIT III POLYMER CHARACTERISATION 9

Synthetic routes to polymers, Molecular weight determination - end group analysis, osmometry, light scattering, ultra centrifugation, gel permeation chromatography and intrinsic viscosity; composition and microstructure, optical microscopy, electron microscopy, analytical microscopy, scanning probe microscopy; thermal analysis, molecular relaxation spectroscopy; X-ray and neutron scattering methods

UNIT IV SYNTHESIS OF TEXTILE POLYMERS 9

Polymer synthesis - polyester, nylon 6, nylon 66, acrylic, polyolefin; co-polymerization and its importance; copolymer equation, reactivity ratio, tailor making of copolymer properties; synthesis of polymers for regenerated fibres; chemical modification of fibres

UNIT V POLYMER PROCESSING 9

Compounding of polymers - fillers, plasticizers, antioxidants, UV stabilizers, colouring agents and flame retardants; polymer processing - compression moulding, injection, extrusion, calendaring and film casting; preparation and properties of epoxy and silicone polymers; conductive polymers, super absorbent polymers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: describe polymerisation reactions for synthesising various polymers

CO2: explain various polymerisation techniques

CO3: assess the characteristics of polymers

CO4: formulate the textile polymers

CO5: appraise the processing of polymers for various applications

TEXTBOOKS

1. Fred W Billmeyer, “Textbook of Polymer Science”, John Wiley & Sons, 984-03.
2. Gowariker V. R., Viswanathan N. V., and Jayadev Sreedhar, “Polymer Science”, 2nd edition, New Age International (P) Limited publishers, Bangalore, 2015.

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1. Joel R., “Fried Polymer Science and Technology”, Journal of Chemical Association, ACS Publications, 2004.
2. Hearle, J.W.S, “Polymers and their Properties”, E. Horwood, New York, 1982.
3. Lenz RW, “Organic Chemistry of Synthetic High Polymers”, Interscience Publishers, New York, 1967.
4. Anil Kumar; Rakesh K Gupta, “Fundamentals of Polymers”, McGraw-Hill, New York, 1998.
5. Stephen Z. D. Cheng and Bernhard Wunderlich, “Polymer Science”, Polymer Physics Ed., 1986.
6. Mishra G. S., “Introductory Polymer Chemistry”, John Wiley & Sons, Dhanpat Rai& Co. Pvt. Ltd., 2003.
7. William D. Callister, Jr, “Materials Science and Engineering – An Introduction”, 7th edition, Sixth Edition, John Wiley & Sons, Inc., 2007.
8. Hobert H. Willard, Lynne L. Merrit, John A Dean and Frank A. Settle, “Instrumental Methods of Analysis”, CBS Publishers, 2004

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	3	2	3	1	1	-	-	-	2	1	3	1	3
2	3	3	3	3	3	1	1	-	-	-	1	2	3	1	3
3	2	2	2	3	3	-	-	-	-	-	1	1	2	-	3
4	2	2	3	3	2	1	1	-	-	-	2	2	2	1	2
5	2	2	2	2	2	-	2	-	-	-	2	1	2	-	3
Overall CO	2.4	2.2	2.6	2.6	2.6	1	1.25	-	-	-	1.6	1.4	2.4	1	2.8

TT23002	POLYMER PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES

To enable the students to learn about

- Fibre forming polymer characteristics and their related models and models describing fibre structure.

UNIT I FUNDAMENTALS OF POLYMERS 9

Classification of polymers; Fundamental definitions, configurational states, shapes of polymer molecules bonding, conformation and chain statistics, typical bond lengths and angles, molar mass and repeating units; average molecular weight, degree of polymerization and polydispersity; size of polymer molecules

UNIT II KINETICS OF POLYMERIZATION 9

Free radical polymerization – cationic polymerization – anionic polymerization; polycondensation; polymer micro structure – chemical, geometrical; dilute solution properties, polymer reaction thermodynamics, kinetics of chain and step polymers, concentrated polymer solutions and polymer melts.

UNIT III CRYSTALLINITY OF POLYMERS 9

Crystalline morphology, degree of crystallinity, experimental determination, crystallites fringed micelle model, chain folded crystallites, extended chain crystallites; crystalline solids and their behavior, crystallites, structural regularity and crystallisability, helical structures, spherulites and single crystal structures

UNIT IV POLYMER REACTIONS 9

Hydrolysis, acidolysis, hydrogenation, aminolysis, addition and substitutions reactions; reaction of various specific groups; cyclization reaction; cross linking reactions; reactions of graft and block copolymers; miscellaneous reactions

UNIT V POLYMER DEGRADATION 9

Thermal degradation, mechanical degradation, degradation by ultrasonic waves, photodegradation, high energy radiation degradation, oxidative degradation, hydrolytic degradation

TOTAL:45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO 1: describe about the fundamentals of polymers
CO 2: explain about the kinetics of polymer process
CO 3: analyse about the crystallinity of polymers
CO 4: discuss about the polymerisation reactions
CO 5: appraise about the polymer degradation

TEXTBOOKS

1. Billmeyer, “Textbooks of Polymer Science”,3rd ed., Wiley, 1984.

2. Gupta.V.B. and Kothari V.K., “Man Made Fibre Production”, Chapman and Hall, 1985

REFERENCES

1. Sperling, “Introduction to Physical Polymer Science”, Wiley, 1986.
2. Odian, “Principle of Polymerizatin”, 3rd ed., Wiley, 1991.
3. Gordon,”High Polymers”, Addision-Wesley, 1963.
4. Kothari V.K., “Textile Fibres: Developments and innovations”, IAFL Publication, 2000
5. Hongu T. and Philips G., “New Fibres”, Wood Head Publishing Ltd,1997

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	2	2	2	2	2	1	2	1	1	-	-	2	3	1	3
2	2	2	2	2	1	1	1	-	1	-	2	2	1	-	2
3	2	2	2	2	2	1	1	-	1	1	1	2	2	1	3
4	3	3	3	3	3	2	2	1	2	1	2	2	2	1	3
5	2	2	2	2	2	1	3	1	1	1	2	2	2	1	3
Overall CO	2.2	2.2	2.2	2.2	2	1.2	1.8	1	1.2	1	1.75	2	2	1	2.8

TT23003	POLYMER RHEOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students

- To learn the basic concepts of rheology
- To analyze the flow behavior of polymer melts
- To learn the basics of fluid mechanism and to analyze behavior of newtonian fluids.

UNIT I LINEAR ELASTIC SOLIDS 9

Basic forces: expansion/contraction, extension and shear; elastic deformations – inter relationships between elastic moduli and Poisson's ratio; thermodynamics of elasticity

UNIT II LINEAR VISCOUS FLUIDS 9

Newtonian flow and simple shear -measurement of viscosity: capillary, couette, cone/plate flow -viscosity of suspensions and dilute polymer solutions -viscosity of concentrated and undiluted polymers

UNIT III LINEAR VISCOELASTICITY 9

Nature of the viscoelastic response - creep, creep recovery and stress relaxation; sinusoidal deformations and isochronal experiments; T_g and T_m - temperature superposition

UNIT IV NON-LINEAR EFFECTS 9

Non-Linear responses - wall slip in steady shear, correlation, complete slip and maximum value; stick-slip transition in controlled stress mode; wall slip during start up shear; relationship between slip and bulk shear deformation; molecular evidence of disentanglement during wall slip; uncertainties in boundary conditions.

UNIT V SUSPENSIONS AND MESOSCOPIC SYSTEMS 9

Suspensions and colloidal fluids – dilute, concentrated, filled systems; emulsions and blends – interfaces, viscoelasticity, drop dynamics; mesoscopic systems; self-assembling and liquid crystal systems – phases, structural characterization; block copolymers – structures and rheology

TOTAL : 45 PERIODS

COURSE OUTCOMES:: On completion of the course, students will be able to

CO 1 : explain about the linear elastic polymers
CO 2 : describe about linear viscous polymers
CO 3 : discuss about linear Viscoelasticity polymers
CO 4 : discuss about nonlinear polymers
CO 5 : describe about polymer suspensions

TEXT BOOKS:

1. J.A.Brydson, Flow properties of polymer melts, life books, London, 1981.
2. R.J. Crawford, Plastics Engineering, Butterworth - Heinemann, Oxford, 2002, 3rd edition
3. Dr.R.K.Bansal, "A Textbook of Fluid mechanics and Hydraulic Machines", 9th edition, 2017

4. Shi Quing Wang, “Nonlinear Polymer Rheology”, John wiley and sons, Inc, 2018. ISBN:9781119029052

REFERENCES:

1. P.N.Cogswell, Polymer Melt Rheology, A guide for Industrial Practice, George Godwin,1981.
2. Richard C. Progelh of and James L. Throne, Polymer Engineering Principles, Hanser Publishers, New York, 1998.
3. John M. Dealy and Kurt F. Wissburn, Melt rheology and its role in plastics processing, Chapman, London, Oct 3rd, 2013.
4. R.S. Lenk, Polymer Rheology, Applied Science, London, 2012.
5. J.D. Ferry, Viscoelastic Properties of Polymers, john Wiley & Sons, New York, 1986.
6. Chang Dae Han. Rheology in Polymer Processing, Academic Press, New York, 1976

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	2	1	2	1	1	2	2	2	2	1	3
2	2	2	2	2	2	1	2	1	1	2	2	2	2	1	3
3	2	2	2	2	2	1	2	1	1	2	2	2	2	1	3
4	2	2	2	2	2	1	2	1	1	2	2	2	2	1	3
5	2	2	2	2	2	1	2	1	1	2	2	2	2	1	3
Overall CO	2	2	2	2	2	1	2	1	1	2	2	2	2	1	3

TT23004 CHARACTERIZATION OF TEXTILE POLYMERS

L	T	P	C
2	1	0	3

OBJECTIVE

- To enable the students to learn about characterization of polymers used in the production of textile fibres

UNIT I SPECTROSCOPIC TECHNIQUES 6

Need for characterization, molecular architecture; UV, IR, ATR and Raman spectroscopy - characteristic absorption bands and analysis of organic monomers and polymers

UNIT II NMR AND MASS SPECTROSCOPY 6

Interpretation of 1 H NMR of organic monomers, introduction to 13C NMR, chemical shift, C-H spin coupling, FT-NMR, 2D NMR (COSY, HSQC, HMBS), Wide-Band proton decoupled CMR, solid state CMR, high resolution CMR of PET and PPO, copolymer composition. Analysis of stereoregularity by CMR in PP and polybutadienes. Polymer analysis by mass spectrometry, polymer pyrolysis GC-MS, FABMS technique, MALDI-TOF.

UNIT III THERMAL ANALYSIS OF POLYMERS 6

Thermogravimetric analysis (TGA), differential thermal analysis (DTA), thermo-mechanical analysis (TMA). Optical and electron microscopy: SEM, TEM, AFM, and XPS for polymer analysis, Polarized Optical Microscopy (POM) for Spherulitic Studies

UNIT IV X-RAY DIFFRACTION ANALYSIS 6

Methods of production of x-rays, properties of x-rays, diffraction of x-rays, Bragg's Law, lattice and powder diffraction methods, small angle scattering of x-ray by polymers, Analysis of molecular structure of simple polymers by XRD, determination of crystallinity, size and orientation of crystallites

UNIT V POLYMER MATERIAL CHARACTERIZATION 6

Polymer solution - thermo dynamics; molecular weight and molecular dimensions by end group analysis, osmometry, light scattering, viscometry, gel permeation chromatography, high performance liquid chromatography. crystallinity by density measurements, surface area, pore volume measurements by B.E.T. method, porosimetry, surface energy measurements and particle size measurement

TUTORIALS

ANALYSIS OF SPECTRA OF VARIOUS CHARACTERIZATION TECHNIQUES - 15 PERIODS

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of this course, the student shall be able to

CO1: analyse the polymer behavior by spectroscopic techniques

CO2: interpret molecular structure obtained from various analytical instruments

CO3: determine the thermal properties using various instruments

CO4: analyse the polymers by X-ray diffraction technique

CO5: discuss about the methods of polymer material characterisation

TEXT BOOKS

1 Gupta V.B. and Kothari V.K., “Man Made Fibre production,” Chapman and Hall, 1985.
2. Billmayer, “Textbooks of Polymer Science,” 3rd ed., Wiley, 1984

REFERENCES

1. Sperling, “Introduction to Physical Polymer Science,” Wiley, 1986.
2. Campell D. and White J.R, “Polymer characterization, Physical Techniques”, McGraw – Hill, New York, 1969.
3. Stamm M., “Polymer surfaces and Interfaces”, Springer1st ed., 2008.
4. Mukesh Kumar Singh, Annika Singh, “Characterization of Polymers and Fibers”, Woodhead Publishing,2021, 9780128239865

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	3	3	2	-	-	-	2	2	2	2	1	3
2	2	2	2	3	3	2	-	-	-	2	2	2	2	1	3
3	2	2	2	3	3	2	-	-	-	2	2	2	2	1	3
4	2	2	2	3	3	2	-	-	-	2	2	2	2	1	3
5	2	2	2	3	3	2	-	-	-	2	2	2	2	1	3
Overall CO	2	2	2	3	3	2	-	-	-	2	2	2	2	1	3

TT23005 **HIGH PERFORMANCE FIBRES**

L	T	P	C
3	0	0	3

OBJECTIVES:

To enable the students to learn about

- Various high performance fibres which are used as technical textiles
- Production of high performance fibres

UNIT I LINEAR POLYMER FIBRES 9

Aramidfibres (PPTA and MPTA)-polymer preparation, spinning, structure and properties and applications; high performance polyethylene fibres – manufacture, fibre characteristics, properties and applications

UNITII CARBON AND MINERAL FIBRES 9

Manufacture of PAN-based, rayon based, pitch-based carbon fibres, graphene fibre, asphalt fibre, basalt fibre – physical properties and applications

UNITIII GLASS AND CERAMIC FIBRES 9

Glass fibres– types, manufacture, properties and applications; ceramic fibres - silicon carbide-based fibres, alumina-based fibres, non-oxide fibres; polycrystalline oxide fibres and single-crystal oxide fibres

UNITIV CHEMICAL AND THERMAL RESISTANCE FIBRES 9

Chemical resistant fibres - chlorinated fibres, fluorinated fibres, polyether ketones, polyphenylene sulphide and polyetherimide - properties and applications; thermal resistant fibres - thermo plastic and thermoset polymers, aromatic polyamides and polyaramids, semi carbonfibres and polybenzimidazole – properties and applications

UNITV SPECIALITY FIBRES 9

Specialty fibres-hollow and profile fibres; blended and bicomponent fibres; superabsorbent fibres- manufacturing process, properties and applications; film fibres, hybrid polymers, polymers for packaging applications; recycling of polyester and rPET based melt spinning

TOTAL:45 PERIODS

COURSE OUTCOMES::

Upon completion of the course, the students will be able to

CO1: explain about the linear polymer fibres

CO2: describe about the methods of manufacturing of carbon fibres

CO3: discuss about the methods and application of glass and ceramic fibres

CO4: appraise the properties and applications of chemical and thermal resistance fibres

CO5: demonstrate the manufacturing and applications of speciality fibres

TEXTBOOKS

1. Kothari V.K., “Textile Fibres: Development and Innovations”, Progress in Textiles, Vol.2, IAFL Publications,2000

2. John W. S. Hearle., “High Performance Fibres”, Woodhead PublishingLtd., Cambridge,England,2001,ISBN:084931304X|ISBN-13:9780849313042

REFERENCES

1. Peebles L.H., “CarbonFibres”,CRC Press,London,1995
2. Hongu T., and Phillips G.O., “New Fibres”, 2nd Edition, Woodhead Publishing Ltd.,England, 1997,ISBN:185573334X/ ISBN:978-1855733343
3. B. Gupta, V. K. Kothari, Manufactured Fibre Technology,Springer,1991
4. Gajanana Bhat, “Structureand properties of high performance fibre”, Woodhead Publishing,2017, ISBN-978-0-08-100550-7

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	3	3	2	2	2	1	-	-	2	2	3	1	3
2	2	2	3	3	2	2	2	1	-	-	2	2	3	1	3
3	2	2	3	3	2	2	2	1	-	-	2	2	3	1	3
4	2	2	3	3	2	2	2	1	-	-	2	2	3	1	3
5	2	2	3	3	3	2	2	1	1	2	2	2	3	2	3
Overall CO	2	2	3	3	2.2	2	2	1	1	0.5	2	2	3	1.2	3

TT23006	TECHNOLOGY OF MELT SPUN FIBRES	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable the students to learn production and properties of various melt spun fibres

UNIT I POLYMER PROPERTIES 9

Monomer selection, polymerisation techniques, polymer properties. principle of melt spinning; necessary conditions for fibre formation, elasticity versus plasticity of melts; melt instabilities; thermodynamic limitations. rheology of molten polymer solution

UNIT II MELT SPUN TECHNOLOGY 9

Melt spinning technology – hydrodynamics, flow conditions, liquid properties; thermodynamics- heat transfer and cooling; variables in melt spinning – polymer variables and process variables; melt spinning process- feeding of polymer to spinning system, melting of the polymer, metering and distribution of melt to spin heads, spin block assembly, filtration, spinneret, quenching of filaments; effect of spinning speeds –moderate, high and very high speeds on properties of filaments

UNIT III MELT SPINNING OF POLYESTER AND POLYAMIDES 9

Polyester melt spinning - polymer preparation and characterisation, melt stability, filament extrusion and attenuation; factors influencing the polyester fibre melt spinning process; melt spinning of polyamides – polymer preparation and characterisation, spinning assembly, spinneret and filtering unit; comparison of conventional, integrated spin-draw and one step high speed melt spinning process, end uses

UNIT IV MELT SPINNING OF POLYOLEFINS AND OTHER SYNTHETIC FIBRES 9

Polypropylene and polyethylene- polymer preparation and characterisation, melt stability, filament extrusion and attenuation; factors influencing the PP and PE fibre melt spinning process; acrylic and its derivatives, end uses

UNIT V DRAWING AND HEAT SETTING 9

Drawing of melt spun fibres and draw twisting; drawing behaviour of thermoplastic polymers – mechanism of drawing through a neck; necking behaviour of polyester and neck drawing of nylon 6; Influence of drawing on structure and properties of fibres; drawing stresses and discontinuities; role of moisture in the drawing process; heat setting process –mechanism of temporary and permanent heat setting; heat setting behaviour of PET and nylon; thermal healing, heat setting of triacetate fibres

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of the course, the students will be able to

CO1: explain about the polymer properties

CO2: describe about the concept of melt spinning process

CO3: discuss about the methods of manufacturing of polyester and polyamide fibres

CO4: appraise the methods and manufacturing of polyolefin and other fibres

CO5: analyse the effect of drawing and heat setting of fibres

TEXTBOOKS

1. Mukhopadhyay S K., “The structure and properties of typical melt-spun fibres” Textile progress Vol.18 No.4. ISBN: 1870812 11 5
2. V. B. Gupta, V. K. Kothari, Manufactured Fibre Technology,Springer,1991
3. Gajanana Bhat,”Structureand properties of high performance fibre, Wood head Publishing,2017, ISBN-978-0-08-100550-7

REFERENCES

1. Moncrrieff R W, “Man-made fibres”, The Butterworth Group, Sixth edition, 1975
2. Gordon Cook J, “Handbook of Textile Fibres”, Woodhead publishing Limited, Cambridge , England, 2001. ISBN: 1 85573 485 0
3. Shi Quing Wang, “Nonlinear Polymer Rheology”, John wiley and sons, Inc, 2018. ISBN:9781119029052
4. Gupta V.B. and Kothari V.K., “Man Made Fibre production,” Chapman and Hall, 1985.
5. Billmayer, “Textbooks of Polymer Science,” 3rd ed., Wiley, 1984

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	2	1	2	1	1	1	2	2	2	1	2
2	3	3	3	2	2	2	2	1	2	2	2	2	3	1	3
3	2	2	2	2	2	1	2	1	2	1	2	2	2	1	2
4	2	2	2	2	2	1	2	1	2	1	2	2	2	1	2
5	2	2	2	2	2	1	2	1	2	1	2	2	2	1	2
Overall CO	2.2	2.2	2.2	2	2	1.2	2	1	1.8	1.2	2	2	2.2	1	2.2

TT23007 TECHNOLOGY OF SOLUTION SPUN FIBRES

L	T	P	C
3	0	0	3

OBJECTIVES

- To enable the students to learn production and properties of various solution spun fibres

UNIT I FUNDAMENTALS OF SOLUTION SPINNING 9

Rheology of solution spinning, spinnability, mechanics of spinning and its limiting effects; kinetics of solution spinning; thermodynamics of solution spinning; effect of polymer modification on morphology of fibres; salient features of solution spinning; structure formation during spinning – molecular orientation, crystallization, morphology, and macroscopic structure

UNIT II PRINCIPLES OF DRY AND WET SPINNING 9

Dry spinning process- dope preparation, fibre formation and spin stretch during dry spinning; polymer/solvent combinations for dry spinning; wet spinning process- dope preparation and fibre formation. coagulation- process, spin stretch during coagulation, fibre cross section shapes. effect of process parameters such as dope concentration, bath concentration, temperature and jet stretch ratio on coagulation rate, fibre breakage and fibre structure

UNIT III REGENERATED CELLULOSIC FIBRES 9

Solvents for cellulose; dilution of cellulose; viscose rayon-chemistry of viscose rayon, alkali cellulose transitions; production process of viscose rayon, structure of rayon fibres, properties of rayon fibres; lyocell process, continuous dissolution process; side reaction and by-product formation; formation of reactive intermediate; process variables; high performance rayon – polynosic rayon, cuprammonium rayon – manufacturing and end uses

UNIT IV CELLULOSE ESTER FIBRES 9

Cellulose characterization - cellulose Purity, intrinsic viscosity, cellulose reactivity, sheet density, moisture content ; cellulose triacetate and cellulose acetate processes, characterization, dope preparation, spinning, properties and end uses

UNIT V ACRYLIC AND ARAMID FIBRES 9

Polymer manufacture, preparation of acrylonitrile, acrylonitrile polymerization, copolymerization kinetics, commercial polymerization methods, solid-state structure of acrylic polymers - stereoregularity and chain conformation, diffraction studies of the crystalline structure, thermal properties: melting, gelation, and crystallization, fiber manufacturing, fiber properties; wet spinning, dry spinning and dry-jet wet spinning of acrylic; aramid fibres - structure–property relationship, polymerization of aromatic polyamides, aramid solutions, fibre spinning, preparation of aramid products, applications

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of the course, the students will be able to

CO1: describe about the fundamentals of solution spinning

CO2: discuss about the principles of solution spinning process

CO3: explain about the methods of manufacturing of regenerated cellulose fibres
CO4: explain about the methods and manufacturing of cellulose ester fibres
CO5: appraise about the methods and manufacturing of acrylic and other fibres

TEXTBOOKS:

1. Mukherjee A K., “Technology of Man-Made fibres” Indian Institute of Technology, New Delhi, 1980
2. Shi Quing Wang, “Nonlinear Polymer Rheology”, John wiley and sons, Inc, 2018. ISBN:9781119029052
3. Mukhopadhyay S K., “The structure and properties of typical melt-spun fibres” Textile progress Vol.18 No.4. ISBN: 1870812 11 5

REFERENCES:

1. Moncrrieff R W, “Man-made fibres”, The Butterworth Group, Sixth edition, 1975
2. Gordon Cook J, “Handbook of Textile Fibres”, Woodhead publishing Limited, Cambridge , England, 2001. ISBN: 1 85573 485 0
3. Gupta V.B. and Kothari V.K., “Man Made Fibre production,” Chapman and Hall, 1985.
4 Billmayer, “Textbooks of Polymer Science,” 3rd ed., Wiley, 1984

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	2	1	3	1	2	2	2	2	3	1	3
2	2	2	3	3	2	1	2	2	1	1	2	2	2	1	3
3	2	2	2	2	2	2	1	1	1	2	2	2	2	1	2
4	2	2	2	2	2	2	1	1	1	2	2	2	2	1	2
5	2	2	2	2	2	2	1	1	1	2	2	2	2	1	2
Overall CO	2	2	2.2	2.2	2	1.6	1.6	1.2	1.2	1.8	2	2	2.2	1	2.4

TT23008	TEXTURED YARN TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable the students to learn production and properties of various textured fibres

UNIT I INTRODUCTION 9

Need for bulking of synthetic yarns; texturability of fibres, classifications and principles of methods of texturing; heat setting – need, types of setting, factors involved; effect on fibre morphology and yarn properties; evaluation of heat setting processes

UNIT II FALSE TWIST TEXTURING 9

Draw texturing - simultaneous and sequential draw texturing; twisting devices; heating and cooling systems; take-up systems; characteristics of feed yarns; process parameters-time, temperature, twist, tension; evaluation of false-twist textured yarns; end-uses.

UNIT III AIR JET TEXTURING 9

Types of yarns produced; airflow pattern in different types of nozzles; loop formation-mechanism, factors involved; evaluation of air-jet textured yarn; comparison of air-jet textured yarn with spun and false twist textured yarns; end-uses

UNIT IV OTHER METHODS OF TEXTURING 9

Stuffer box, edge crimping, knit-de-knit and gear crimping methods; bi-component filament texturing; differential shrinkage texturing; chemo - mechanical texturing; limitations and applications

UNIT V CHARACTERISATION 9

Measurement of bulkiness for bulk yarn, stretch yarn and modified stretch yarn, tensile strength and elongation, stretch and elastic recovery, dimensional stability, effect of yarn structure on fabric properties, performance evaluation of different types of textured yarn fabrics

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of the course, the students will be able to

CO1: discuss about the fundamentals of texturing principles
CO2: explain about the principles of false twist texturing
CO3: discuss about the principles of air jet texturing
CO4: demonstrate about the other texturing principles
CO5: analyse about the characterisation of textured yarn

TEXTBOOKS

1. Wilson D. K. and Kollu T., "Production of textured yarns by the false twist technique", Textile progress Vol. 21, No.3, Textile Institute, Manchester, U.K., 1991.

2. Hes L. and Ursiny P., "Yarn Texturing Technology ", Eurotex, U.K. 1994.

REFERENCES

1. Ali Demir and Hassan M. Behery., "Synthetic filament yarn texturing technology", Prentice Hall, 1996, ISBN: 0134400259.
2. Gulrajani M. L. (Ed.), “Annual symposium of texturing”, I.I.T Delhi, 1977.
3. Wilson D. K. and Kollu T., "Production of textured yarns by methods other than false twisttechnique", TP Vol.16, No.3, Textile Institute, 1981.
4. Hearl J.W.S., Hollick L. and Wilson D.K., “ Yarn texturing Technology”, Woodhead Publication Ltd., 2001 ISBN: 185573575X

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	2	1	1	1	1	2	2	2	2	1	2
2	2	2	2	2	2	-	-	-	-	1	2	2	2	1	2
3	2	2	2	2	2	-	-	-	-	1	2	2	2	1	2
4	2	2	2	2	2	-	-	-	-	1	2	2	2	1	2
5	3	3	3	3	3	-	-	-	-	-	2	2	2	1	2
Overall CO	2.2	2.2	2.2	2.2	2.2	1	1	1	1	1.25	2	2	2	1	2

TT23009	SUSTAINABLE TEXTILES	L	T	P	C
		3	0	0	3

OBJECTIVE

- To enable the students to learn about sustainable fibres, processing, circular economy, ecolabelling and lifecycle assessment

UNIT I SUSTAINABLE FIBRES 9

Sustainability – need, concepts, principle and challenges; Sustainablilty Development Goals (SDGs); sustainable solutions in fibre, barriers in sustainable textiles, economic issues

UNIT II SUSTAINABILITY IN PROCESSING 9

Red listed textile chemicals, recommendations and remedial measures; environmental impact audit for pollution control, toxicology of textile dyes and chemicals, eco-parameters and testing of various toxic chemicals and dyes; reduction of carbon footprints and water foot print in textile processing.

UNIT III CIRCULAR ECONOMY 9

Linear economy – principle, shortcomings; circular economy – principle, need, benefits, challenges, circular business model, opportunities, resell and reuse of textiles, recycling of textiles – mechanical process, chemical process, biological process; traceability and transparency for sustainable fashion-apparel supply chain; ethical practices - fair trade, living wages and safe working; environmental issues relating to textiles and fashion industry

UNIT IV ECOLABELLING 9

Objectives, classification, criteria for eco labelling; concept of ecology in textiles – production, human, disposal, eco label standards, examination and anatomy of ecolabels, eco labels around the world; standards and certification: GOTS, Organic Content Standard (OCS) and the Recycled Claim Standard (RCS), Global Recycle Standard, Responsible wool standard, Oeko-tex, SA 8000, Fair Trade, WRAP.

UNIT V LIFE CYCLE ASSESSMENT 9

Key Indicators; Lifecycle assessment – cotton, wool, silk textiles and clothing; comparative lifecycle assessment of natural and manmade textiles

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to
CO1: Comprehend about the sustainable fibres available in the industry
CO2: Analyse the red chemicals and avoiding its usage in processing house
CO3: Comprehend about the circular economy in textile industry
CO4: Explain the need and importance of ecolabelling
CO5: Interpret the challenges in life cycle assessment of textile products

TEXT BOOKS

1. Peter P Rogers., “An Introduction to Sustainable Development”, Glen Educational Foundation, Inc, 2008, ISBN 978-1-84407-520-1.

2. Blackburn R S., “Sustainable Textiles”, Woodhead Publishing Limited, 2009, ISBN 978-1-84569-453-1.

REFERENCES

1. Marim I. Tobler. Rohr., “Handbook of Sustainable Textile Production”, Woodhead Publishing Limited, Cambridge, 2011, ISBN 0-85274-426-9.
2. Miraftab M and Horrocks R, “Eco-Textiles”, Woodhead Publishing Limited, Cambridge, 2007, ISBN 978-1-42004-444-7.
3. Youjiang Wang, “Recycling in Textiles”, Woodhead Publishing Limited, Cambridge, 2006, ISBN 1-85573-952-6.
4. Chavan R B and Radhakrishnan J, “Environmental Issues - Technology Options for Textile Industry”, IIT Delhi Publication, 1998.
5. Cavaco-Paulo and Gübitz G M, “Textile Processing with Enzymes”, Woodhead Publishing Ltd., UK, 2003, ISBN 978-1-85573-610-8.
6. Manivasakam N, “Treatment of Textile Processing Effluents”, Chemical Publishing Company, U.S.A, 2013, ISBN 978-0-82060-175-5.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	3	3	3	-	2	3	3	-	2	-	2	2	2	2
2	2	3	3	3	-	2	3	3	-	2	-	2	2	2	2
3	2	3	3	3	-	2	3	3	-	2	-	2	2	2	2
4	2	3	3	3	-	2	3	3	-	2	-	2	2	2	2
5	2	3	3	3	-	2	3	3	-	2	-	2	2	2	2
Overall CO	2	3	3	3	-	2	3	3	-	2	-	2	2	2	2

VERTICAL II

TEXTILE MANUFACTURING

TT23010 THEORY OF DRAFTING AND TWISTING

L	T	P	C
3	0	0	3

OBJECTIVES:

To enable the students to learn

- Ideal drafting and causes for deviation from ideal drafting
- Mechanism of twisting in ring spinning and other spinning systems

UNIT I IDEAL DRAFTING 9

Ideal drafting - definition, model, conditions required in roller drafting system; deviations from ideal drafting and actual drafting conditions; drafting wave - definition, causes, estimation, conditions to avoid formation; role of presser bar, double nip and aprons in controlling drafting wave formation, limitations of apron system

UNIT II ROLLER SLIP AND ROLLER NIP MOVEMENT 9

Roller slip - definition, conditions for the formation of forward and backward slips in the roller drafting systems, measures to avoid roller slip occurrence; causes for roller nip movement and roller speed variation, control measures

UNIT III ROLLER VS WIREPOINT DRAFTING 9

Comparison of roller drafting system with wire point drafting system; application of wire point drafting in card and rotor spinning machine; comparison of roller drafting in drawframe, comber preparatory, comber, roving frame, ringframe and condensed yam spinning.

UNIT IV TWISTING PRINCIPLES 9

Principle of false twisting, applications in short staple spinning; fundamental requirements to create real twist in the strand; principle of twist insertion in ring spinning; limitations of ring twisting; mechanics of balloon formed during twisting; twist balance for plied yarns; principle of two-for-one twisting

UNIT V TWISTING PRINCIPLES IN ALTERNATIVE SPINNING SYSTEMS 9

Principle of twist insertion in open-end spinning, application of this principle in rotor, friction and electrostatic spinning; principle of twist formation in two nozzle air-jet and air-vortex spinning; principle of twist insertion in core spinning, wrap spinning and self-twist spinning.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of this course the student can

CO1: Describe the concept of ideal drafting and real drafting and explain the causes for formation of drafting wave

CO2: Explain the phenomena and causes of roller slip and roller nip movement and examine the control measures

CO3: Compare wire point and roller drafting; compare drafting system of different machines of short staple spinning system

CO4: Differentiate false and real twist and explain the process of twisting in ring spinning and two for one twisting

CO5: Describe the theory of twist formation in rotor spinning, two nozzle air jet, air vortex, friction, core, wrap and self twist spinning systems

TEXTBOOKS:

1. Foster G.A.R., “The Principles of Roller Drafting and the Irregularity of Drafted Materials”, The Textile Institute, Manchester, 1958.
2. Lord P.R., “Roller Drafting”, Textile Progress, The Textile Institute, Manchester, 1993.
3. Klein. W., “New Spinning Systems”, The Textile Institute, Manchester, 1993.

REFERENCES:

1. Grosberg P. and lype C., “Yarn Production: Theoretical Aspects”, The Textile Institute, Manchester, 1999.
2. De Barr A.E. and Catling H., “The Principle and Theory of Ring Spinning”, The Textile Institute, Manchester, 1965

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	2	1	1	-	1	1	1	1	2	1	2
2	3	3	3	2	2	1	1	-	1	1	1	1	2	1	2
3	3	3	2	2	2	1	1	-	1	1	2	1	2	1	2
4	2	3	2	2	2	1	2	-	2	2	2	2	3	2	2
5	2	3	2	3	2	1	1	-	2	2	1	1	2	1	2
Overall CO	2.6	3	2.4	2.2	2	1	1.2	-	1.4	1.4	1.4	1.2	2.2	1.2	2

TT23011	LONG STAPLE SPINNING TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to learn opening, cleaning, combing, drafting and twisting processes involved in the production of yarn from long staple fibres.

UNIT I FIBRE INDIVIDUALISATION 9

Impurities in wool and their removal; methods adopted to process raw flax and jute; blending methods followed for long staple fibres; fibre individualization in the carding machine; working principle and details of different type of carding machine-worsted carding, semi–worsted carding, woollen carding, flax carding and jute carding

UNIT II COMBINIG 9

Objective of combing; basic principles of combing; details of wool combing preparation and combing operation; worsted top finishing

UNIT III DRAWING 9

Principle of long-staple drafting; working details of worsted, semi worsted, jute and flax drawing; operating principle of roving machine

UNIT IV YARN SPINNING 9

Mule spinning– drafting, twisting, backing-off, winding on; description of centrifugal spinning; flyer spinning; ring spinning – twisting, rings and travellers; condenser yarn spinning; cap spinning

UNIT V ALTERNATIVE SPINNING 9

Open end spinning – general features of rotor and friction spinning as applicable to long-staple fibres; double-rove spinning; self-twist spinning system

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students can
CO1: Explain long staple fibres separation, cleaning and individualization
CO2: Explain combing process related to long staple fibres
CO3: Interpret drawing operations
CO4: Describe different spinning methods for production of yarns from long staple fibres
CO5: Explain different types of alternative spinning systems for long staple fibres

TEXTBOOKS

1. Oxtoby E., “Spun Yarn Technology”, Butterworths, London, 1987
2. Happey F., “Contemporary Textile Engineering”, Academic Press, London, 1983
3. Lord P.R., “Yarn Production: Science, Technology and Economics”, The Textile Institute, Manchester, 1999

REFERENCES

1. Ross D.A., Carnaby G.A and Lappage J., “Woollen Yarn Manufacture (TextileProgress)”, Vol.15, North Carolina State University, 1986
2. Richards R.T.D., and Sykes A.B., “Woollen Yarn Manufacture”, The Textile Institute, Manchester, 1994
3. Henshaw D.E., “Worsted Spinning”, Vol.11, Textile Progress, The Textile Institute, Manchester, 1981

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	3	3	-	2	2	1	2	2	2	2	3	1	2
2	3	2	2	2	-	1	1	1	1	1	1	1	3	1	2
3	2	2	2	2	-	1	1	1	1	1	1	1	3	1	2
4	2	2	2	2	-	1	1	1	1	1	1	1	3	1	2
5	3	2	2	3	-	1	2	1	2	1	1	2	3	2	3
Overall CO	2.6	2	2.2	2.4	-	1.2	1.4	1	1.4	1.2	1.2	1.4	3	1.2	2.2

TT23012 PROCESS CONTROL IN SPINNING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to analyse the effect of various process parameters on quality and quantity of materials produced in spinning machinery

UNIT I LEVELLING 9

Process flow for producing cotton carded and combed yarns, carded/ combed cotton-polyester blended yarns, polyester-viscose blended yarns; fibre mix selection and optimisation; control of yarn count and CV%; control of yarn strength and CV%; different levelling methods adopted in the pre-spinning machines, assessment of autoleveling and its control

UNIT II NEP AND HOOK FORMATION AND ITS REMOVAL 9

Causes of nep and hook formation in the fibre-opening processes; improving the removal of neps in the carding and combing machines; fibre hook straightening during drafting and combing; measurement of nep and hook level

UNIT III WASTE CONTROL 9

Waste determination and cleaning efficiency; control of waste in blowroom, card and combers; influence of machine and processing parameters on waste removal; controlling the lint content in waste; control of pneumafil waste, hard waste in ring frame; determination of yarn realization

UNIT IV PRODUCTION CONTROL 9

Balancing of machinery; factors affecting the production limits of the spinning machinery; new concepts in achieving higher production in the spinning machinery; computation of the productivity indices

UNIT V HUMIDITY CONTROL AND MACHINERY MAINTENANCE 9

Humidity and temperature — maintenance, influence on machine performance and quality of yarn; cleaning and maintenance of machinery, influence on machine performance and yarn quality; process conditions required for polyester, viscose in the spinning machinery; control of yarn imperfections and faults.

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of this course, the student shall be able to

CO1: Decide on quality control measures in terms of levelling of material

CO2: Analyse the mechanism of neps and hooks formation and their removal during the preparatory processes

CO3: Control of waste during spinning

CO4: Analyse the factors influencing on production rate and efficiency of the spinning machine, calculate the machine and labour production

CO5: Take special measures while processing manmade fibres and analyse the importance ofhumidity control and machinery maintenance

TEXTBOOKS

1. Thomas Weide., “The Rieter Manual of Spinning, Vol.7”, Rieter Machine Works Ltd., Winterthur, 2014, ISBN: 10 3-9523173-7-3 / ISBN: 13 978-3-9523173-0-3
2. MajumdarA., Das A., Alagirusamy. R., and Kothari V.K., “Process Control in Textile Manufacturing”, wood Head publishing, 2012, ISBN: 0857090275 | ISBN-13: 9780857090270
3. Garde A.R., and Subramaniam T.A., “Process Control in Spinning”, ATIRAPublications, Ahmedabad, 1989.

REFERENCES

1. Lord P.R., “Handbook of Yarn Production; Science, Technology and Economics”,Wood head Publishing, 2003, ISBN: 1855736969 | ISBN-13: 9781855736962
2. Furter R., “Evenness Testing in Yarn Production Part I”, The Textile Institute, Manchester,1981, ISBN 10: 0900739487 ISBN 13: 9780900739484.
3. Furter R., “Evenness Testing in Yarn Production Part II”, The Textile Institute, Manchester,1982, ISBN 10: 0900739495 ISBN 13: 9780900739491
4. Van der Sluijs M., and Hunter L., “Neps in Cotton Lint, Textile Progress”,T he Textile Institute ,Manchester, 1999, ISBN: 1870372239 / ISBN: 978-1870372237
5. Slater K., “Yarn Evenness”, Textile Progress, The Textile Institute, Manchester, 1986.
6. Townend P.P., “Nep Formation in Carding”, Wira, U.K., 1986, ISBN: 0900739851 /ISBN: 978- 0900739859.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	3	2	2	1	1	1	2	2	2	3	3	3
2	3	3	3	3	2	2	1	1	1	2	2	2	3	3	3
3	3	3	3	3	2	2	1	1	1	2	2	2	3	3	3
4	3	3	3	3	2	2	1	1	1	2	2	2	3	3	3
5	3	3	3	3	2	2	1	1	1	2	2	2	3	3	3
Overall CO	3	3	3	3	2	2	1	1	1	2	2	2	3	3	3

TT23013 PROCESS CONTROL IN FABRIC MANUFACTURING

L	T	P	C
3	0	0	3

OBJECTIVES

To enable the students to learn the

- Quality requirements of yarn and its preparation for weaving
- Selection and control of process parameters during fabric formation.

UNIT I WEAVING PREPARATION 9

Yarn quality requirements - weaving and knitting; winding – yarn and package faults, quality of splice/knot, knot factor and clearing efficiency, optimum clearing of yarn; control of ends break in warping, warp beam quality requirements; quality control in size recipe, size pick-up control, yarn stretch control, quality requirements of sized beam – defects and their causes and remedies; improving productivity in winding, warping and sizing

UNIT II WEAVING 9

Quality requirements of loom accessories and its effects on loom performance; control of cross ends and missing ends; productivity control – loom speed, loom efficiency, loom stops; fabric quality control – fabric defects and their causes and remedies; process control for weaving filament, blended and dyed yarn.

UNIT III KNITTING 9

Types of stitches and their influence on knit fabric properties; weft knitting – method of setting the machine, factors affecting the formation of loops in weft knitting, knitted fabric defects-causes and remedies.

UNIT IV NON-WOVEN 9

Quality control in web preparation; Influence of material and process parameters on quality and performance of nonwoven.

UNIT V UNCONVENTIONAL FABRIC FORMATION 9

3D Fabrics – structure and properties, comparison of properties of 2D and 3D fabrics, classifications; influence of machine and raw materials parameters on multilayer fabric, braided fabric, multi axial warp knit fabrics

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Appraise machine and process control parameters of winding, warping and sizing

CO2: Comprehend the desired quality of loom accessories and control of production rate of loom

CO3: Analyse the knitted fabric defects and control it by assessing various knitting process parameters

CO4: Distinguish the effect of various process parameters on quality of nonwoven

CO5: Predict the structure and properties of special fabrics made with different process and fabric parameters

TEXTILE BOOKS

1. Russel S.J., “Hand book of nonwovens”, Wood head Publishers, Cambridge, England, 2007.
2. Albrecht W., Fuchs K. and Kitteleman W., “Nonwoen fabrics”, Wiley Vch, 2003, ISBN :3-527-30406-1
3. Paliwal M.C. and Kimothi P.D., Process control in weaving, ATIRA Publications.

REFERENCES

1. Anadur S., “Handbook of weaving”, CRC Press, London, 2001.
2. Lord P.R. and Mohamed M.H., “Weaving: Conversion of yarn to fabric”, Merrow, 1992, ISBN: 090409538X
3. Booth J.E., “Textile Mathematics-Volume 3”, The Textile Institute, Manchester, 1977, ISBN: 090073924X.
4. Talukdar M.K., Sriramulu P.K. and Ajgaonkar D.B., “Weaving: Machines, Mechanisms, Management”, Mahajan Publishers, Ahmedabad, 1998, ISBN: 81-85401-16-0
5. Ajgaonkar D.B., “Knitting technology”, Universal Publishing Corporation, Mumbai, 1998, ISBN: 81-85027-34-X.
6. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach., “Circular knitting”, Meisenbach GmbH, Bamberg, 1995, ISBN: 3-87525-066-4.
7. Spencer D.J., “Knitting Technology”, III Ed., Textile Institute, Manchester, 2001, ISBN:185573 333 1.
8. Samuel Raz., “Warp knitting production”, Melliand Textilberichte, GmbH, Rohrbacher, 1987, ISBN: 3-87529-022-4.
9. Lunenschloss J., Albrecht W. and David Sharp, “Non-woven Bonded Fabrics”, Ellis Harwood Ltd., New York, 1985, ISBN: 0-85312-636-4.
10. Hu J., “3-D fibrous assemblies: Properties, applications and modelling of three dimensional textile structures”, Woodhead Publishing Ltd., ISBN 1 84569 377 9.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	3	2	1	3	2	1	2	2	2	3	3	2
2	3	3	3	2	1	1	1	1	1	2	2	2	3	2	2
3	3	3	3	2	2	2	2	1	2	2	2	2	3	2	2
4	3	3	3	2	2	2	2	1	1	2	2	2	3	3	3
5	3	3	3	3	3	2	2	1	1	2	2	2	3	3	3
Overall CO	3	3	3	2.4	2	1.6	2	1.2	1.2	1.2	2	2	3	2.6	2.4

TT23014	ADVANCES IN KNITTING TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable the students to learn the advanced concepts of knitting

UNIT I ADVANCES IN YARN PREPARATION AND YARN FEEDING IN KNITTING 9

High speed weft and warp knitting process - yarn quality requirement, yarn preparation, yarn package quality; modern yarn delivery device – yarn feed length control and yarn tension control; yarn storage and delivery; effect of yarn quality and yarn feed control system on the quality of fabrics

UNIT II ADVANCES IN CIRCULAR KNITTING 9

Developments in knitting elements – needle, cam system and sinker; electronic and computer controlled circular weft knitting machine; concept of mini and full jacquard for knit design; fine gauge knitting machine; analysis of advanced/novel structures; quality and production monitoring system in weft knitting machines

UNIT III ADVANCES IN FLAT KNITTING 9

Flat bed knitting - modern computer controlled flatbed knitting machine; working principle and developments - yarn feeding, sinker system, yarn gripper, stitch presser; advanced carriage mechanism; concept of gauge less knitting; digital stitch control system; whole garment knitting

UNIT IV ADVANCES IN WARP KNITTING 9

Warp knitting – inlay stitch; full late stitch; spacer warp knitting technique; multi bar warp knitting technique; compression garment; seamless garment; auxetic fabrics; Delaware stitch; Americana stitches; Crêpe Tricot; weft insertion technique; multi guide bar warp knit structures. Production of various types of stitch bonded fabrics

UNIT V KNIT FABRICS IN TECHNICAL TEXTILES 9

Knit structures in technical textiles – types and structure; application of knit fabrics – sports, medical, automotive, geo, smart wear; knit fabric and garment for protective applications.

TOTAL : 45 PERIODS

COURSE OUTCOMES::

Upon completion of this course, the student shall be able to
CO1: Explain and identify the advances in yarn preparation
CO2: Describe the advance techniques in circular knitting
CO3: Describe the advance techniques in flat knitting
CO4: Discuss on the various advancements in warp knitting
CO5: Comprehend the applications of knit fabrics in technical textiles

TEXTBOOKS

1. Spencer D.J.,“Knitting Technology”, IIIEd., Textile Institute, Manchester, 2001,ISBN:1855733331.
2. Samuel Raz., “Flat Knitting: The new generation”, Meisenbach GmbH, Bamberg,1997,ISBN:3-87525-054-0.

3. SamuelRaz.,“WarpKnittingproduction”,MelliandTextilberichte,GmbH,Rohrbacher,1987,ISBN:3-87529-022-4

REFERENCES

1. AjgaonkarD.B., “Knitting technology”, Universal Publishing Corporation, Mumbai,1998,ISBN:0818502738/ISBN:9780818502736
2. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach,“Circular Knitting”, Meisenbach GmbH, Bamberg, 1995, ISBN:3-87525-066-4.
3. DewiGwynfa Bailey Thomas, “An introduction to warp knitting”, Merrow Publishing Company Limited, 1971, ISBN 0900541067, 9780900541063
4. Subhankar M, Sohel R, Pintu P, Kunal S, “Advanced Knitting Technology”, Woodhead Publishing,2022, ISBN-978-0-323-85534-1

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	2	1	1	1	2	1	2	2	3	3	3
2	3	3	3	2	2	1	1	1	2	1	2	2	3	3	3
3	3	3	3	2	2	1	1	1	2	1	2	2	3	3	3
4	3	3	3	2	2	1	1	1	2	1	2	2	3	3	3
5	3	3	3	2	2	1	1	1	2	1	2	2	3	3	3
Overall CO	3	3	3	2	2	1	1	1	2	1	2	2	3	3	3

TT23C17 **SPECIAL TEXTILE STRUCTURES**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to learn about the developments and properties of special textile structures

UNIT I 3D WOVEN FABRICS **9**

3D multilayer interlock weave, 3D non crimp weave, 3D dual interlaced weave; hollow 3D woven fabrics; properties and applications

UNIT II 3D KNITTED FABRICS **9**

3D knitting technologies, 3D knitted structures, multi-axial warp knit, fully fashioned 3Dfabrics, Spacer fabric; properties and applications

UNIT III BRAIDING AND NONWOVEN **9**

Tubular, bifurcated structures, track and column braiding processes; high bulk nonwovens, shaped 3D nonwovens; properties and applications

UNIT IV ADVANCED TEXTILE STRUCTURES I **9**

Development in leno weave fabrics, development in tri-axial woven fabric, interwovenfabrics, pile carpets, flocked fabric, knotted fabrics; properties and applications

UNIT V ADVANCED TEXTILE STRUCTURES II **9**

Shell woven textiles, nodal three-dimensional woven textiles; properties and applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the student shall able to

CO1: Create and assess 3D woven fabric

CO2: Create and assess 3D knitted fabric

CO3: Produce braided and 3D nonwovens fabrics and predict their properties

CO4: Design advance structured fabrics and analyse their properties

CO5: Design shell woven and nodal 3D woven fabrics and analyse their properties

TEXTBOOKS

1. Xiaogang Chen, “Advances in 3D Textiles1st Edition”, Woodhead Publishing, 2015 ISBN: 9781782422143.
2. YordanKyosev, “Braiding Technology for Textiles,1st Edition”, Woodhead Publishing, 2014, ISBN: 9780857091352.”

REFERENCES:

1. DewiGwynfa Bailey Thomas, “An introduction to warp knitting”, Merrow Publishing Company Limited, 1971, ISBN 0900541067, 9780900541063.

2. Jinlian Hu., “3D Fibrous Assemblies: Properties, Applications and Modelling of Three-Dimensional Textile structures”, CRC Press, 2008, ISBN: 1420079867 | ISBN-13:9781420079869
3. Antonio Miravete., “3D Textile Reinforcements in Composite Materials”, Wood head Publishing, 1999, ISBN: 1855733765 | ISBN-13: 9781855733763
4. Tong L., MouritzA.P., and Bannister M., “3D Fibre Reinforced Polymer Composites”, Elsevier, 2002, ISBN: 0080439381 | ISBN-13: 9780080439389
5. NandanKhokar, “3D-Weaving and Noobing: Characterization of Interlaced and Non-interlaced 3D Fabric Forming Principles”, Ph. D. Thesis, Chalmers University of Technology, 1997. ISBN: 91-7197-492-X

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	2	2	1	1	1	2	2	2	2	2	3
2	3	3	3	2	2	1	1	1	1	2	2	2	2	2	3
3	3	3	3	2	2	1	1	1	1	2	2	2	2	2	3
4	3	3	3	2	2	1	1	1	1	2	2	2	2	2	3
5	3	3	3	2	2	1	1	1	1	2	2	2	2	2	3
Overall CO	3	3	3	2	2	2	1	1	1	2	2	2	2	2	3

VERTICAL III
TEXTILE CHEMICAL PROCESSING

TT23015 **COLOR SCIENCE**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to learn the theory of colour and measurement of colour

UNIT I LIGHT-MATTER INTERACTION 9

Electromagnetic spectrum – the optical region, interaction of light with matter: Transparent case – Beer's Law and Lambert's Law, Opaque case – reflection absorption and scattering, the concept of "Radiative Transfer Theory" and its simplification into the Kubelka – Munk model

UNIT II HUMAN COLOUR VISION 9

Colour sensation – physiological and psychological mechanism of colour vision; colour vision theories; defects in colour vision; colour vision tests; additive and subtractive colour mixing and confusion in colour perception

UNIT III COLOUR ORDER SYSTEMS 9

Description of colour, various colour order systems, CIE numerical system for colour definition and its components – illuminants, the versions of the standard observer, the colour scales, chromaticity diagram**.**

UNIT IV METAMERISM AND COLOUR DIFFERENCE ASSESSMENT 9

Metamerism – types and its assessment, metamerism in textile materials; colour differences – visual assessment, standard conditions, methods and problems, assessment of colour difference, non-linearity of subjective perception of colour, need for specific colour difference systems, setting up of objective pass/fail standards**.**

UNIT V NUMERICAL COLOUR MATCHING 9

Reflectance and K/S value, relationship between dye concentrations, reflectance values and K/S values, reflectance and K/S curves of dyed samples; CIE model for computer colour matching and the calculation of colour recipes; non CIE models for colour matching, limitations of computer colour matching

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of this course, the students shall be able to

CO1: Comprehend about light matter interaction

CO2: Appraise about various colour vision theories

CO3: Recognize different concepts of colour

CO4: Compare different colour assessment techniques

CO5: Describe about numerical colour matching

TEXT BOOKS

1. Wright W.D., “The Measurement of Colour”, Adam Hilger Ltd., 1969, ISBN: 0852741340 |ISBN-13: 9780852741344
2. Sule A.D., “Computer Colour Analysis”, New Age International Publishers, 2005, ISBN: 8122410847 | ISBN-13: 9788122410846.

REFERENCES

1. Shah H.S., and Gandhi R. S., “Instrumental Colour Measurement and Computer Aided Colour Matching for Textiles”, Mahajan Book Publication, 1990.ISBN: 8185401004 / ISBN: 9788185401003.
2. Park J., “Instrumental Colour Formulation: A Practical Guide”, Wood head Publishing, 1993, ISBN: 0901956546 | ISBN-13: 9780901956545
3. Kuehni R.G., “Computer Colorant Formulation”, Lexington Books, 1976, ISBN: 0669033359 | ISBN-13: 9780669033359
4. ChoudhuryA. K. R., “Modern Concepts of Colour and Appearance”, Oxford and IBH Publishing Ltd., 2000,ISBN: 1578080797 | ISBN-13: 9781578080793
5. McLaren K., “The Colour Science of Dyes & Pigments”, Adam Hilger Ltd., 1983, ISBN: 0852744269 | ISBN-13: 9780852744260
6. Travis D., “Effective Colour Displays”, Academic Press, 1991, ISBN: 0126976902 | ISBN 13:9780126976908.
7. Gulrajani M. L. (Ed.), “Colour Measurement - Principles, advances and industrial applications’’, Wood head publishing Ltd, 2010, ISBN: 1845695593 |ISBN- 13:9781845695590

Course Articulation Matrix:

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

TT23016	ADVANCES IN PRE-TREATMENT AND DYEING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to learn the advances in wet processing

UNIT I PRETREATMENT PROCESS 9

Enzymes in pre-treatment process, quantification and assessment of enzyme activity; gas phase bleaching of textiles, challenges in combined pre-treatment process; recovery of chemicals in pre-treatment process; eco-friendly chemicals and auxiliaries in pre-treatment process

UNIT II DYEING OF COTTON 9

Salt free reactive dyes, low liquor dyeing machines, surface modification of substrates for salt free dyeing; development in melange yarn production; developments in vat and sulphur dyes; pigment dyeing

UNIT III DYEING OF SYNTHETIC FIBRES 9

Mass coloration and dope dyeing of synthetic fibres-polypropylene, nylon, polyester, acrylic; thermosol and rapid dyeing of polyester; functionalization of synthetic fibres for dyeing

UNIT IV DYEING TECHNOLOGY 9

Super critical carbon dioxide dyeing; foam dyeing; air dyeing; ultrasonic dyeing; low temperature dyeing; electrochemical dyeing

UNIT V FUNCTIONAL DYES 9

Dyes for leather, fur, paper, hair, food and inks – introduction, chemical structure and requirements; dyes used for imaging, invisible imaging, displays, electronic materials and biomedical applications; solar cells; thermochromic dyes, photochromic dyes; halochromic dyes

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to
CO1: Recognize advances in preparatory process
CO2: Distinguish about development in dyeing of cotton
CO3: Explain about various dyeing techniques of synthetic fibres
CO4: Analyze various advanced dyeing technology
CO5: Investigate the applications of functional dyes in textile

TEXTBOOKS

1. Trotman E. R., “Dyeing and Chemical Technology of Textile Fibres”, B.I Publishing Pvt.Ltd., New Delhi, 1994.

2. Menachem Lewin and Eli M. Pearce, “Handbook of Fibre Chemistry: Second Edition, Revised and Expanded, Marcel Dekker, Inc., 1998.

REFERENCS

1. Menachem Lewin and Stephen B. Sello., “Handbook of Fibre Science and Technology: Volume I: Chemical Processing of Fibres and Fabrics-Fundamentals and Preparation Part A”, Marcel Dekker, Inc., 1983.
2. Karmakar S. R., “Chemical Technology in the Pre-treatment Process of Textiles”, Elsevier sciences B.V., 1999.
3. Choudhury A. K. R., “Textile Preparation and Dyeing”, SDC India Region,2011.
4. Bhagwat R. S., “Handbook of Textile Processing”, Colour Publication, Mumbai. 1999.
5. Cavaco-Paulo A. and Gubitz G. M., “Textile Processing with enzymes”, Woodhead Publication Ltd., 2003.
6. Schindler W.D and Hauser P., “Chemical Finishing of Textiles”., Wood headPublications, ISBN: 1855739054
7. Heywood D,“Textile Finishing”, Wood head Publishing Ltd., 2003, ISBN 090195681.
8. Yin-Ling Lam , Chi-Wai Kan& Chun-Wah Marcus Yuen, " Developments in functional finishing of cotton fibres – wrinkle-resistant, flame retardant and antimicrobial treatments", Textile Progress, Vol. 44, Nos. 3-4, September-December 2012, 175–249
9. Gulrajani M. L., “Advances in the dyeing and finishing of technical textiles”, Woodhead Publication Ltd., 2013.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

TT23017 TEXTILE CHEMICALS AND AUXILIARIES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to learn textile chemicals and auxiliaries

UNIT I AUXILLARIES AND SURFACTANTS ` 9

Auxiliaries - Importance and functions; surfactants - classification, chemistry, mode of action; cationic, anionic, non-ionic surfactants - properties and applications; assessment of wetting agent

UNIT II AUXILLARIES IN PREPARATORY PROCESS 9

Synthesis of acids and alkali, estimation of strength of acids and alkali; synthesis of sodium hypochlorite, sodium chlorite, hydrogen peroxide, and estimation of its strength, synthesis of optical brightening agent, chelating/ sequestering agent, defoaming agent, pH regulators**,** antichlor agent, and peroxide killer

UNIT III AUXILLARIES IN DYEING PROCESS 9

Chemistry and role of salt, reducing agent, levelling agent, dispersing agent, after treatment chemicals, soaping agent in dyeing process; padding auxiliaries, machine cleaners

UNIT IV AUXILLARIES IN PRINTING PROCESS 9

Chemistry and role of thickeners, humectant, carrier agent / swelling agent, binders, fixer, catalyst, oxygen carrier, crosslinking agents, emulsifier, inks and auxiliaries used in digital printing

UNIT V AUXILLARIES IN FUNCTIONAL FINISHING PROCESS 9

Chemicals used for spin finish; Chemistry and role of softener, stiffener, lubricant and other auxillaries - crease proofing, hydrophilic, water and oil repellency, soil release, antimicrobial, antistatic, flame retardancy and other finishes, raising agents, catalysts used in finishing

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of the course, the students will be able to

CO1: Comprehend about role and importance of auxiliaries, surfactants

CO2: Explain about synthesis and estimation of auxiliaries used in textile preparatory process

CO3: Analyze the various chemistry and assessment of chemicals and auxiliaries used in dyeing process

CO4: Recognize about various printing auxiliaries

CO5: Investigate the role of chemicals and auxiliaries used in finishing

TEXT BOOKS:

1. Shennai.V.A, "Organic Textile Chemicals", Sevak Publication, Bombay,1995
2. Vaidya.A.A, "Chemistry of Textile auxiliaries", Wheeler Publishing, NewDelhi,1999

REFERENCES:

1. John Shore, "Colourants& Auxiliaries" Wiley and Sons Ltd, New York, Volume I & II,1999.
2. Chakraborty, J.N, "Fundamentals and Practices in colouration of Textiles", Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3
3. Shennai.V.A, "Organic Textile Chemicals", Sevak Publication, Bombay,1995
4. Vaidya.A.A, "Chemistry of Textile auxiliaries", Wheeler Publishing, NewDelhi,1999
5. W D Schindler P J Hauser., “Chemical Finishing of Textiles”, Woodhead publishing Ltd, 2004.
6. Mathews Kolanjikombil.,”Dyeing of Textile substrates III –Fibres, Yarns and Knitted fabrics”, Woodhead publishing India , 2021
7. Trotman E. R., “Dyeing and Chemical Technology of Textile Fibres”, Charles Griffin & Co. Ltd., U.K., 1984, ISBN : 0 85264 165 6.
8. N N Mahapatra., “Textile dyeing”, Woodhead publishing India, 2018
9. AATCC Manual of International Test Methods and Procedures-2022
10. Laundry Detergents, Smulders, E., Wiley VCH, Weinheim, 2002.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

TT23C03 **ADVANCES IN TEXTILE FINISHING**

L	T	P	C
3	0	0	3

OBJECTIVES

- To enable the students to learn the advances in the field of textile finishing

UNIT I WATER REPELLENT AND SOIL RELEASE FINISH 9

Wetting and wicking; surface energy — concept, measurement and relevance to repellency; water repellent, soil release – mechanism, application and assessment; self cleaning textiles

UNIT II FLAME RETARDANT FINISH 9

Flame retardant mechanisms, factors affecting flammability of fabrics, flame retarding chemicals for textile materials, standards and testing of flame retardant finishes

UNIT III UV RESISTANT AND ANTISTATIC FINISH 9

UV radiation - mechanism, factors affecting UV protection, UV protection finishes, Measurement of UV protection; Antistatic finishes - Mechanism, Agents applied and its assessment.

UNIT IV ANTIMICROBIAL FINISHES 9

Antimicrobial finishes- classification, chemistry and application of antimicrobial finishes, evaluation of antimicrobial finishes; Anti-odour and fragrance finishes, Mosquito repellent finish: application and assessment technique.

UNIT V OTHER FINISHES 9

Sol-gel technique; spin coating; spray pyrolysis; electro spraying; electrophoretic and electrochemical deposition; layer by layer deposition; plasma treatment; ozone finishing of textiles

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course the student shall be able to

CO1: Comprehend the theory behind water and soil repellence finish

CO2: Analyze the theory behind flame retardant finish and evaluate the performance of flame retardant fabric

CO3: Appraise a need for UV and antistatic finish and evaluate the finishes

CO4: Distinguish chemistry and assessment of antimicrobial, anti-odour and mosquito repellent finish

CO5: Examine the need for unique finishes and evaluate the performance

TEXT BOOKS

1. Shore J, “Colorants & Auxiliaries”, Vol. I & II, Society of Dyers and Colourists, UK, 1990
2. Principles of Nanotechnology by Phani Kumar
3. Nanofibres & Nanotechnology in Textiles by P.J. Brown & K. Stevens

REFERENCES

1. Schindler W D and Hauser P J, “Chemical Finishing of Textiles”, The Textile Institute, Woodhead Publishing Ltd., Cambridge, 2004.
2. Charles T, “Chemistry & Technology of Fabric Preparation & Finishing”, NorthCarolina State University, USA, 1992.
3. Perkins W S, “Textile Colouration and Finishing”, Carolina Academic Press, UK,1996.
4. Holme L, “New developments in chemical finishing of textiles”, Journal of Textile Institute, UK, 2008.
5. Heywood D., ”Textile Finishing”, Woodhead Publishing Ltd.,2003
6. Mohammad Shahid & Ravindra Adivarekar, “Advances in Functional Finishing of Textiles”, Textile Science and Clothing Technology,2020
7. Plasma Technology for Textiles by Roshan Shishoo, CRC Publication
8. Plasma Surface Modification and Plasma Polymerization – Norihiro Inagaki: CRC Press
9. The Nanoscope, Encyclopedia of Nano Science & nanotechnology Vol.-I to VI, Dr. Parag Diwan & Ashish Bharadwaj

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

TT23018	DENIM MANUFACTURING	L	T	P	C
		3	0	0	3

OBJECTIVES

To enable the students to learn about

- Requirement of fibre, yarn
- Production of fabric, dyeing and finishing
- Stitching for denim garments

UNIT I OVERVIEW OF DENIM 9

An overview on denim and jeans; fiber qualities for denim yarn production; yarns for denim production and their characteristics; weaving preparatory and weaving

UNIT II INDIGO DYES AND NON-INDIGO DYES 9

Indigo dye and its reduction; dyeing technology of denim yarns; non-indigo dyes for denims; weaving and finishing of denim fabrics.

UNIT III DENIM GARMENT MANUFACTURING 9

Denim garment manufacture - types of garments and production sequence, seams and stitches, sewing threads and needles, sewing machines, fastenings, trims, pressing and inspection.

UNIT IV DENIM COLOURATION 9

Dyeing of denim garments; digital printing of denim garments; comfort aspects of denim

UNIT V DENIM FINISHING 9

Dry and wet finishes to produce effects and colours on denim garments; novel denims; recent trends on waterless finishing technologies in denim finishing; Denim recycling

TOTAL: 45 PERIODS

COURSE OUTCOMES::

Upon completion of this course, the students shall be able to

CO1: Comprehend about requirement of fibre and yarn for denim manufacturing process
CO2: Recognize dyes used in denim industry
CO3: Appraise about denim garment manufacturing techniques
CO4: Analyze various denim finishing process
CO5: Explain about dyeing and printing of denim

TEXTBOOKS:

1. Parmar M. S., Satsangi S. S., and Jai Prakash, “Denim – A fabric for ALL (Dyeing, Weaving, Finishing)”, NITRA, Ghaziabad, India, 1996.
2. Roshan Paul (Ed.), “Denim – Manufacture, Finishing and Applications”, Woodhead Publishing, 2015, ISBN: 0857098438 | ISBN-13: 9780857098436

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

TT23019 ECO FRIENDLY DYES, CHEMICALS AND PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES

- To enable the students to learn eco standards and eco-friendly processing

UNIT I ECO STANDARDS AND ECO-LABELS 9

Regulations - RSL(Restricted Substance List) dyes and chemicals, Pesticides, Heavy metals, Formaldehyde and Penta Chloro Phenol(PCP) in textiles; Global eco standards and eco-labels; Ecolabelling- Criteria for an eco-label based on the life cycle; Certification and labelling of eco-friendly textiles; Chemical standards for ecological products

UNIT II ECO-TESTING OF TEXTILES 9

Testing of RSL(Restricted Substance List) dyes and chemicals; Principle of Instruments used – Chromatography (HPLC, GC, TLC), Mass Spectrometry and Atomic Absorption/Emission Spectrometry.

UNIT III ECO-FRIENDLY PROCESSING 9

Concept of Sustainable Textiles. Alternative methods/chemicals in Pre-treatments, Eco-friendly dyes and dyeing & printing, Eco-Friendly Finishing – formaldehyde free finishing, Halogen free FR finish. Standing bath technique.

UNIT IV ENZYMATIC PROCESSING 9

Mechanism and activity of enzyme; Enzymes in preparatory processes; Enzymes used in printing and finishing; Enzymes for surface modification.

UNIT V ADVANCED PROCESSING TECHNIQUES 9

Mechanism of plasma treatment; Surface modification by UV irradiation and Laser; Super critical carbon dioxide processing, Ultrasonic dyeing; Foam dyeing; Ozone finishing; Other advanced water less processing techniques

TOTAL: 45PERIODS

COURSE OUTCOMES:

Upon completion of this course the student shall beable to

CO1:Comprehend eco label and eco standards
CO2: Analyse eco testing
CO3: Appraise eco-friendly processing
CO4: Distinguish enzymatic process
CO5: Examine clean technologies for future

TEXT BOOKS:

1. “Eco -Textiles, Special report”, The Bombay Textile Research Association, Mumbai, February, 1996.
2. “Eco friendly Textiles: Challenges to the Textile Industry”, Textiles Committee, Mumbai, 1996.

REFERENCES:

1. Miraftab M and Horrocks A R, “Eco Textiles”, The Textile Institute, Woodhead Publication Ltd., Cambridge, 2007.
2. Susanna Benny and Janakiraman K P, “Eco parameters: Present Status”, Mill Control Report No.15, The South India, Textile Research Association, Coimbatore, 1998.
3. “Oko-tex Standard 100”, International Association for Research and Testing in the field of Textile Ecology (Oko- tex), Zurich, Switzerland, January, 1997.
4. Chavan R B, Radhakrishnan J, “Environmental Issues - Technology Options for Textile Industry”, IIT Delhi Publication, 1998.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

TT23020 MANAGEMENT OF TEXTILE EFFLUENTS

L	T	P	C
3	0	0	3

OBJECTIVES

- To enable the students to learn the concepts of effluent treatment methods for textile industry and their management

UNIT I CHARACTERISATION OF EFFLUENTS 9

Characteristics of textile effluents colour, pH, hardness TSS, TDS, COD, BOD, alkalinity, estimation of metalions.

UNIT II PRELIMINARYTREATMENT 9

Effluent treatment flowchart; preliminary treatment–screening, shredding, grit removal; primary treatment–equalization, coagulation, flocculation, sedimentation.

UNIT III SECONDARY TREATMENT AND TERTIARY TREATMENT 9

Secondary treatment – activated sludge process; tertiary treatment - adsorption, membrane technology,radiation(UV,gamma,electronbeam),electrochemical,chemical(H_2O_2,chlorine,fenton'sreagent), thermal, corona discharge. Marine discharge of effluent.

UNIT IV RECYCLE AND REUSE 9

Recycling and reuse of waste water; reject water treatment/management-importance, brine reject source; thermal evaporation – mechanical vacuum recompression evaporator, multiple effect evaporators; crystallizer; sludge management.

UNIT V TEXTILE EFFLUENT TREATMENT 9

Generation of textile effluents; characteristics and norms of textile effluents; zero liquid discharge(ZLD) in chemical processing industry, zero discharge of hazardous chemicals(ZDHC); Effluent treatment plants in processing units.

TOTAL:45PERIODS

COURSE OUTCOMES:

Upon completion of the student shall be able to

CO1:Analyse the various effluent parameters

CO2:Comprehend about preliminary treatments in a processing house

CO3: Appraise and analyse role of secondary and tertiary treatments in a processing house

CO4:Explain importance of recycling and reuse

CO5:Design effluent treatment process based on zero liquid discharge

TEXTBOOKS

1. Manivasakam N, "Treatment of Textile Processing Effluents", Chemical PublishingCompany,U.S.A,2013,ISBN978-0-82060-175-5
2. Christie R M, "Environmental aspects in Textile Dyeing", Woodhead Publishing Ltd.,UK,2007,ISBN978-1-84569-115-8

REFERENCES

1. Karmakar S R, “Chemical Technology in the Pre-treatment Processes of Textiles”,Elsevier, New York,1999,ISBN978-1-8044450-060-1
2. Cavaco-Paulo and Gübitz GM,“Textile Processing with Enzymes”,Woodhead PublishingLtd.,UK,2003,ISBN978-1-85573-610-8
3. Peter J Hauser, “Advances in Treating Textile Effluent”, In Tech Publisher, Croatia,2011, ISBN978-9-53307-704-8
4. BabuBV, “Effluent Treatment :Basics & A Case Study”,Chemical Engineering Department, Birla Institute of Technology and Science (BITS), PILANI, Rajasthan,India,2000

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

TT23021	COATED AND LAMINATED TEXTILES	L	T	P	C
		3	0	0	3

OBJECTIVE

- To enable the students to learn the production and applications of coated and laminated textile and their testing

UNIT I MATERIALS USED IN COATING 9

Polymers- rubbers, polyolefin and substituted polyolefins, elastomers- polyacrylate, silicone, fluorinated polymers; properties

UNIT II PRODUCTION METHODS 9

Coating-knife, roller, dip, transfer and gravure, calendaring, melt and foam coating, printing, lamination and joining of textiles

UNIT III PRODUCTS FROM COATED AND LAMINATED FABRICS I 9

Water proof breathable fabrics, hydrophilic films, stimuli responsive fabrics, artificial leather, inflated textiles, textiles used in construction and transportation, interlinings

UNIT IV PRODUCTS FROM COATED AND LAMINATED FABRICS II 9

Temperature and pH responsive garments, protective textiles for NBC, camouflage nets, high visibility garments, intumescent coated fabric, conductive textiles and medical textiles

UNIT V TESTING OF COATED TEXTILES 9

Mechanical characterization- tensile, elongation, creep, stress relaxation, adhesion, tear resistance , weathering behaviour, ageing studies against microbes and environment, other testing standards

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course the student shall be able to

CO1: Comprehend different kinds of polymers used for coating and lamination

CO2: Distinguish different methods of coating and lamination

CO3: Appraise various applications of coated and laminated textiles in different industry

CO4: Appraise various applications of laminated textiles in different industry

CO5: Analyse and interpret various characteristics of coated textiles

TEXT BOOKS

1. Walter Fung, “Coated and Laminated Textiles”, Woodhead Publishing Ltd, UK, 2002, ISBN 978-1-85573-576-7.
2. Carr C M, “Chemistry of the Textile Industry”, Blackie Academic & Professional, UK, 1995.

REFERENCES

1. Smith W C, “Smart textile Coatings and Laminates”, Woodhead Publishing Ltd, UK, 2010, ISBN 978-1-84569-379-4.

2. Brown P J and Stevens K, “Nanofibers and Nanotechnology in Textiles”, Woodhead Publishing Ltd, UK, 2007, ISBN 978-1-84569-105-9
3. Ashish Kumar Sen, “Coated Textiles: Principles and Applications”, CRC Press, New York, 2008

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	1	-	-	3	1	-	-	-	2	3	2	3
2	3	3	3	1	-	-	3	1	-	-	-	2	3	2	3
3	3	3	3	1	-	-	3	1	-	-	-	2	3	2	3
4	3	3	3	1	-	-	3	1	-	-	-	2	3	2	3
5	3	3	3	1	-	-	3	1	-	-	-	2	3	2	3
Overall CO	3	3	3	1	-	-	3	1	-	-	-	2	3	2	3

TT23022	ADVANCES IN TEXTILE PRINTING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable the students to learn the advances in the field of textile printing

UNIT I SUBLIMATION AND TRANSFER PRINTING 9

Mechanism of sublimation transfer printing**;** selection of the paper; printing methods; dyes and inks; Transfer prints on both man-made fibres and natural fibres; Machineries

UNIT II SPECIAL PRINTING TECHNIQUES 9

Developments in photo printing and blast printing with Indigo. Developments in xerox printing and laser printing for fancy effects. Yarn printing (space dyeing) Transfer printing: Sublimation transfer, melt and film release transfer, wet transfer printing.

UNIT III CARPET PRINTING 9

Mechanism of carpet printing; selection of chemicals and dyes for printing of carpet; treatment before and after carpet printing; machineries

UNIT IV DIGITAL PRINTING I 9

Comparison with conventional printing techniques; ink jet printing- principles, ink jet printing machines

UNIT V DIGITAL PRINTING II 9

Pre-treatment of substrates; formulation of aqueous inks; dye- fibre interaction; post treatment of substrate; importance of digital colour management in inkjet printing, pigment based digital printing: pigment formulation, test methods for pigmented textile ink; print quality and its measurement

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course the student shall be able to
CO1: Comprehend about sublimation and transfer printing
CO2: Explain about various textile printing techniques
CO3 Describe the process involved in carpet printing
CO4: Comprehend about principles of ink jet printing
CO5: Formulate the recipe for ink jet printing of various substrate

TEXTBOOKS

1. Miles L W C, “Textile Printing”, Society of Dyers and Colourists, Hobbs the Printers, Hampshire, UK, 2003.
2. Shenai V A, “Technology of Printing”, Sevak Publishers, Mumbai, 1990.

REFERENCES

1. Tyler D, “Textile Digital Printing Technologies”, Textile Institute Publication UK,Vol.37 No.4, 2005
2. Ujiie, “Digital Printing of Textiles”, CRC, Wood Head Publishing Ltd, UK, 2006.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
2	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
3	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
4	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
5	3	3	3	3	-	1	2	2	-	-	-	2	3	1	3
Overall CO	3	3	3	2.2	-	1	2	2	-	-	-	2	3	1	3

TT23023	COLORATION OF SYNTHETIC FIBRES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to learn about mass coloration, pre-treatment of synthetic fibres, dyeing of polyester, polypropylene, nylon, acrylic and printing of the fabrics

UNIT I MASS COLOURATION 9

Different methods of mass colouration, mass colouration of polymers - polyester, nylon, acrylic and polypropylene

UNIT II PRETREATMENTS 9

Pretreatments for polyester, nylon, acrylic and polypropylene fabrics, pretreatments for blends - polyester/cotton, polyester/wool, acrylic/wool and acrylic /cotton

UNIT III DYEING OF POLYESTER AND POLYPROPYLENE 9

Different mechanisms of dyeing polyester, dyeing of textured polyester, differentially dyeable polyester and its blends, carrier free dyeable polyester; dyeing of polyester blends - polyester/cotton and polyester/wool; dyeing of unmodified and modified polypropylene

UNIT IV DYEING OF NYLON AND ACRYLIC 9

Dyeing of nylon with acid and disperse dyes, dyeing of polyamide blends, differentially dyeable nylon and its blends; dyeing of acrylic with cationic and disperse dyes, dyeing of acrylic blends, differentially dyeable acrylic and its blends

UNIT V PRINTING 9

Different styles of printing polyester, polyamide and polypropylene fabrics; transfer printing – different systems of transfer printing, heat transfer printing, advantages and limitations

TOTAL: 45 PERIODS

TEXTBOOKS

1. Burkinshaw S.M., “Dyeing of synthetic fibres”, Blackie, 1995.
2. Datye K.V. and Vaidhya A.A., “Chemical processing of synthetic fibers and blends”, Wiley-Interscience Publication, 1984.

REFERENCES

1. Gulrajani M.L., “Dyeing Polyester and its blends”, IIT, Delhi, 1987.
2. Shore J., "Blends dyeing ", SDC, U.K, 1998. ISBN: 090195446740
3. Burkinshaw S.M., “Chemical Principles of Synthetic Fibre Dyeing”, Textile Insititute Publication, 1995.

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Comprehend about the mass coloration processes

CO2: Recognize the basics of pretreatment

CO3: Differentiate the dyeing of polyester and polypropylene fibre materials and dyeing machineries

CO4: Distinguish dyeing of nylon and acrylic materials

CO5: Explain about the printing of synthetic fabrics

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
2	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
3	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
4	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
5	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3
Overall CO	3	3	3	-	-	-	3	2	-	-	-	2	3	2	3

VERTICAL IV

GARMENT TECHNOLOGY

TT23C06 GARMENT PRODUCTION MACHINERY

L	T	P	C
2	0	2	3

OBJECTIVES:

- To enable the students to recognize the garment production machines and its working mechanisms

UNIT I SPREADING AND CUTTING MACHINES 6+9

Spreading machines, cutting machines, Fusing machines; working mechanism- straight knife, round knife, rotary shears, band knife, die cutting, computer controlled cutting machine, laser cutting, notches and drills; automations and advancements.

Practicals:

1. Study on the working principle of spreading machine
2. Study on the working mechanism of different cutting machines

Unit II SEWING MACHINES 6+15

Types of sewing machines and mechanism- lockstitch, chainstitch, overlock, coverstitch, button hole, button attachment, feed off arm; machine components and functions, basic operation and maintenance

Practicals:

1. Study on the threading, tensioning and working principle of button hole machine
2. Evaluation of the strength and consistency of stitches produced by different settings on the SNLS machine.
3. Evaluation of the strength and consistency of stitches produced by different settings on the chain stitch machine.
4. Evaluation of the strength and consistency of stitches produced by different settings on the overlock machine.
5. Evaluation of the strength and consistency of stitches produced by different settings on the flatlock machine.

Unit III SPECIAL MACHINES AND WORK AIDS 6

Special machines based on product category – shirt, pants, denim, knits, leather and functional garments. Work aids - folders, presser foot, guides and attachments.

UNIT IV PRESSING AND FINISHING EQUIPMENT 6+6

Ironing equipment- steam irons, vacuum tables; needle detectors, washing and finishing machines, pressing techniques and tools, folding machines, poly bagging machine.

Practicals:

1. Study on the working principle ironing equipments
2. Study on the working mechanism of form finishers

UNIT V GARMENT MACHINERY MAINTENANCE 6

Preventive, predictive, breakdown maintenance; safety standards in garment production, automation in garment production – sew bots.

TOTAL: 30 PERIODS + 30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO 1 Comprehend the fundamental concepts on belts and drives
CO 2 Explain the fundamental principle and working of machines used for spreading and cutting
CO 3 Analyse the stitch formation and other mechanisms of SNLS machine
CO 4 Explain the stitch formation and other mechanisms of chain stitch machine
CO 5 Classify different types of feed mechanisms and attachments

TEXTBOOKS:

1. Harold Carr., and Barbara latham., “The Technology of Clothing Manufacture”, 4th Edition,
   Whiley-Black well Sciences, 2008, ISBN: 1405161981 / ISBN: 978-1405161985
2. Jacob Solinger., “Apparel Manufacturing Handbook”, 2nd Edition Bobbin Blenheim Media Corp,1988, ISBN : 1879570009 / ISBN: 978-1879570009
3. Ruth E. Glock., and Grace I. Kunz., “Apparel Manufacturing Sewn Product Analysis”, 4thEdition, Pearson Prentice Hall, 2005, ISBN: 0131119826 | ISBN-13: 9780131119826

REFERENCES:

1. Villumsone-Nemes I., “Industrial Cutting of Textiles material”, Wood head Publications Pvt. Ltd 2012, ISBN: 978-1-85709-134-5
2. JelkaGersak., “Design of Clothing Manufacture Process - A Systematic Approach to Planning Scheduling and Control”, Wood head Publications Pvt. Ltd, 2013, ISBN: 978-1-85709-778-1

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	2	2	2	1	3	1	2	2	1	1
CO2	3	2	2	2	2	2	1	2	1	2	2	1	2	1	1
CO3	2	1	3	1	2	1	2	1	1	3	1	3	2	1	1
CO4	2	1	3	1	2	1	2	1	1	3	1	3	2	1	1
CO5	3	3	1	1	1	2	2	2	2	3	1	2	2	1	1
Overall CO	2.6	2	2.4	1.6	2	1.6	1.8	1.6	1.2	2.8	1.2	2.2	2	1	1

TT23024	ADVANCED PATTERN MAKING AND GARMENT CONSTRUCTION LABORATORY	L	T	P	C
		0	0	6	3

OBJECTIVES

- To enable the students to draft a pattern and construct the various styles of kids, women's and men's wear

Draft Pattern for

1. Kid's frock
2. Kid's romper
3. Women's top
4. Women's skirt
5. Salwar and kameez
6. Ladies blouse
7. Men's Formal shirt
8. Men's Formal trouser

TOTAL: 90 PERIODS

OUTCOMES:

Upon completion of this practical course, the students can be able to

CO1 –develop the pattern and construct children's wear

CO2 - develop the pattern and construct women's wear; analyse the fit of the developed garment with respect to fit standards

CO3 - develop the pattern and construct men's wear; analyse the fit of the developed garment with respect to fit standards

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	-	-	2	-	2	-	-	3	2	3	2
CO2	2	2	3	3	-	-	2	-	2	-	-	3	2	3	2
CO3	-	-	2	2	-	-	2	-	2	-	-	2	2	2	2
Overall	2	2	2.6	2.6	-	-	2	-	2	-	-	2.6	2	2.6	2

AT23C01 APPAREL PRODUCTION AND PLANNING

L	T	P	C
2	1	0	3

COURSE OBJECTIVES

- To enable the students to understand the production planning in garment industry
- To emphasis on the improved methods of material control in apparel production
- To acquaint students with quality concepts for implementing quality in apparel production

UNIT I SAMPLING AND PRE - PRODUCTION ACTIVITIES 6+3

Concepts of concurrent engineering and reverse engineering of standard garments; overview of pre-production functions, purpose and procedure of conducting pre-production meeting; sampling stages, steps between prototypes to production; product data management; cut order planning; bundle distributions and tracking

UNIT II OPERATION BREAKDOWN 6+3

Operation break down and production sequence, line balancing, identification of bottlenecks and critical operations, operation wise machinery allocation–basic shirts, trousers, skirts; production grid and flowchart.

UNIT III PLANT LOADING AND CAPACITY PLANNING 6+3

Determination of machinery requirements for a new factory, calculation of labour requirements; line balancing techniques – line and operator efficiency, balance control; establishing factory capacity, TAKT time, planning for multi style production – preparation of planning board; subcontracting – reasons.

UNIT IV PRODUCTION SCHEDULING 6+3

Principles of scheduling, scheduling charts - master schedule, GANTT chart, backlog graph for WIP control, scheduling control techniques; network representations - CPM and PERT; preparation of time and action calendar.

UNIT V PRODUCTION SYSTEM AND CONTROL METHODS 6+3

Production systems - full garment assembly, make through, batch production, progressive bundle, straight line assembly, unit production system, modular production system; material management - Manufacturing Resources Planning (MRP II), Just In Time production system (JIT), Optimised Production Technology (OPT), Economic Order Quantity (EOQ), ABC, VED analysis in inventory control; lean manufacturing and its performance measures, kanban system.

TUTORIALS

Solving the problems using computer spread sheet

TOTAL:30 PERIODS +15 PERIODS

COURSE OUTCOMES

Upon completion of this course, the student will be able to

1. Understand the aspects of production planning
2. Explain operations involved in cutting room
3. Illustrate operations and assembly planning
4. Understand the material management
5. Describe the significance of inspection and quality control

TEXTBOOKS:

1. JacobSolinger.,"ApparelProductionHandbook",ReinholdPublications,1998,ISBN:18795 70009/ISBN:978-1879570009(series1 &series 2)
2. CarrH and LathamB., "The Technology of Clothing Manufacturing",Blackwell Science,U.K.,1994,ISBN:0632037482|ISBN-13:9780632037483
3. RuthE.Glock.,andGraceI.Kunz.,"ApparelManufacturing,SewnProductAnalysis",FourthE dition,PearsonEducation,2004, ISBN:0131119826ISBN-13:9780131119826.
4. VilumsoneIandNemes.,"Industrialcuttingoftextilematerials",WoodheadPublishingLimited ,2012,ISBN:978-0081021224/ISBN :0081021224.

REFERENCES:

1. Laing R.M., and WebsterJ., "Stitches&Seams", TheTextile Institute, India,1999,ISBN:1870812735|ISBN-13:9781870812733
2. Shaeffer Claire., "Sewing for the Appare lIndustry", PrenticeHall, NewJersey,2001,ISBN:0321062841 |ISBN-13:9780321062840
3. Singer.,"Sewing Lingerie", CyDeCosse Incorporated, 1991,ISBN:0865732604|ISBN-13:9780865732605
4. PattyBrown., and Janett Rice.,"Ready-To Wear Apparel Analysis",Third Edition, Prentice- HallInc.,NewJersey,2000,ISBN:0130254347| ISBN-13:9780130254344
5. Chuter A.J., "Introduction to Clothing Production Management", Blackwell Scientific Publications,Oxford, 2001, ISBN: 0632039396 | ISBN-13:978063203939

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO2	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO3	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO4	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO5	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
Overall CO	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3

AT23C02	APPAREL MARKETING AND MERCHANDISING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To acquaint the students with the concepts of business, design merchandising, sourcing and export documentation

UNIT I MARKET RESEARCH **9**

Core concepts and orientation towards market place, market research; forecast- data collection, research, forecasting methods- qualitative and quantitative techniques (time series, moving average, exponential smoothening, regression analysis, econometric analysis, input output), analysis and calculations; market segmentations

UNIT II MARKETING FOR APPAREL **9**

Introduction to fashion marketing; types of fashion marketing; understanding fashion change; elements of fashion marketing; fashion marketing strategies- of the developed economies, developing economies, whole sale and retail; apparel business practices; AI lead apparel business for beyond generation alpha; fashion trends

UNIT III MERCHANDISING **9**

Concepts of merchandising, apparel product lines, dimensions of product change, determination and development of product line and product range; creative design of garments and accessories, new product development and seasons of sale; role and responsibilities of merchandiser

UNIT IV SOURCING **9**

Understanding the basics of sourcing, sourcing strategy and best sourcing practice in apparel and textile businesses, supply chain and demand chain, sourcing negotiations, global co-ordination in sourcing, identifying & qualifying new sourcing destinations; supplier partnership in sourcing; materials management and quality in sourcing, quick response, ERP.

UNIT V EXPORT DOCUMENTATION AND POLICIES **9**

Government policies, guidelines for apparel export and domestic trade, tax structures and government incentives in apparel trade; export documents and its purposes, finance and banking activities, Letter of credit, logistics and shipping, foreign exchange regulation, export risk management and insurance; export finance, role of Special economic zones.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Identify various apparel markets and create innovative forecasting strategies for apparel markets

CO2: Analyse various apparel and fashion markets and predict changing fashion

CO3: Analyse the apparel product dynamics in a market and relating it along the value chain.

CO4: Applythe concepts of sourcing in various apparel industries

CO5: Outline the documents involved in trade.

TEXTBOOKS

1. Elian stone, Jean A samples, “Fashion Merchandising”, McGraw Hill Book Company, New York, 1985, ISBN: 0-07-061742-2
2. Shivaramu S.,” Export Marketing” – A Practical Guide to Exporters”, Wheeler Publishing, Ohio, 1996, ISBN: 81-7544-166-6
3. Ruth E. Glock, Grace I. Kunz ” Apparel Manufacturing Sewn Product Analysis” Fourth Edition, Pearson Prentice Hall, NJ, 2005, ISBN: 81-7758-076-0

REFERENCES:

1. Dominic Kosorin., “Introduction To Programmatic Marketing”, Dominik Kosorin, 2016, ISBN 8026096118
2. Dimitris N. Chorafas., “Integrating Erp, Crm, Supply Chain Management and Smart Materials”, Auerbach, 2001, ID 54795
3. Michael Mc Tear, ZoraidaCallejas, David Griol., “The Conversational Interface- Talking to Smart Devices”, Springer Publishing, 2016, ISBN 3-319-32967-3

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO2	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO3	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO4	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO5	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
Overall CO	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3

AT23C04 INDUSTRIAL ENGINEERING IN APPAREL INDUSTRY

L	T	P	C
2	1	0	3

OBJECTIVES:

To enable the students to learn about basics of industrial engineering and different tools of industrial engineering and its application in apparel industry

UNIT I PLANT LOCATION AND LAYOUT **6+3**

Industrial engineering – concept and application; site selection for garment industry; plant layout – types and their suitability; line balancing concepts

UNIT II METHOD STUDY **6+3**

Work study- introduction and procedure; methods study – introduction, approaches; techniques of recording and analysis; application of methods study in garment manufacture; principles of motion economy, motion analysis

UNIT III WORK MEASUREMENT I **6+3**

Work content; time study – equipment and procedure, rating concepts; standard time; standard data- PMTS, GSD; wage incentive systems

UNIT IV WORK MEASUREMENT II **6+3**

Work measurement applied to garment industry; calculation of standard allowed minutes (SAM); line balancing for garment construction

UNIT V ERGONOMICS **6+3**

Production and productivity concepts; Ergonomics – importance, types, principles; materials handling tools; lighting, ventilation, climatic conditions; noise control; introduction to human anthropometry, designing of workplace; effects on operator's health and productivity; safety measures in garment industry

TUTORIALS

Solving the problems using computer spread sheet

TOTAL: 30 PERIODS + 15 PERIODS

OUTCOMES:

Upon the completion of the course the student shall be able to

CO1: explain the productivity concepts, selection of plant location and design of plant layout

CO2: Carryout method study and Motion analysis

CO3: explain the concept of work measurement and tools

CO4: Calculate SAM and carryout line balancing for garment construction

CO5: Illustrate the importance of ergonomics in garment industry and design the workplace

TEXT BOOKS:

1. George Kanwaty, "Introduction to Work Study ", ILO, Geneva, 1996, ISBN: 9221071081 |ISBN-13: 9789221071082
2. Enrick N. L., "Time study manual for Textile industry", Wiley Eastern (P) Ltd., 1989, ISBN: 0898740444 | ISBN-13: 9780898740448
3. Khanna O. P., and Sarup A., "Industrial Engineering and Management", Dhanpat Rai Publications, New Delhi, 2010, ISBN: 818992835X / ISBN: 978-8189928353

REFERENCES

1. Norberd Lloyd Enrick., “Industrial Engineering Manual for Textile Industry”, Wiley Eastern (P) Ltd., New Delhi, 1988, ISBN: 0882756311 | ISBN-13: 9780882756318
2. Chuter A. J., “Introduction to Clothing Production Management”, Wiley-Black well Science, U.S. A., 1995, ISBN: 0632039396 | ISBN-13: 9780632039395
3. David M. Levine., Timothy C. Krehbiel., and Mark L. Berenson., “Business Statistics: A First Course”, 7th Edition, Pearson Education Asia, New Delhi, 2015, ISBN: 032197901X | ISBN-13: 9780321979018
4. Chase., Aquilano., and Jacobs., “Production and Operations Management”, Tata McGraw-Hill, New Delhi, 8th Edition, 1999, ISBN: 0256225567 | ISBN-13: 9780256225563
5. GavrielSalvendy., “Industrial Engineering – Technology and operations management”, WileyInterscience Publications, USA, 2001, ISBN: 0471330574 | ISBN-13: 9780471330578
6. GordanaColovic., “Ergonomics in the garment industry”, Wood publishing India Pvt. Ltd., India, 2014, ISBN: 0857098225 | ISBN-13: 9780857098221

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO2	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO3	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO4	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
CO5	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3
Overall	3	3	2	3	3	2	2	2	2	2	2	2	2	2	3

TT23025	COMPUTER AIDED GARMENT DESIGNING	L	T	P	C
		0	0	6	3

OBJECTIVES

- To train the students in CAD used for designing, pattern making and marker planning of garments

LIST OF EXPERIMENTS:

1. Practice on tools of the Software used for 3D simulation.
2. Creating an avatar using body measurement for men, women and children.
3. 3D Simulation of kids frock and analyse the simulation of visual effects of varying fabric
4. 3D Simulation of kids romper and analyse the simulation of visual effects of varying seams
5. 3D Simulation of women's top and analyse the simulation of visual effects of varying print
6. 3D Simulation of women's skirt and analyse the simulation of visual effects of varying fabric
7. 3D Simulation of women's blouse and analyse the fit of the garment
8. 3D Simulation of men's shirt and analyse the simulation of visual effects of varying print
9. 3D Simulation of men's trouser and analyse the influence of fabric low stress mechanical properties on fit of the garment

TOTAL: 90 PERIODS

COURSE OUTCOMES

Upon completion of this course the student shall be able to

CO1: simulate the pattern and analyse the visual effects of fabric on kid's wear

CO2: simulate the pattern and analyse the fit of the women's wear for varying fabrics

CO3: simulate the pattern and analyse the fit of the men's wear

Course Articulation Matrix:

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	3	-	2	-	2	-	-	3	2	3	2
CO2	2	2	3	3	3	-	2	-	2	-	-	3	2	3	2
CO3	-	-	2	2	3	-	2	-	2	-	-	2	2	2	2
Overall CO	2	2	2.6	2.6	3	-	2	-	2	-	-	2.6	2	2.6	2

VERTICAL V
TECHNICAL TEXTILES

TT23026 AUTOMOTIVE, INDUSTRIAL AND FILTRATION TEXTILES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to explain about the various industrial textile and filtration products

UNIT I AUTOMOTIVE TEXTILES 9

Raw materials and construction principles – airbags, seat belts, coverings, oil and air filters in automobiles, headliners, door casings, truck and car covers

UNIT II INDUSTRIAL TEXTILES 9

Raw materials and construction principles- hoses, belts (power transmission and conveyors), industrial ropes, tyre cords

UNIT III QUALITY ASSURANCE OF INDUSTRIAL AND AUTOMOTIVE TEXTILES 9

Quality evaluation – standard test methods - hoses, belts (power transmission and conveyors), industrial ropes, tyre cords, airbags, seat belts, coverings, oil and air filters, headliners, door casings, truck and car covers

UNIT IV FILTRATION TEXTILES 9

Filtration and separation, contaminants, Surface and Depth Filtration, Mechanism of filtration . Raw material and construction of air filters – Industrial air filtration, gas turbine air intake filters, Vaccum cleaner, Air purifier, Face mask and Respirator. Raw material and construction of liquid and oil filters- Water filters, oil water separator and engine filter

UNIT V QUALITY ASSURANCE AND TESTING OF FILTRATION TEXTILES 9

Measurement - Density and Bulk, Solidity and Porosity, Pore Size and Pore Structure, filtration efficiency, air permeability; respirators - aerosol and bacterial filtration efficiency, airflow resistance and fit analysis; water filtration testing-pure water flux, permeate flux, water flow resistance, molecular weight cut-off, organic content removal efficiency, removal of metals and metal oxides; Standards of testing

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course the student shall be able to

CO1. Explain about the various technical textile products
CO2. Describe about the automotive textile products
CO3. Evaluate the performance of automotive textile products
CO4. Discuss about the construction of various types of filters
CO5: Evaluate the performance of filters

TEXTBOOKS

1. Richard A Scott, “Textiles for protection”, Woodhead publishing, 2005

2. Shisoo R., “ Textile Advances in the automotive Industry” Woodhead publishing, 2008, ISBN 978-1-4200-9000-0

REFERENCES:

1. Pushpa B, Sengupta A K , "Industrial Application of Textiles for Filtration and Coated fabrics", Textile progress, UK, 1992

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3
2	3	3	3	3	3	2	2	2	2	2	2	2	3	2	3
3	2	2	2	2	2	-	2	-	-	2	2	2	1	1	3
4	3	3	3	3	3	2	2	2	2	2	2	2	3	2	3
5	2	2	2	2	2	-	2	-	-	2	2	2	1	1	3
Overall CO	2.4	2.4	2.4	2.4	2.4	2	2	2	2	2	2	2	2.2	1.6	3

TT23027	GEOTEXTILES	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable the students to explain about the various geotextile products

UNIT I GEOSYNTHETICS 9

Definition, Types- Geonets, geotextiles, geogrids, geomembranes, Functions and Requirements, Understanding soil characteristics and its behaviour, Principles of soil reinforcement, Composition of geosynthetics, structure of geocomposites

UNIT II GEOTEXTILES 9

Fibres and fabric selection criteria, functions and mechanism – separation, filtration, reinforcement, drainage, erosion control; essential properties- physical, mechanical, hydraulic, endurance of geotextiles; mechanics of reinforcement

UNIT III MANUFACTURING 9

Fabric construction and manufacturing processes, Material aspects and stability considerations; Designing of geotextiles for separation, road way reinforcement, filtration, drainage; Case studies

UNIT IV TESTING AND EVALUATION 9

Testing of geotextiles – Index and performance test, Evaluation of filtration and drainage functions, reinforcement, creep, moisture barrier characteristics, durability and ageing; Standards related to geotextiles.

UNIT V APPLICATIONS 9

Geotextile installation, survivability, cost and durability, types of fibre and fabric construction - retaining walls, embankment, foundation, roads and railways; Environmental control - landslides and erosion control

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course students are expected to

CO1 comprehend about the usage of geosynthetics
CO2 distinguish the geotextiles in terms of fibre, fabric selection and properties
CO3 design geotextiles for separation, reinforcement, filtration and drainage
CO4 analyse the performance of geotextiles
CO5 design the geotextiles for various applications

TEXT BOOKS

1. Horrocks A R and Anand S C, “Handbook of Technical Textiles”, The Textile Institute, Manchester, 2000.
2. Rawal, A, Shah T, and Anand S, Geotextiles: Production, Properties and Performance. Textile Progress, 2010.

REFERENCES

1. Koerner, R M, “Designing with Geosynthetics”, 5th edition, Pearson Education Inc, London, 2012.
2. Shukla, S K, “Geosynthetic Applications—General Aspects and Selected Case Studies. In Geosynthetics and their Applications”, Thomas Telford Publishing, 2002.
3. Sanyal, T, “Jute Geotextiles and their Applications in Civil Engineering”, Springer, Singapore, 2017.
4. Sarsby R W, “Geosynthetics in Civil Engineering”, Woodhead Textiles, UK, 2006.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	2	2	-	-	-	-	-	-	-	2	2	2	1
2	3	2	2	2	-	-	-	-	-	-	-	2	2	2	1
3	3	2	2	2	-	-	-	-	-	-	-	2	2	2	1
4	3	2	2	2	-	-	-	-	-	-	-	2	2	2	1
5	3	2	2	2	-	-	-	-	-	-	-	2	2	2	1
Overall CO	3	2	2	2	-	-	-	-	-	-	-	2	2	2	1

TT23C19	MEDICAL TEXTILES	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students to learn about

- Scope of textile materials in medical field
- Significance of biomaterials and applications
- Biomedical application of different textile structures

UNIT I MATERIALS USED IN MEDICAL APPLICATIONS 9

Biomaterials; Classification of medical textiles - types, features, applications and limitations; chemistry and synthesis of biopolymers - synthetic and natural biopolymers, metals and ceramics; super absorbent polymers; cell- biomaterial interaction

UNIT II WOUND DRESSINGS AND BANDAGES 9

Wound - classification, stages of healing, and type of care required; wound dressing - requirements, types, construction, features and limitations; bandages – types, construction, features and applications; testing of wound dressing and bandages; standards

UNIT III IMPLANTABLE DEVICES AND INTELLIGENT TEXTILES 9

Sutures - specifications, types, manufacturing, characteristics and applications; Implantable biomedical devices, vascular grafts, artificial tendons and ligaments- materials, types, features

UNIT IV EXTRA-CORPOREAL DEVICES 9

Extra-corporeal devices - artificial leg, kidney, liver, lungs; scaffolds for tissue engineering - development and characterization; safety, legal and ethical issues involved in conducting trials with medical textile materials;

UNIT V INFECTION CONTROL, BARRIER AND HYGIENE CARE 9

Healthcare and hygiene products: surgical gowns, masks, respirators, wipes, napkins, antibacterial, antiodour textiles- materials, types, construction, features, applications and limitations; Regulations - disposal of medical textile products

TOTAL:45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Comprehend the use of materials in medical applications

CO2: Appraise various types and characteristics of wound dressings, bandages and pressure garments

CO3: compare the various types of implantable and intelligent textiles

CO4: comprehend about the requirement, material of extracorporeal devices and to study safety and legal issues in medical textiles

CO5: comprehend about textiles used for infection control and hygiene care

TEXTBOOKS

1. Allison Mathews., and Martin Hardingham., “Medical and Hygiene Textile Production
- A Hand Book”, Intermediate Technology Publications, 1994, ISBN: 1853392111 | ISBN-13: 9781853392115
2. Anand S.C., Kennedy J.F.,Miraftab M., and Rajendran S., “Medical Textiles and Biomaterials for Health Care”, Wood head Publishing Ltd., 2006, ISBN: 0849317800 |ISBN-13: 9780849317804

REFERENCES

1. Joon B. Park., and Joseph D. Bronzino., “Biomaterials – Principles and Applications”, CRCPress, Boca Raton London, New York, Washington, D.C. 2002, ISBN: 0849314917 | ISBN-13: 9780849314919
2. Anand S., “ Medical Textiles”, Textile Institute, 1996, ISBN: 185573317X
3. Horrocks A.R., and Anand S.C., “Technical Textiles”, Textile Institute, 1999,ISBN:185573317X
4. Adanur S., “Wellington Sears Handbook of Industrial Textiles”, Technomic PublishingCo. Inc.,LancasterPennylvania, 1995, ISBN 1-56676-340-1
5. Michael Szycher., and Steven James Lee., “Modern Wound Dressing: A Systematic Approachto Wound Healing”, Journal of Biomaterials Applications.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	3	3	-	2	2	3	1	2	2	3	-	2	3
2	2	-	3	3	-	2	3	2	1	1	1	3	2	2	3
3	-	-	2	3	-	2	2	2	-	1	1	3	-	2	1
4	2	-	3	3	-	3	3	3	1	1	2	3	2	2	3
5	-	-	3	1	-	3	2	3	1	2	2	1	-	2	2
Overall CO	2	-	2.8	2.6	-	2.4	2.4	2.6	1	1.4	1.6	2.6	2	2	2.4

TT23028	TEXTILE REINFORCED COMPOSITES	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students to learn about

- Reinforcements, matrices used for the composites and techniques for makingcomposites
- Manufacture and testing of composites and application of composites

UNIT I INTRODUCTION 9

Composite-reinforcement materials, classification and properties; matrix and resin – classification, additives and properties; reinforcement and matrix types; role of reinforcement and matrix interface wettability

UNIT II PREPREGS AND PREFORMS 9

Manufacture, characteristics and applications of prepregs; manufacture, characteristics and applications of textile preforms- weaving, knitting and braiding; interface characteristics.

UNIT III TECHNIQUES FOR MANUFACTURE OF COMPOSITES 9

Introduction, manufacturing processes – open mould process, closed mould process and continuous process

UNIT IV MECHANICAL PROPERTIES OF TEXTILE COMPOSITES 9

Geometrical aspects-volume fraction, weight fraction, voids and specific gravity; testing of reinforced plastics – tensile, flexural, impact, interlaminar shear and compression properties

UNIT V MECHANICS 9

Micro mechanics and macro mechanics; classical lamination theory; failure theories-maximum stress, maximum strain

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall

CO1. Understand the basics of composites
CO2. Know about preforms, pre-pegs and their geometrical aspects
CO3. Know different methods of composite making
CO4. Know evaluation of characteristics of composites
CO5. Select different types of composites for different applications

TEXTBOOKS

1. Leonard Hollaway, “Handbook of Polymer Composites for Engineering”, Wood head Publishing limited, 2007.
2. Long A C, “Design and Manufacture of Textile Composites”, Wood head Publishing limited, 2005

REFERENCES

1. White J R, and De S K, “Short Fiber-Polymer Composites”, Wood head Publishing limited, 1996.
2. George Lubin, “Handbook of Fiberglass and Advanced Plastics Composites”, VanNostrand Reinhold Company, New York, 1969.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2	3	3	1	2	1	1	1	3	1	2	1	2	2
2	1	3	3	3	1	2	1	1	1	3	1	2	1	2	2
3	1	2	3	3	1	2	1	1	1	3	1	2	1	2	2
4	1	3	3	3	1	2	1	1	1	3	1	2	1	2	2
5	1	2	3	3	1	2	1	1	1	3	1	2	1	2	2
Overall CO	1	2.4	3	3	1	2	1	1	1	3	1	2	1	2	2

TT23C16	SMART TEXTILES AND GARMENTS	L	T	P	C
		2	1	0	3

OBJECTIVES

- To enable the students to understand the concept and construction of smart fabrics and interactive garments

UNIT I SENSORS **6**

Smart fabrics – passive, active, very smart; classification of smart materials, concept of wearable computing; Introduction to sensors; principle, design, working mechanism and application- Thermal sensors, Light sensors, Sound sensors, Humidity sensors, Strain sensors, Chemical sensors, Biosensor; development of textile based sensors

UNIT II ACTUATORS AND STORAGE DEVICE **6**

Introduction to actuators; materials for actuators; types of actuations, design, working mechanism, types of actuators and application; storage device- introduction, types, materials, working mechanism and applications; development of textile based actuators and storage devices

UNIT III CONTROL UNITS AND DATA PROCESSING **6**

Control units- introduction, types, materials, working mechanism and applications; communication and data processing

UNIT IV INTEGRATION OF ELECTRONICS TO TEXTILE STRUCTURES **6**

Integration of sensors, actuators, storage devices and control units into textiles by spinning, weaving, e-broidery, printing, coating techniques; e- composites

UNIT V DESIGN OF SMART INTERACTIVE GARMENTS **6**

Requirements, selection of material and sensors, garment construction for smart interactive garments - military applications, hospital and patient care, sports and fitness activities; smart home textiles

TUTORIALS **15**

Design and development of smart textiles and garments

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students shall be able to

CO1: Classify and explain the design of sensors

CO2: Explain and analyse the functions of actuators

CO3: Discuss on control units and data processing

CO4: Comprehend the integration of electronics to textile

CO5: Design smart interactive garments

TEXTBOOKS

1. Sanjay Gupta, “Smart Textiles their Production and Marketing Strategies”, NIFT, New Delhi, 2000.

2. William C. Smith., “Smart Textile Coatings and Laminates”, Wood Head Publishing Series in Textiles, UK, 2010, ISBN 978-1-84569-379-4.

3. Mattila HR, “Intelligent Textiles and Clothing”, The Textile Institute, CRC press, New York, & Washington, Wood Head Publishing Ltd., England, 2006.

4. Xiaoming T, “Wearable Electronics and Photonics”, The Textile Institute, Wood Head Publishing Ltd., England, 2005 203

REFERENCES

1. Tao X.M., “Smart Fibres, Fabrics and Clothing Fundamentals and Application”, Wood Head Publishing Ltd., October 2001, ISBN 1 855735466.

2. Mc Cann J. and Bryson D., “Smart Clothes and Wearable Technology”, Wood Head Publishing Series in Textiles, UK, 2010, ISBN-10: 1845693574.

3. Langenhove L V, “Smart textiles for medicine and healthcare”, Textile Institute & CRC press, Woodhead publishing ltd., England, 2007.

4. Xiaoming Tao, Hand book of smart textiles, Springer-Verlag, Singapur,2015

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO2	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO3	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO4	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
CO5	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2
Overall CO	3	2	2	2	2	1	2	1	1	2	1	1	2	2	2

TT23029 PROTECTIVE TEXTILES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students learn the selection of fibre, yarn, fabric and design of garments for different protective applications

UNIT I FIBRES, YARNS AND FABRICS FOR PROTECTIVE FABRICS 9

Characteristic requirements of fibre, yarn and fabric for flame proof, heat resistance, ballistic resistance, electrical conduction, bacterial protection, radiation protection and radiation contamination protection; fabrics for reduced visible places; textiles for clean room.

UNIT II CHEMICAL FINISHES FOR PROTECTIVE FABRICS 9

Mechanism, chemistry, materials and methods - Flame retardant, Liquid repellent, Antistatic, Antibacterial, UV protection and mite protection finishes; responsive clothing coating for protective clothing.

UNIT III PROTECTIVE GARMENT CONSTRUCTION 9

Garment construction - method of construction of protective garments for hazards- mechanical, biological, chemical, physical, physiological and accident; use of accessories for protective garment; ergonomics of protective clothing; integration of electronic components and sensors into protective garments

UNIT IV EVALUATION OF PROTECTIVE TEXTILES I 9

Standards and test methods for evaluating the performance of protective textile against mechanical hazard; test methods for finished protective textiles; analysis of comport properties of protective clothing – concept of dynamic manikins, thermal manikins and segmented thermal manikins

UNIT V EVALUATION OF PROTECTIVE TEXTILES II 9

Standards and test methods for evaluating the performance of protective textile against chemical hazard; evaporative resistance measurement-moisture permeability index, skin model; permeation resistance test-index of penetration and index of repellency; liquid tight integrity and gas tight integrity

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students shall be able to

CO1: Explain the functional requirement of fibres, yarns and fabrics fordifferent protective applications

CO2: Illustrate the mechanism of chemicalfinishes for protective textiles

CO3: Design and construct protective garments

CO4: Evaluate the performance of protective textiles against mechanical hazard

CO5: Determine the properties of protective textiles against chemical hazard

TEXTBOOKS

1. Adanur S., “Wellington Sears Handbook of Industrial Textiles”, TechnomicPublishing Co. Inc., 1995, ISBN : 1 – 56676 – 340 – 1.

2. Pushpa Bajaj., and Sengupta A.K., “Protective Clothing”, The Textile Institute,1992, ISBN:1-870812 – 44-1.

REFERENCES

1. Chellamani K. P., and Chattopadhyay D., “Yarns and Technical Textiles”, SITRA, 1999.
2. Scott R.A., “Textiles for Protection”, Wood head Publishing Limited, Cambridge, UK, ISBN :1-85573-921-6, 2005.
3. Saville.B.P., “Physical Testing of Textiles”, Wood head Publishing Limited, Cambridge, UK, ISBN :1-85573-367-6, 1999.
4. Fan Q., “Chemical Testing of Textiles”, Wood head Publishing Limited, Cambridge, UK, ISBN :1-85573-917-8, 2005.
5. Long A.C., “Design and Manufacture of Textile Composites”, Wood head Publishing Limited, Cambridge, UK, ISBN : 1-85573-744-2, 2005.
6. Fung W., “Coated and Laminated Textiles”, Wood head Publishing Limited, Cambridge, UK, ISBN :1-85573-576-8, 2002.
7. Horrocks A.R. and Anand S.C., “Handbook of Technical Textiles”, Wood head Publishing Limited, Cambridge, UK, ISBN :1-85573-385-4, 2004.
8. Anand S.C., Kennedy J.F., Miraftab M., and Rajendran S., “Medical Textilesand Biomaterials for Health Care”, Wood head Publishing Limited, Cambridge, UK, ISBN:1-85573-683-7, 2006.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	3	2	2	2	2	2	2	2	2	2	2	3
2	3	3	2	3	2	2	2	2	2	2	2	2	2	2	3
3	3	3	2	3	2	2	2	2	2	2	2	2	2	2	3
4	3	3	2	3	2	2	2	2	2	2	2	2	2	2	3
5	3	3	2	3	2	2	2	2	2	2	2	2	2	2	3
Overall CO	3	3	2	3	2	2	2	2	2	2	2	2	2	2	3

TT23030	SPORTS TEXTILES	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable the students to learn about the functional requirement, designing and evaluation of sports textiles

UNIT I SPORTSWEAR - PHYSIOLOGICAL COMFORT 9

Sportswear – introduction, types; textiles in sportswear- introduction and market overview; sportswear - comfort and protective gears, measurement of physiological comfort; heat exchange mechanism and heat balance, water resistance, water vapour transfer, condensation problem in waterproof breathable fabrics for sportswear.

UNIT II TEXTILES USED IN SPORTS FIELD 9

Outdoor sports - synthetic floorings, nets; indoor sports – application of textiles, construction

UNIT III SPORTSWEAR FOR ATHLETS 9

Athlets garment – functional requirement, design, construction and evaluation; advancements in materials

UNIT IV SPORTSWEAR FOR SWIMMERS 9

Swim suits, caps – functional requirement, design, construction and evaluation

UNIT V SPORTSWEAR FOR OTHER GAMES 9

Outdoor games – cricket, football, tennis - protective gears – functional requirement, construction and evaluation

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course the students can

CO1: Explain requirements and criteria for comfort of sportswear.
CO2: Demonstrate the construction of .materials used for sports field
CO3: Explain the functional requirement and design the garments for athlets.
CO4: Design the sportswear for swimmers
CO5: Design the protective gears for outdoor games

TEXT BOOKS

1. R.Shishoo, “Textiles for sportswear”, Woodhead Publishing Series in Textiles, Cambridge, England, 2015.
2. Ghosh. S. K., “Functional Coatings”, Wiley-VCH Verlag, GmbH & Co. KGaA, Weinheim, 2006, ISBN:3-527-31296-X.
3. R.Shishoo, Textiles in Sports, Woodhead Publishing Series in Textiles, Cambridge, England, 2005.

REFERENCES

1. A.R. Horrocks& S.C. Anand (Edrs.), “Handbook of Technical Textiles”, The Textile Institute, Manchester, U.K., Woodhead Publishing Ltd., Cambridge, England, 2000.
2. S. Adanur “Wellington Sears Handbook of Industrial Textiles”, Technomic Publishing Co. Inc., Lancaster, Pennsylvania, 1995.
3. A.K.Sen, Coated Textiles: Principal and Applications, Technomic Publication, Lancaster, Pennsylvania, USA, 2001.
4. Schindler W.D and Hauser P., “Chemical Finishing of Textiles”., Woodhead Publications, ISBN: 1855739054
5. Richard. A.Scott, Textiles for Protection, CRC press, Woodhead Publication, USA, 2005
6. Fung.W, Coated and Laminated Textiles”,Woodhead Publishing Ltd.,Cambridge,UK,2002, ISBN1-85573-576-8.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	3	2	-	-	-	-	-	-	-	2	2	2	2
2	2	2	3	2	-	-	-	-	-	-	-	2	2	2	2
3	2	2	3	2	-	-	-	-	-	-	-	2	2	2	2
4	2	2	3	2	-	-	-	-	-	-	-	2	2	2	2
5	2	2	3	2	-	-	-	-	-	-	-	2	2	2	2
Overall CO	2	2	3	2	-	-	-	-	-	-	-	2	2	2	2

TT23031 NANOTECHNOLOGY IN TEXTILES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to learn about synthesis and applications of nanomaterials in textile industry

UNIT I INTRODUCTION TO NANO TECHNOLOGY 9

Nano particles, comparison between micro and nano particles, properties of nano particle-surface area, melting point, thermal and electrical conductivity; applications of nano technology in different fields

UNIT II PHYSICAL APPROACHES I 9

Introduction to synthesis of nanostructure materials, bottom-up approach and top-down approach– equipment for mechanical alloying, process variables in milling, Mechanism of alloying, Mechanochemical processing - Thermodynamic Aspects, Powder Contamination, Safety Hazards Related to Mechanical Alloying Processes.

UNIT III PHYSICAL APPROACHES II 9

Inert gas condensation technique – arc plasma and laser ablation, Vapor deposition and different types of epitaxial growth techniques (CVD,MOCVD, MBE,ALD)- pulsed laser deposition, Sputtering-Magnetron sputtering - Lithography: Photo/UV/EB/FIB techniques, Dip pen nanolithography, Etching process: Dry and Wet etching, micro contact printing.

UNIT V CHEMICAL AND BIOLOGICAL APPROACHES 9

Sol gel method, Solvothermal and hydrothermal routes, precipitation, Spray pyrolysis, Electro spraying and spin coating routes, Self-assembled monolayers (SAMs), Langmuir-Blodgett (LB) films, micro emulsion polymerization- Template based synthesis of nanomaterials- Electrochemical deposition, Electrophoretic deposition; Synthesis of nano materials from bacteria, fungi, yeast, plant parts and biological templates

UNIT V NANOTECHNOLOGY IN TEXTILES 9

Electro spinning process; Nano finishing- water repellent and water proof textiles, Soil repellent, Nano-crosslinking, Nano-softening, Self-cleaning textiles, flame retardant, conductive and magnetic textiles, nano technology in medical textiles; Toxicity assessment and control in nano technology

TOTAL :45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Comprehend different properties of nanoparticles

CO2: Recognize the synthesis of nanoparticles

CO3: Differentiate the various approaches in deposition of nanoparticles on textiles

CO4: Analyse the role of nanotechnology in textile preparatory and finishing

CO5: Analyse the characteristics of nano-finishes

TEXT BOOKS

1. P. Brown, K Stevens, “Nanofibers and nanotechnology in textiles Woodhead Publishing 2007, ISBN 9781845693732.

2. Charles P Poole, Jr and Frank J Owens, Introduction to Nanoscience and Nanotechnology ; Wiley India -Student Edition(2006)

REFERENCE

1. Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, Nanoscale Science and Technology, John Wiley and Sons (2005)
2. M Joshi and A Bhattacharya, Nanotechnology : A New Route to High Performance Textiles, Textile Progress, Vol 43, No.3, Sep (2011)
3. Ed. P Brown and K Stevens, Nanofibres and Nanotechnology in Textiles, WoodheadPublishing Co. UK (2007)
4. Ed. Deopura BL, R Alagirusamy, M Joshi and Gupta B, 'The Impact of Nanotechnology on Polyesters and Polyamides' , Woodhead Publishing Co. UK (2008)
5. Ed. T J Pinnavia & G W Beall Polymer Clay Nanocomposites, John Wiley and Sons Ltd.England (2000)
6. Seeram Ramakrishna, K Fujihara, W Teo and TL Zumie Ma , An Introduction toElectrospinning and Nanofibres, , World Scientific Publishing Co. Ltd. (2005)
7. Zhen Guo, Li Tan, Fundamentals and Applications of Nanomaterials, (Artech House) London (2009)
8. Hari Singh Nalwa, Encyclopedia of Nanoscience and Nanotechnology, American Scientific Publishers, 10 Volumes Set (2004)

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
2	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
3	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
4	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
5	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
Overall CO	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2

TT23C14 **HOME TEXTILES**

L	T	P	C
3	0	0	3

OBJECTIVES

To enable the students to learn about

- Various kinds of materials used as home textiles
- Recent developments in home furnishing, floor covering and other home textile products
- Finishes and evaluation required for home textiles.

UNIT I INTRODUCTION **9**

Concepts of Home textiles and its market scenario, consumer expectation from home textiles; fibers and fabrics used - Woven, nonwoven and knits; manufacturing concepts- damask, brocade, organdie, chiffon, oxford, tapestry Textile surface design - basic techniques.and applications.

UNIT II HOME FURNISHING **9**

Living room furnishings – types, fabric selection and design concepts; bed room furnishings- types, fabric selection and design concepts; advances in the production of different types of bed linen, bed sheets, blankets, blanket covers, comforts, comfort covers, bed spreads, mattress and mattress covers, pads, pillows; kitchen furnishing - fabric selection and finishing for dish cloth, hand towels, aprons, mittens and runners

UNIT III FLOOR COVERING AND DRAPES **9**

Recent developments in manufacturing of floor coverings - hard floor coverings, resilient floor coverings; soft floor coverings – carpets and rugs, laying procedure, maintenance and care; cushion and pads; factors affecting the selection of floor covering; advances in home decoration -draperies – choice of fabrics, curtains, finishing of draperies- tucks and pleats; types of drapery rods, hooks, tape rings and pins.

UNIT IV FINISHES USED IN HOME TEXTILES **9**

Introduction, thermal draperies, protection against unpleasant odour, antimicrobial finish, moisture management finish, flame retardant finish, towel finishing; sensory perception technology; insect and mite repellent finish, antistatic finish; temperature regulated beddings

UNIT V EVALUATION OF HOME TEXTILES **9**

Test methods - towels, rugs; flammability standards for curtains, test methods for pot holders and woven mittens; labelling and care instructions of home textiles

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to learn

CO 1 - Different types of materials used as home textiles

CO 2 - Selection of fabric and design for living room, bed room and kitchen furnishings

CO 3 – Selection of floor coverings and draperies

CO 4 - Finishes used for various home textile products

CO 5 - Evaluation of home textile products

TEXTBOOKS:

1. AlexanderN.G., “Designing Interior Environment”, Mas Court Brace Covanorich, Newyork, 1972 67

2. DonserkeryK.G., “Interior Decoration in India”, D.B.Taraporeval Sons and Co. Pvt. Ltd., 1979, ISBN: 0906216338 | ISBN-13: 9780906216330
3. Brian. D Colemen , "Luxurious Home Interiors", Gibbs Smith Publication, Hong Kong, 2004.
4. Premavathy Seetharaman and Parveen Pannu , "Interior Design and Decoration", CBS Publishers and Distributors, New Delhi, India,2005.

REFERENCES:

1. Wingate J. F., and Mohler I. B., “Textile Fabrics& Their Selection”, Prentice Hall Inc., New York, 1984,ISBN: 0139128654 | ISBN-13: 9780139128653
2. Subtra Das, “Performance of home textiles”, Woodhead Publishing India Pvt.Ltd., 2010, ISBN: 0857090070 | ISBN-13: 9780857090072
3. Rowe T., “Interior Textiles Design and Developments”, Woodhead Publishing India Pvt.Ltd., 2009, ISBN: 1845693515 | ISBN-13: 9781845693510
4. Schindler W. D., and Hauser P. J., “Chemical finishing of textiles”, Woodhead Publishing, England, 2004, ISBN: 1855739054 | ISBN-13: 97
5. Jay Diamond and Ellen Diamond , "Fashion Apparel, Accessories and Home Furnishings", Prentice Hall, New Delhi, 2007.
6. Katrin Cargill , "Simple Curtains", Ryland Peters and Small, London, 2002.
7. Wendy Baker , "Curtain and Fabric Selector", Collins and Brown, London,2000.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	3	3	-	-	2	-	-	-	-	1	2	1	2
2	2	2	3	3	-	-	2	-	-	-	-	1	2	1	2
3	2	2	3	3	-	-	2	-	-	-	-	1	2	1	2
4	2	2	3	3	-	-	2	-	-	-	-	1	2	1	2
5	2	2	3	3	-	-	2	-	-	-	-	1	2	1	2
Overall CO	2	2	3	3	-	-	2	-	-	-	-	1	2	1	2

TT23032	CLOTHING COMFORT	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students to learn about the

- Important characteristics of the fabric responsible for its comfort properties and
- Different phenomena which take place in the fabric related to the comfort propertiesof the fabric

UNIT I **9**

Comfort – types and definition; human clothing system, comfort perception and preferences

UNIT II **9**

Psychological comfort; neuro-physiological comfort-basis of sensory perceptions; measurement techniques - mechanical stimuli and thermal stimuli

UNIT III **9**

Thermo physiological comfort – thermoregulatory mechanisms of the human body, role of clothing on thermal regulations

UNIT IV **9**

Heat and moisture transfer — moisture exchange, wearer's temperature regulations,effect of physical properties of fibres, behaviour of different types of fabrics; fabrics for extreme climatic conditions

UNIT V **9**

Fabric tactile and mechanical properties - fabric prickliness, itchiness, stiffness, softness, smoothness, roughness, and scratchiness; predictability of clothing comfort performance

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to learn

CO1: Criteria for comfort of fabrics
CO2: Psychological and physiological comfort with respect to clothing
CO3: Thermo physiological comfort requirements of human and the role of clothing
CO4: The behavior of different fabric in relation to heat and moisture transfer
CO5: The low stress mechanical properties of fabric with respect to comfort to thewearer

TEXTBOOKS

1. Hassan M. Behery., "Effect of Mechanical and Physical Properties on Fabric Hand",Wood head Publishing Ltd.,2005, ISBN: 1855739186 | ISBN-13: 9781855739185
2. Li Y., "The Science of Clothing Comfort", Textile Progress 31:1-2, Taylor and Francis,UK, 2001, ISBN: 1870372247 | ISBN-13: 9781870372244

REFERENCES

1. Laing R.M., and Sleivert G.G., "Clothing, Textile and Human Performance" Textile Progress 32:2, The Textile Institute, 2002, ISBN: 1870372514 | ISBN-13: 9781870372510.

2. ApurbaDas.,andAlagirusamy R., “Science in clothing comfort”, Wood head PublishingIndia Pvt. Ltd., India, 2010, ISBN: 1845697898 | ISBN-13: 9781845697891
3. Guowen Song., “Improving comfort in clothing”, Wood head Publishing Ltd., UK, 2011, ISBN: 1845695399 | ISBN-13: 9781845695392
4. Ukponmwan J.O., “The Thermal-insulation Properties of Fabrics”, Textile Progress 24:4, 1-54, Taylor and Francis, UK, 1993, ISBN: 1870812654 | ISBN-13: 9781870812658

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	2	1	1	1	1	1	2	2	2	1	3
2	2	2	2	2	2	2	2	2	1	1	2	2	3	2	3
3	2	2	2	2	2	2	2	2	1	1	2	2	3	2	3
4	2	2	2	2	2	2	2	2	1	1	2	2	3	2	3
5	2	2	2	2	2	2	2	2	1	1	2	2	3	2	3
Overall CO	2	2	2	2	2	1.8	1.8	1.8	1	1	2	2	2.8	1.8	3

VERTICAL VI
TEXTILE AND APPAREL MANAGEMENT

TT23C10 STATISTICS FOR TEXTILE INDUSTRY

L	T	P	C
2	1	0	3

OBJECTIVES

To make the students to learn about the

- Probability distributions, sampling and testing of hypothesis
- Process control using charts and process capability
- Design of experiments for textile applications and
- Modeling the probabilistic phenomena

UNIT I BASIC STATISTICS 6

Frequency distribution and histogram; probability density curves; measures of central tendency – mean, median and mode; measures of dispersion – range, mean deviation about mean, mean deviation about median, variance and standard deviation; coefficient of variation

UNIT II DISCRETE DISTRIBUTION 6

Basic terminologies; probability distribution and it application to textile industry – binomial, Poisson, control charts for discrete variables

UNIT III CONTINUOUS DISTRIBUTION 6

Normal, exponential, chi-square, t-distribution, F-distribution; point and interval estimation; hypothesis testing; control charts for continuous variables

UNIT IV ANALYSIS OF VARIANCE AND NON-PARAMETRIC TEST 6

One-way and two-way analysis of variance; non-parametric tests - sign test, rank test, concordance test; process capability analysis

UNIT V REGRESSION, CORRELATION AND DOE 6

Simple linear regression, correlation analysis, rank correlation, Test of significance of regression coefficients; basic principles and applications of Design of Experiments

TUTORIAL 15 PERIODS

Solving the problems using spread sheet

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1 comprehend about basic calculations in statistics
CO2 analyse the problems in discrete distribution
CO3 analyse the problems in continuous distribution
CO4 analyse the variance in data and carry out non parametric test
CO5 design the experiments based on design models available and analyse them

TEXT BOOKS

1. Montgomery D.C., “Introduction to Statistical Quality Control”, John Wiley and Sons, Inc., Singapore, 2002, ISBN: 997151351X.
2. Leaf G.A.V., “Practical Statistics for the Textile Industry, Part I and II”, The Textile Institute, Manchester, 1984, ISBN: 0900739517.

REFERENCES

1. Douglas C. Montgomery, “Design and analysis of experiments”, John Wiley & Sons, Inc., Singapore, 2000, ISBN 9971 51 329 3
2. Ronald D. Moen, Thomas W. Nolan, Lloyd P. Provost, “Quality improvement through experimentation’, McGraw-Hill, 1998, ISBN 0-07-913781-4

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	3	3	-	-	-	-	2	2	2	3	1	3
2	3	3	3	3	3	-	-	-	-	2	2	2	3	1	3
3	3	3	3	3	3	-	-	-	-	2	2	2	3	1	3
4	3	3	3	3	3	-	-	-	-	2	2	2	3	1	3
5	3	3	3	3	3	-	-	-	-	2	2	2	3	1	3
Overall CO	3	3	3	3	3	-	-	-	-	2	2	2	3	1	3

TT23033	ENERGY MANAGEMENT IN TEXTILE INDUSTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to learn about energy management in textile industry

UNIT I GENERAL ASPECTS OF ENERGY 9

Commercial and Non-commercial energy - final energy consumption - energy needs of growing economy - energy pricing - energy conservation and its importance - Re-structuring of the energy supply sector - Energy Conservation Act 2001, Energy Conservation (Amendment) Act, 2010, and its features - electricity tariff - Thermal Basics - need and types of energy audit - Energy management/audit approach- understanding energy costs - maximizing system efficiencies - optimizing the input energy requirements - energy audit instruments - Case study with Textile Industries.

UNIT II ENERGY EFFICIENCY IN ELECTRICAL UTILITIES 9

Electrical load management and maximum demand control - power factor improvement and its benefit - selection and location of capacitors - performance assessment of PF capacitors - automatic power factor controllers - transformer losses - Electric motors: Types - losses in induction motors - motor efficiency - factors affecting motor performance - rewinding and motor replacement issues - energy saving opportunities with energy efficient motors - soft starters with energy saver - variable speed drives – Fans and blowers: Types - efficient system operation - flow control strategies -Pumps and Pumping System: Types - system operation - flow control methods - Lighting System: Light source, choice of lighting, luminance requirements – ballast - occupancy sensors - energy efficient lighting controls - energy conservation avenues - Case Study with Textile Industries.

UNIT III ENERGY EFFICIENCY IN THERMAL UTILITIES 9

Introduction to fuels - properties of fuel oil, coal and gas - principles of combustion - combustion of oil, coal and gas - Boilers: Types, combustion in boilers, performances evaluation, analysis of losses - energy conservation opportunities - FBC boilers - Steam System: Properties of steam, assessment of steam distribution losses, steam leakages, steam trapping, condensate and flash steam recovery system, identifying opportunities for energy savings - Furnaces: Classification, general fuel economy measures in furnaces, excess air, heat distribution, temperature control, draft control, waste heat recovery – Refractory : types, selection and application of refractories, heat loss - Cogeneration: classification and saving potentials - Case Study in Textile Industries

UNIT IV ENERGY MANAGEMENT 9

Methods for preparing process flow - material and energy balance diagrams - Energy policy purpose - location of energy management - roles and responsibilities of energy manager – employees training and planning- Financial Management: financial analysis techniques, simple payback period, return on investment, net present value, internal rate of return – Case Study.

UNIT V ENERGY AND ENVIRONMENT 9

Greenhouse effect and the carbon cycle - current evidence and future effects of climate change - Global Environmental Concerns-United Nations Frame work Convention on Climate Change(UNFCC), Kyoto Protocol, Conference of Parties(COP), Emissions trading(ET), Joint

implementation(JI), Clean Development Mechanism (CDM), Proto type Carbon Fund(PCF), Sustainable Development

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: Comprehend the general features of energy and analyse its importance in textile industry

CO2: Recognize about energy efficiency of various electrical utilities

CO3: Differentiate energy efficiency in thermal utilities in comparison to other industries and analyse its importance in various verticals of textile industry

CO4: Explain about the importance of energy management

CO5: Analyse effect of energy in global environment

TEXTBOOKS

1. Energy Manager Training Manual (4Volumes) available at http://www.em-ea.org/gbook1.asp, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India.2004.
2. L.C. Witte, P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ,Washington,1988.

REFERENCES

1. W.C.Turner, “Energy Management Hand book”Wiley,NewYork,1982
2. W.R.Murphy and G.McKay “Energy Management” Butter worths, London 1987 5. Eastop.T.D & Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, ISBN-0-582-03184, 1990.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	-	-	3	3	2	-	-	2	2	2	2	1
2	2	2	2	-	-	3	3	2	-	-	2	2	2	2	1
3	2	2	2	-	-	3	3	2	-	-	2	2	2	2	1
4	2	2	2	-	-	3	3	2	-	-	2	2	2	2	1
5	2	2	2	-	-	3	3	2	-	-	2	2	2	2	1
Overall CO	2	2	2	-	-	3	3	2	-	-	2	2	2	2	1

TT23C07 OPERATIONS RESEARCH FOR TEXTILE INDUSTRY

L	T	P	C
3	0	0	3

OBJECTIVES:

To enable the students to learn

- Expressing of problems arising in the textile industry in appropriate Operations Research formats
- Methods of solving such Operations Research problems

UNIT I LINEAR PROGRAMMING PROBLEMS 9

Linear programming problem – construction, solution by graphical method, Simplex method and its extension by the Big M method; sensitivity analysis; integer programming-introduction; application of the LP technique in textile industry

UNIT II TRANSPORTATION PROBLEMS 9

Transportation problem – construction; initial basic feasible solution – North West Corner rule, lowest cost entry method, Vogel's Approximation Method; optimality test – modified distribution method, stepping stone method; transhipment problem; application in textile industry

UNIT III ASSIGNMENT AND SEQUENCING PROBLEMS 9

The Assignment problem – construction, solution by Hungarian, graphical method; sequencing problems; replacement analysis; application in the textile industry

UNIT IV DECISION, QUEUING THEORY 9

Decisions theory-decisions under assumed certainty, decision under risk, decision under uncertainty, illustrations from textile industry; queuing theory- ; inventory control-EOQ models-deterministic models – probabilistic models

UNIT V PROJECT SCHEDULING 9

Project planning and control models: CPM, PERT – network representation, determining critical path, project duration; crashing of project duration; resource levelling

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students can

CO1: Design linear programming problems from the cases arising in the textile industry and solve the linear programming problems by different methods
CO2: Construct, solve transportation and transhipment problems and interpret results
CO3: Construct and solve assignment, sequencing problems; execute replacement analysis
CO4: Explain and execute decision making under different conditions; relate queuing and inventory control models with textile industry
CO5: Construct and solve project scheduling by PERT and CPM techniques and interpret the results

TEXT BOOKS

1. Hamdy A. Taha., "Operations Research - An Introduction", Prentice Hall, 9th Edition, 2010.

2. Panneerselvam R., “Operations Research”, Prentice-Hall of India Pvt. Ltd., 2nd Edition, 2004

REFERENCES

1. Tulsian P.C., “Quantitative Techniques Theory and Problems”, Dorling Kindersley (India) Pvt. Ltd., 2006
2. Ronald L. and Rardin, “Optimization in Operations Research”, Pearson Education, 1998
3. Srivastava U.K., Shenoy G.V. and Sharma S.C., “Quantitative Techniques for Managerial Decisions”, Second Ed., New Age International (P) Ltd., 2007
4. Gupta P.K. and Hira D.S., “Problems in Operations Research”, 3rd Ed., S.Chand&Company, 2013
5. Mustafi C.K.,“Operations Research: Methods and Practice”, 5thEdition, New Age International (P) Ltd., 2012
6. Sharma J. K., “Operations Research: Theory and Applications”, 5th Ed., Laxmi Publication, New Delhi, 2013

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	2	-	3	-	-	1	2	1	2	-	-	1	-
2	-	-	2	-	3	-	-	1	2	1	2	-	-	1	-
3	-	-	2	-	3	-	-	1	2	1	2	-	-	1	-
4	-	-	2	-	3	-	-	1	2	1	2	-	-	1	-
5	-	-	2	-	3	-	-	1	2	1	2	-	-	1	-
Overall CO	-	-	2	-	3	-	-	1	2	1	2	-	-	1	-

TT23034	TEXTILE COSTING	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To enable the students to learn costing of yarn, fabric and garments

UNIT I COSTING OF YARN – MATERIAL AND LABOUR COST 6

Costing of yarn – estimation of direct material cost; labour cost, allocation to yarns

UNIT II COSTING OF YARN – POWER AND OTHER COSTS 6

Estimation of power cost; allocation of overhead costs

UNIT III COSTING OF FABRIC 6

Grey fabric costing – woven and knitted; estimation of material, labour, power cost; allocation of overhead costs

UNIT IV COSTING OF CHEMICAL PROCESSING 6

Preparatory, dyeing, printing and finishing cost estimation; material, labour and energy cost estimation; allocation of overhead costs

UNIT V COSTING OF GARMENTS 6

Costing of garment – accounting of prime costs and overhead costs, allocation of overhead costs; tax structure

TUTORIAL 15 PERIODS

Solving the problems using computer spread sheet

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students can
CO1 Execute costing of yarn by estimating material and labour cost
CO2 Estimate power cost and allocate the overhead cost to different sorts of yarns produced
CO3 Determine the cost of preparatory and production of woven and knitted fabrics
CO4 Estimate the cost of chemical processing of textile fabrics
CO5 Execute costing of garments

TEXTBOOKS

1. Kantwala D.N., “Costing and Cost Control –Marginal Approach for Textile Industry”, Texcons, Bombay, 1977.
2. “How to Arrive at Wages Cost Count-Wise from HOK”, SITRA Publications, 1991

REFERENCES

1. BhaveB.V.,andSrinivasanv.,“Cost accountingtotextilemills”,ATIRA,Ahmadabad,1974
2. James C., and Van Home., “Financial Management and Policy”, Prentice Hall of India Pvt. Ltd, New Delhi,2001

3. Thukaram Rao M.E., “Cost and Management Accounting”, New Age International, Bangalore, 2004

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	1	-	2	1	-	2	2	-	2	-	-	2	-
2	-	-	1	-	2	1	-	2	2	-	2	-	-	2	-
3	-	-	1	-	3	1	-	2	2	-	2	-	-	2	-
4	-	-	1	-	2	2	-	2	2	-	2	2	-	2	-
5	-	-	1	-	2	-	-	2	2	-	2	-	-	2	-
Overall CO	-	-	1	-	2.2	1.2	-	2	2	-	2	2	-	2	-

AT23C03 LOGISTICS AND SUPPLY CHAIN MANAGEMENT FOR APPAREL INDUSTRY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide an insight on the fundamentals of supply chain networks, tools and techniques.

UNIT I INTRODUCTION **9**

Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain–Decision Phases in Supply Chain - Competitive and Supply chain Strategies–Drivers of Supply Chain Performance and Obstacles

UNIT II SUPPLY CHAIN NETWORK DESIGN **9**

Role of Distribution in Supply Chain–Factors influencing Distribution network design–Design options for Distribution; Network Distribution Network in Practice-Role of network Design in Supply Chain–Framework for network Decisions

UNIT III LOGISTICS IN SUPPLY CHAIN **9**

Role of transportation in supply chain–factors affecting transportations decision–Design option for transportation network–Tailored transportation – Routing and scheduling in transportation.

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN **9**

Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration, sourcing planning and analysis-supply chain co-ordination-Bull whip effect–Effect of lack of coordination in supply chain and obstacles–Building strategic partnerships and trust within a supply chain

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY **9**

The role IT in supply chain-The supply chain IT frame work Customer Relationship Management–Internal supply chain management–supplier relationship management–future of IT in supply chain–E-Business in supply chain.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of this course, the student would be able to

CO1: Gain knowledge on basics of Supply chain Management
CO2: Understand the framework and scope of supply chain networks and functions
CO3: Understand the importance of logistics in supply chain
CO4: Acquire skills on sourcing and coordination in supply chain
CO5: Comprehend the knowledge on role of information technology in supply chain

TEXT BOOKS:

1. Sunil Chopra, Peter Meindl and Kalra, “Supply Chain Management, Strategy, Planning, and operation”, Pearson Education, 2010.

2. David Simchi-Levi., Philip Kaminsky., and Edith Simchi-Levi., “Designing and Managing the Supply Chain: Concepts, Strategies, and Cases”, 3rd Edition, Tata McGraw-Hill, 2012,ISBN: 0073341525 / ISBN: 978-0073341521

REFERENCES:

1. Ronald H. Ballou, Samir K. Srivastava, " Buisness Logistics/ Supply chain management", Pearson Education, 2007
2. David J.Bloomberg , Stephen Lemay and Joe B.Hanna, "Logistics", PHI 2002.
3. James B.Ayers, "Handbook of Supply chain management", St.Lucle press, 2000.
4. Jeremy F.Shapiro, "Modeling the supply chain", Thomson Duxbury, 2002.
5. Srinivasan G.S, "Quantitative models in Operations and Supply Chain Management", PHI, 2010

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	3	2	3	3	2	2	2	3	2	2	3	2	3	2
2	2	3	2	3	3	2	2	2	3	2	2	3	2	3	2
3	2	3	2	3	3	2	2	2	3	2	2	3	2	3	2
4	2	3	2	3	3	2	2	2	3	2	2	3	2	3	2
5	2	3	2	3	3	2	2	2	3	2	2	3	2	3	2
Overall CO	2	3	2	3	3	2	2	2	3	2	2	3	2	3	2

TT23035 ENTREPRENEURSHIP IN APPAREL INDUSTRY

L	T	P	C
2	1	0	3

OBJECTIVES:

- To provide an understanding of the scope of entrepreneurship in apparel, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits

UNIT I ENTREPRENEURSHIP 6

Entrepreneur – types of entrepreneurs – difference between entrepreneur and intrapreneur – entrepreneurship in economic growth, factors affecting entrepreneurial growth

UNIT II MOTIVATION 6

Major motives influencing an entrepreneur – achievement motivation training, self rating, business game, thematic apperception test – stress management, entrepreneurship development programs – need, objectives

UNIT III BUSINESS 6

Small enterprises – definition, classification – characteristics, ownership structures – project formulation – steps involved in setting up a business – identifying, selecting a good business opportunity, market survey and research, techno economic feasibility assessment – preparation of preliminary project reports – project appraisal – sources of information – classification of needs and agencies

UNIT IV SUPPORT TO ENTREPRENEURS 6

Small business – problems and types, sickness, magnitude, causes and consequences, corrective measures; government policy for small scale enterprises, textile and apparel start-ups – business ideas, growth strategies, expansion, diversification, joint venture, merger and sub-contracting.

UNIT V BOUTIQUE MANAGEMENT 6

Boutique – definition, management skills required, identifying target market and customer, marketing; types of boutique; location and space management – infrastructure, fashion accessories, value addition and customization, customer relations and promotion; boutique operations – case study and project report.

TUTORIAL : 15 PERIODS

Preparation and presentation of group project

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

CO1: Understand the role and types of entrepreneurship

CO2: Narrate the motivation for entrepreneurs

CO3: Compile the processes involved in setting up a business

CO4: Critically analyse the financing and tax implications

CO5: Summarize the types of supports available for the entrepreneurs

TEXT BOOKS:

1. S.S.Khanka “Entrepreneurial Development” S.Chand& Co. Ltd. Ram Nagar New Delhi, 1999.
2. Kuratko& Hodgetts, “Enterprenuership – Theory, process and practices”, Thomson learning 6th edition.

REFERENCES:

1. Hisrich R D and Peters M P, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala,” Enterprenuership theory at cross roads: paradigms and praxis” Dream tech 2nd edition 2006.
3. Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi, 1998.
4. EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development” Institute of India, Ahmadabad, 1986.
5. Briana Stewart, (2014). How to Open a Boutique, The Simple Guide to Boutique Success, New York: Create Independent Publishing Platform. Print.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
2	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
3	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
4	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
5	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
Overall CO	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3

TT23036	PROJECT MANAGEMENT IN TEXTILE INDUSTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on project planning, scheduling, execution, monitoring and control

UNIT I INTRODUCTION TO PROJECT MANAGEMENT 9

Objectives of project management- importance of project management, types of projects; project life cycle and phases; project management processes

UNIT II PROJECT PLANNING 9

Project selection – techno economic feasibility study, case study from textiles; work breakdown structure (WBS), activity sequencing and net working – CPM, project time reduction with least cost; project schedule development

UNIT III PROJECT COST AND RISK MANAGEMENT 9

Cost estimation; developing budget, cost control and monitoring; quality planning and assurance; risk management process - risk identification, assessment, monitoring and control

UNIT IV PROJECT EXECUTION AND CONTROL 9

Stackholders identification, project team planning and coordination; resources planning and levelling; contracting, change control; project monitoring and control techniques

UNIT V PROJECT CLOSURE AND SPECIAL TOPICS 9

Audit scheduling, process auditing and deviation; project closure- types; process; post project audit; professional ethical practices; project management for textile industry – case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student can
CO1: Explain the types of projects, project management process and project life cycle.
CO2: Plan for execution of project and design the schedule
CO3: Estimate project cost and execute risk management.
CO4: Execute the project and take control measures
CO5: Execute project audit and apply ethical practices in project management

Text Books*:*

1. Project Management Institute A Guide to the Project Management Body of Knowledge PMBOK Guide (Sixth Edition), Sept 2017
2. James C.Van Horne, Fundamentals of Financial Management, Person Education 2004.

References:

1. Kuster J., Huber, E., Lippmann, R., Schmid, A., Schneider, E., Witschi, U., Wust, R. Project Management Handbook,2015
2. Khanna, R.B.,Project Management, PHI 2011.
3. Prasanna Chandra, Financial Management, Tata McGraw-Hill,2008.
4. By Carl S. Warren, James M. Reeve, Jonathan Duchac.Financial and Managerial Accounting,2016

5. PaneerSelvam, R., and Senthilkumar, P., Project Management, PHI, 2011.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	-	1	-	-	2	-	-	3	3	3	2	2	3	1
2	2	-	1	-	-	2	-	-	3	3	3	2	2	3	1
3	2	-	1	-	-	2	-	-	3	3	3	2	2	3	1
4	2	-	1	-	-	2	-	-	3	3	3	2	2	3	1
5	2	-	1	-	-	2	-	-	3	3	3	2	2	3	1
Overall CO	2	-	1	-	-	2	-	-	3	3	3	2	2	3	1

TT23037	INDSUTRY 4.0	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the basic concepts of technology involved in Industry 4.0
- To provide knowledge on the applications of the technologies on textile and apparel industry

UNIT I ARTIFICIAL INTELLIGENCE 9

Need, Goals and Design Principles, Technologies of Industry 4.0, Artificial Intelligence – Introduction, Predictive model, AI Environment. Societal influences of AI, Application of AI in textiles – yarn manufacturing, inspection of fabric patterns, color management, fabric grading, pattern making, supply chain management and merchandising

UNIT II INTERNET OF THINGS 9

Internet of Things (IoT) : Introduction to IoT, Architecture of IoT, Elements of IoT, Technologies for IoT, Developing IoT Applications, Security in IoT, Applications of IoT in textile manufacturing – weaving, knitting, dyeing & finishing, testing, non-woven, sewing

UNIT III MACHINE LEARNING 9

Introduction, Types of Machine Learning – Supervised, Unsupervised, Reinforcement Learning, Algorithms for Machine Learning, Problems solved by Machine Learning, Tools for Machine Learning, Application areas of Machine Learning in textile industry

UNIT IV ROBOTIC PROCESS AUTOMATION (RPA) 9

Introduction, Need for automation, programming constructs in RPA, Robots and Softbots, RPA architecture and process methodologies, Risks & Challenges with RPA. Applications of Robotics in Textile Industry – manufacturing, packing and inspection

UNIT V VIRTUAL REALITY AND AUGMENTED REALITY 9

Introduction to Digital design, Editing, design & modelling, lighting & rendering, character set-up and animation, Application – Garment Design and Simulation system, rendering textiles, marketing, merchandising

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of this course, the students shall be able to
CO1:comprehend the concepts and applications of Artificial intelligence
CO2: analyse the technology and impact of IoT on textile and apparel sector
CO3:.comprehend the concepts and impact of machine learning on textile and apparel industry
CO4: comprehend the technology and applications of Robotic Process Automation
CO5: design concepts using virtual reality and augmented reality of textile and apparels

Text Books

1. Pascal Volino and Nadia Magnenat-Thalmann, “Virtual Clothing: Theory and Practice”1st ed., Springer publications, 2000
2. Giancarlo Fortino and Antonio Liotta, Internet of Things, Technology, Communications and Computing, Springer publications, 2023
3. Charu C. Aggarwal, Artificial Intelligence**,** A Textbook, Springer Publications, 2021

References:

1. Diego Carou, Antonio Sartal and J. Paulo Davim, Machine Learning and Artificial Intelligence with Industrial Applications From Big Data to Small Data, Springer 2022
2. Kaliraj P, Devi T, Innovating with Augmented Reality: Applications in Education and Industry (P. Kaliraj, Ed.) (1st ed.). Auerbach Publications, 2021

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	2	2	3	-	-	-	-	2	2	2	2	1	2
2	2	2	2	2	3	-	-	-	-	2	2	2	2	1	2
3	2	2	2	2	3	-	-	-	-	2	2	2	2	1	2
4	2	2	2	2	3	-	-	-	-	2	2	2	2	1	2
5	2	2	2	2	3	-	-	-	-	2	2	2	2	1	2
Overall CO	2	2	2	2	3	-	-	-	-	2	2	2	2	1	2

TT23C13 **DIGITAL MARKETING AND E-BUSINESS**

L	T	P	C
3	0	0	3

OBJECTIVES

- To introduce the fashion online business and E-Marketing
- To acquaint the students with online enabling technologies

UNIT I DIGITAL SPACE AND SEO **9**

Online Market space- Digital Marketing Strategy- Components -Opportunities for building apparel and fashion brands; Website for apparel and fashion brands - Planning and Creation; Content Marketing; Search Engine optimization (SEO) – keyword strategy, SEO strategy, SEO success factors; Search Engine Marketing for apparel and fashion brands, website – promotion and visibility, digital advertisements

UNIT II E- MAIL MARKETING **9**

E- Mail Marketing for apparel and fashion brands- Types, Email Automation, Lead generation; integration of Email with Social Media and mobile - email campaign effectiveness and measurement; Mobile Marketing, Inventory/channels; Coupons and offers, Mobile Apps, Mobile based Commerce and campaigns for target customers

UNIT III SOCIAL MEDIA MARKETING **9**

Social Media Marketing for apparel and fashion brands - Social Media Channels- Leveraging Social media for apparel and fashion brand conversations and buzz; Social media campaigns - effectiveness and measurement; different types / methods of social media Marketing and its effectiveness;Engagement Marketing - Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNIT IV E-BUSINESS AND ITS APPLICATIONS **9**

E-business, e-business vs e-commerce,e-business models; e-business design, develop and manage; consumer oriented e-business – e-tailing and models, marketing on web, advertising, e-mail marketing, affiliated programs - e-CRM; online services, business oriented e-business, e-governance, EDI on the internet, delivery management system; web auctions.

UNIT V e-BUSINESS PAYMENTS AND LEGAL REQUIREMENTS **9**

E-payments - characteristics of payment of systems, protocols, e-cash, e-cheque and micro payment systems; payment systems security and protocols; e-business– legal requirements, ethical requirements, privacy issues, consumer protection, cyber laws,taxation and government policies.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of this course, the student would be able to

CO1: Outline of digital fashion marketing and features of E commerce technology

CO2: Understand E-commerce business and E marketing

CO3: Explain social media and digital marketing techniques

CO4: Explain strategic decisions using online technology

CO5: outline the importance of online marketing and E advertising

TEXT BOOKS:

1. P.T. Joseph , E-Commerce: An Indian Perspective, PHI Learning, 2015
2. Kenneth C. Laudon, Carol Guercio Traver, E-Commerce 2016: Business, Technology, Society, Pearson; 12 edition, 2016
3. Clare Harris, The Fundamentals of Digital Fashion Marketing, Bloomsbury Visual Arts, 2017 147
4. Harriet Posner, Marketing Fashion, Second edition: Strategy, Branding and Promotion, Laurence King Publishing; 2 edition, 2015

REFERENCES:

1. David Whiteley, E - Commerce: Strategy, Technologies and Applications, McGraw Hill Education, 2017
2. Henry Chan (Author), Raymond Lee (Author), Tharam Dillon (Author), Elizabeth Chang, ECommerce: Fundamentals and Applications, Wiley; 1 edition 2007
3. Wendy K. Bendoni , Social Media for Fashion Marketing: Storytelling in a Digital World, Bloomsbury Visual Arts, 2017
4. Mike Easey , Fashion Marketing, Wiley; 3rd Edition edition, 2009

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
2	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
3	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
4	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
5	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
Overall CO	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3

TT23038 ENTERPRISE RESOURCE PLANNING FOR APPAREL INDUSTRY

L T PC
0 0 6 3

OBJECTIVE

- To enable the students, understand about the Enterprise Resource Planning software and its modules

LIST OF EXPERIMENTS

Practice on data entry, report generation in Enterprise Resource Planning software

1. Costing, order booking, MRP, purchase, production planning, production orders, inventory control, packing, shipping, scheduling, sample preparation and approval, business reports
2. ERP in apparel production – time study, cutting, production tracking, cut panel process, garment quality control, order completion, machine repairs and maintenance, reports
3. ERP in retail management – style template, finished goods barcoding, stock taking, stock inward, retail order booking, stock allocation, scan and pack, dispatch, invoice, point of sale, reports

TOTAL: 90 PERIODS

COURSE OUTCOMES:

Upon the completion of this course the students shall be able to practically

CO1: Carryout data entry in ERP software
CO2: Execute order placement
CO3: Generate report using ERP software
CO4: Generate bill of materials report
CO5: Perform costing

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO2	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO3	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO4	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
CO5	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3
Overall CO	2	3	2	3	3	2	2	2	3	2	2	3	3	3	3

TT23C12	BUSINESS ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

To Learn

- the usage of business analytics for decision making
- how to apply the appropriate analytics and generate solutions
- the Model and analyse the business situation using analytics.

UNIT I INTRODUCTION TO BUSINESS ANALYTICS (BA) 9

Business Analytics - Terminologies, Process, Importance, Relationship with Organisational Decision Making, BA for Competitive Advantage.

UNIT II MANAGING RESOURCES FOR BUSINESS ANALYTICS 9

Managing BA personnel, data and technology. organisational structures aligning BA. managing information policy, data quality and change in BA.

UNIT III DESCRIPTIVE ANALYTICS 9

Introduction to descriptive analytics - visualising and exploring data - descriptive statistics - sampling and estimation - probability distribution for descriptive analytics - analysis of descriptive analytics

UNIT IV PREDICTIVE ANALYTICS 9

Introduction to predictive analytics - logic and data driven models - predictive analysis modeling and procedure - data mining for predictive analytics. analysis of predictive analytics

UNIT V PRESCRIPTIVE ANALYTICS 9

Introduction to prescriptive analytics - prescriptive modeling - non linear optimisation -demonstrating business performance improvement.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of this course the students shall be able to

1. to understand the role of business analytics in decision making
2. to identify the appropriate tool for the analytics scenario
3. to apply the descriptive analytics tools and generate solutions
4. understand of predictive analytics and applications
5. apply prescriptive analytics and demonstrating business process improvement

REFERENCES

1. Marc J. Schniederjans, Dara G. Schniederjans and Christopher M. Starkey, " Business Analytics Principles, Concepts, and Applications - What, Why, and How" , Pearson Ed, 2014
2. Christian Albright S and Wayne L. Winston, "Business Analytics - Data Analysis and Decision Making" , Fifth edition, Cengage Learning, 2015.
3. James R. Evans, "Business Analytics - Methods, Models and Decisions", Pearson Ed, 2012.

Course Articulation Matrix:

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	2	-	-	-	-	-	2	2	2	3	2	1
CO2	2	2	2	2	-	-	-	-	-	2	2	2	3	2	1
CO3	2	2	2	2	-	-	-	-	-	2	2	2	3	2	1
CO4	2	2	2	2	-	-	-	-	-	2	2	2	3	2	1
CO5	2	2	2	2	-	-	-	-	-	2	2	2	3	2	1
Overall CO	2	2	2	2	-	-	-	-	-	2	2	2	3	2	1

EMERGING TECHNOLOGY COURSES

TT23E01 WEB DESIGNING FOR TEXTILES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to learn about fascinating and appealing websites using computer programs and graphics for textile industry.

UNIT I INTRODUCTION TO WEB DESIGN 9

Difference between internet and web, concepts of web page address; anatomy of web page; fundamentals of web page design; dizzying multitude devices; responsive web design

UNIT II HTML MARKUP FOR STRUCTURE 9

Creating a simple page; marking up text; adding links, image, table markup, forms

UNIT III CASCADING STYLE SHEET ORIENTATION 9

Cascading style sheet orientation (CSS); forming text, colors background, thinking inside the box, floating and positioning, page layout with CSS; transitions, transforms, animations, and CSS techniques

UNIT IV JAVASCRIPT FOR BEHAVIORS 9

Basics of java script, adding java script to a page, the anatomy of a script, the browser object and events; use of java script -meet the (Document Object Model) DOM, polyfills, java script libraries

UNIT V WEB GRAPHICS 9

Basics of web graphics -image sources, formats, image size and resolution; introduction to (Scalable Vector Graphics) SVG; lean and mean web graphics-general image optimization strategies, optimizing GIFs, JPEGs, PNGs, optimize to file size

`TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of this course, the student would be able to

CO1 Comprehend the basics of web design

CO2 Visualize the fundamental concepts and elements of HTML

CO3 Recognize the theory of CSS, Java script and web graphics

CO4 Comprehend the fundamentals of Java script

CO5 Explain the theory of web graphics

TEXTBOOKS:

1. Jennifer Niederst Robbins, “Learning Web Design”, 4th Ed, 2012, ISBN: 978-1-449-1927-4
2. Steven M. Schafer, “HTML, XHTML, and CSS Bible”, 5th Ed, Wiley India

REFERENCES:

1. K. Arnold, J. Gosling and D. Holmes, The Java Programming Language, 3rd Ed, Addison Wesley, 2000.
2. P. Deitel and H. Deitel, Java - How to Program, 6th Ed, Prentice-Hall, 2005.

3. B. Breedlove, Web Programming Unleashed, Sams Net Publishing, 1996.
4. C. Musciano and B. Kennedy, HTML: The Definitive Guide, 2nd Ed, O'Reilly, May 1997.
5. D. Flanagan, Java in a Nutshell, O'Reilly, 1997 (also published by Shroff Publishers and Distributors Pvt. Ltd., Mumbai).

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	1	3	2	0	1	3	2	2	2	0	3	0
CO2	3	2	3	1	3	2	0	1	3	2	2	2	0	3	0
CO3	3	2	3	1	3	2	0	1	3	2	2	2	0	3	0
Overall CO	3	2	3	1	3	2	-	1	3	2	2	2	-	3	-

TT23E02 UX & UI DESIGNING FOR TEXTILES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the basic concepts of UX/UI designing
- To provide knowledge on the various tools and techniques used in developing the design

UNIT I UX/UI & DESIGN THINKING 9

Scope of UX/UI; Design Thinking - Empathize, Define, Ideate, Prototype, Test; UX Research & Research Data analysis; User research; basic types in user research - Primary Research, Secondary Research; Research Data Analysis; User Personas; Empathy & User Journey Mapping

UNIT II DESIGN STRATEGY & PROTOTYPING 9

Information Architecture; Story boarding; Sketching; Low fidelity wireframe Heuristics & Laws; Heuristics – definition, heuristic evaluation in project; UX Laws

UNIT III ADOBE PHOTOSHOP & ILLUSTRATOR 9

Photoshop - Layers; Colors & Adjustment Layers, Tools panel, Selections, Mastering pen tool, Maskings, Filters & Smart objects; Illustrator - Tool Panels, pen tool, Drawing in illustrator, Types & Fonts

UNIT IV FIGMA 9

Figma - Frames - Desktop & Mobile, color Palettes Solid & gradients , Pen Tool, Overview of Grids, Layers & Assets, Design & Prototypes, Effects & Exports, Components, Variants & Plugins, Frame interactions

UNIT V UI DESIGN 9

Understanding Layouts, Mobile & Web layouts, Visual Hierarchy, Iconography & Typography, Contrast, Colors & Color Palettes, Margin & Padding, High Fidelity prototype, Interaction design fundamentals; Usability Testing - A/B & Remote Usability Testing, Gorilla Testing, Heuristics Evaluation

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of this course, the students shall be able to
CO1:comprehend the concepts and tools of design thinking
CO2: analyse the strategy for developing the prototype
CO3:.comprehend the tools of illustrator and photoshop in designing
CO4: comprehend the tools of Figma in designing
CO5: understand the concepts of UI designing and usability testing

TEXTBOOKS:

1. Walter Brenner, Falk Uebernickel, Design Thinking for Innovation Research and Practice by Walter Brenner, Falk Uebernickel , Springer, 2016
2. Gavin Ambrose and Paul Harris, “Design Thinking”, AVA publishing, Singapore, 2010.
3. Russ Unger, Carolyn Chandler, “A Project Guide to UX Design: For User Experience Designers in the Field or in the Making”, New Riders, 2009

REFERENCES:

1. Tracy Jennings, “Creativity in Fashion Design – An Inspiration Workbook”, Fairchild books, Newyork, 2011.
2. Frédéric Darbellay, Zoe Moodyand Todd Lubart, Creativity, Design Thinking and Interdisciplinarity, Springer, 2017

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
2	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
3	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
4	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
5	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
Overall CO	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3

TT23E03 DIGITAL PRINTING

L	T	P	C
2	0	2	3

OBJECTIVES

To enable the students to learn the advances in the field of textile printing

UNIT I INTRODUCTION 6+8

Difference between conventional and digital printing; Ink systems; Importance of fabric pre-treatment-reactivity and substantivity; Pre-treatments and Post-treatments of various textiles for ink jet printing; Effect of pretreatments on print quality

PRACTICAL:

1. Pretreatment of cotton fabric
2. Pretreatment of polyester fabric

UNIT II PRINTING INK 6+14

Comparison of CMYK colors to Spot colors; Characteristics of pigment based ink-viscosity, surface tension; Aqueous ink - Organic solvents and surface energy of ink; Additives

PRACTICAL:

3. Printing of cotton and polyester using reactive and disperse dye ink
4. Determination surface tension of printing ink
5. Determination of viscosity of printing ink

UNIT III MECHANISM OF DIGITAL PRINTER 6

Ink printing techniques-Continuous ink jet printing, Drop on Demand; Piezoelectric inkjet and Thermal inkjet techniques; Various types of print head; Advantages and limitations of various printing technique

UNIT IV DIGITAL PRINTING OF TEXTILES 6

Dye-fibre interaction; Printing of textile using reactive, disperse, acid and direct dye inks; Digital printing of cationized cotton using reactive dye ink

UNIT V TESTING OF PRINTED TEXTILE 6+8

Test methods for pigmented textile ink-viscosity, surface tension, pH, particle size, total solids, regulatory and safety etc,; print quality and its measurement

PRACTICAL:

6. Assessment of sharpness of printed textile
7. Assessment of wash, rub, perspiration and light fastness behavior of printed textile

TOTAL: 30 PERIODS + 30 PERIODS

COURSE OUTCOMES

Upon completion of this course the student shall be able to

CO1: Comprehend about importance of pretreatment of textile for digital printing process

CO2: Distinguish characterestics of dye and pigment based ink

CO3 Describe about principle of digital printing

CO4: Comprehend about method of printing of various textiles using ink
CO5: Explain about various test methods for digital printed substrate

TEXTBOOKS

1. Miles L W C, “Textile Printing”, Society of Dyers and Colourists, Hobbs the Printers, Hampshire, UK, 2003.
2. Shenai V A, “Technology of Printing”, Sevak Publishers, Mumbai, 1990.

REFERENCES

1. Tyler D, “Textile Digital Printing Technologies”, Textile Institute Publication UK,Vol.37 No.4, 2005
2. Ujiie, “Digital Printing of Textiles”, CRC, Wood Head Publishing Ltd, UK, 2006.

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
2	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
3	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
4	3	3	3	2	-	1	2	2	-	-	-	2	3	1	3
5	3	3	3	3	-	1	2	2	-	-	-	2	3	1	3
Overall CO	3	3	3	3	-	1	2	2	-	-	-	2	3	1	3

TT23E04	3D WEAVING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the design, manufacture and quality aspects of 3D woven fabrics using various techniques and techniques to create complex geometrically shaped components

UNIT I INTRODUCTION 9

3D Weaving – introduction, need, differentiation between 2D and 3D weaving process; basic aspects of 3D fabric manufacturing; shedding systems in 3D weaving; basic requirements of 3D weaving process; applications of 3D woven structures

UNIT II ORTHOGONAL WEAVING 9

Weave structure; loom requirements; types of manufacturing – plate weaving method, conventional weaving loom; shape weaving methods – pleat weaving, tapered weaving, surface integration by weft, weaving of complex shapes; preform calculations

UNIT III ANGLE INTERLOCK WEAVING 9

Weave architecture basics, variants; fibre content calculations; combination of angle interlock and orthogonal weave architectures

UNIT IV DUAL PLANE SHEDDING BASED 3D WEAVING 9

Working principle; theoretical information governing machine design; yarn control; shedding; picking; beat-up; take-up; design and development of a prototype 3D weaving machine; weaving cycles; advantages

UNIT V QUALITY CONTROL ASPECTS FOR 3D WOVEN PREFORMS 9

Control parameters; notating 3D preforms; checking of weaving uniformity; data sheet and weave designs for different types of 3D woven preforms; case study on weaving a complex geometrically shaped component

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of this course, the students shall be able to

CO1: explain the fundamentals of 3D weaving

CO2: comprehend the design and manufacture 3D woven fabrics using orthogonal weaving

CO3:.explain the design and manufacture 3D woven fabrics using angle interlock weaving.

CO4: appraise the design and operate a dual plane shedding based 3D weaving machine

CO5: Inspect and control the quality of 3D woven preforms

TEXTBOOKS:

1. N. Gokarneshan a & R. Alagirusamy, “Weaving of 3D fabrics: A critical appreciation of the developments, Textile Progress, 2013
2. Bangalore Sridharan Sugun (Ed.), “Practical Approach to 3D weaving”, Springer publications, 2021

REFERENCES:

1. Xiaogang Chen (Ed.), “Advances in 3D textiles” Woodhead publishing series in textiles, 2015

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
2	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
3	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
4	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
5	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3
Overall CO	2	2	3	3	-	-	2	3	2	-	-	3	1	2	3

SKILL BASED COURSES

TT23S01 COMPUTER AIDED FABRIC DESIGNING

L	T	P	C
0	0	4	2

OBJECTIVES

To train the students in CAD used for designing of fabrics using Adobe Substance 3D software.

LIST OF EXPERIMENTS

1. Introduction to the interface and basic tools of Adobe Substance 3D
2. Basic Weave Creation
3. Repeatable Pattern Design – checks, stripes and other repeats
4. Texture Mapping on Fabrics
5. Texture Export and Integration: Demonstrate the process of exporting textures from Substance 3D for use in other 3D modeling and rendering software or virtual reality applications
6. Surface Variation - Experiment with creating different surface variations such as wrinkled fabric, embroidered textures using procedural techniques in Substance 3D.
7. Material Realism - Create realistic fabric materials that mimic specific physical properties like reflectivity, translucency, and surface roughness.
8. Color Variations and Dyeing - Explore the effects of dyeing on fabrics by modifying colors.
9. Custom Fabric Weaving - Digitally weave custom patterns and designs, experimenting with different weave structures (plain, twill, satin)
10. Designing fabric with various prints, embroidery and laces

TOTAL: 60 PERIODS

COURSE OUTCOMES

Upon completion of this course the student will be able to

CO1: Design fabrics with different textures and patterns fabrics using software

CO2: Design fabrics with surface variation and color variations

CO3: Design fabrics with various prints and embroidery

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	-	2	-	3	2	1	2	-	2	-	2	3	2	1
CO2	2	-	2	-	3	2	1	2	-	2	-	2	3	2	1
CO3	2	-	2	-	3	2	1	2	-	2	-	2	3	2	1
Overall CO	2	-	2	-	3	2	1	2	-	2	-	2	3	2	1

TT23S02	PROFESSIONAL DEVELOPMENT	L	T	P	C
		0	0	4	2

OBJECTIVES

To enable the students to

- Use Microsoft Office (Word, Excel, PowerPoint, Outlook) to create and manage files
- Work efficiently and collaborate using Microsoft Office tools

LIST OF EXPERIMENTS

1. Familiarize with the interfaces of Word, Excel, PowerPoint, and Outlook, and practice file management.
2. Create and format a Word document with various text and paragraph styles.
3. Create a worksheet in Excel and perform basic calculations.
4. Create and customize charts to visually represent data.
5. Design a PowerPoint presentation with text, images, and multimedia.
6. Create a professional presentation using templates and themes.
7. Practice managing emails and scheduling events using Outlook.
8. Utilize advanced formatting techniques to enhance a Word document.
9. Analyze data using pivot tables.
10. Learn to integrate and share data across Word, Excel, PowerPoint, and Outlook.

COURSE OUTCOMES

Upon completion of this course, the student would be able to

CO1: use Microsoft Office applications (Word, Excel, PowerPoint, and Outlook) to create, edit, and manage documents, data, and presentations.

CO2: integrate Microsoft Office applications, apply advanced techniques, and troubleshoot common issues to enhance productivity and collaboration.

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	3	-	2	-	2	3	3	3	2	1	2
CO2	2	2	3	3	3	-	2	-	2	3	3	3	2	1	2
Overall	2	2	3	3	3	-	2	-	2	3	3	3	2	1	2

TT23S03 **FASHION PHOTOGRAPHY**

L	T	P	C
0	0	4	2

OBJECTIVES

Upon completion of this course, students will be able to master the technical skills, creative vision, and knowledge required to produce high-quality fashion photographs

LIST OF EXPERIMENTS

1.Introduction to camera settings and functions
2. Experiment with the effects of depth of field and focal length on the rendering of the human face.
3. Experiment with different light sources of direct sun, open shade and available artificial light sources
4. Experiment with distance and amplitude
5. Experiment with light modifiers
6. Introduction to software tools and processing RAW files
7. Experiment with colour corrections for proper skin tone
8. Experiment with colour corrections for accurate garment or object reproduction
9. Experiment with retouch methods for skin, eyes, and clothing
10. Create a mood board by choosing appropriate models, makeup, locations, styling and wardrobe concepts for studio shooting
11. Create a mood board by choosing appropriate models, makeup, locations, styling and wardrobe concepts for outdoor shooting

TOTAL: 60 PERIODS

COURSE OUTCOMES

Upon completion of this course, the student would be able to
CO1: comprehend the different settings and requirements for photography
CO2: develop a fashion photography portfolio by using proper tools and methods

Course Articulation Matrix:

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	-	-	2	-	2	-	-	3	2	1	2
CO2	2	2	3	3	-	-	2	-	2	-	-	3	2	1	2
Overall CO	2	2	3	3	-	-	2	-	2	-	-	3	2	1	2

TT23S04 SURFACE ORNAMENTATION OF APPARELS

L	T	P	C
0	0	4	2

COURSE OBJECTIVE

- To enable the students to develop different structures and textures using value addition techniques

List of Experiments

1. Theme based conceptualization, illustration, rendering of apparel and accessory for product development.
2. Surface value addition technique: prints, embroidery and painting technique from regional arts of India.
3. Structure and texture development and its application for designing apparel: Patch work, applique work, cutwork, drawn thread work, bead work, mirror work and metal work.
4. Structure development for apparel: smocking, quilting, macrame, crochet.
5. Dyeing techniques - tie and dye, batik.
6. Decorative Effects – tassels, fringes and pompom

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: identify the theme and render the different accessories based on the theme

CO2: Experiment the surface value addition technique

CO3: Design and develop structure and texture for designing apparel using different techniques

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	-	-	2	-	2	-	-	3	2	3	2
CO2	2	2	3	3	-	-	2	-	2	-	-	3	2	3	2
CO3	-	-	2	2	-	-	2	-	2	-	-	2	2	2	2
Overall CO	2	2	2.6	2.6	-	-	2	-	2	-	-	2.6	2	2.6	2

TT23S05 COMPOSITE MAKING AND TESTING

L	T	P	C
0	0	4	2

OBJECTIVES:

To enable the students to develop and characterize composite laminates using various fabrication techniques and evaluate their mechanical properties and they also understand the designing and manufacturing of moulds using prepreg materials to produce complex composite shapes

LIST OF EXPERIMENTS

1. Fabricate a simple composite laminate using hand layup technique
2. Fabricate a simple composite laminate using vacuum bagging technique
3. Fabricate a simple composite laminate using compression moulding technique
4. Study on the tensile strength of the developed composites and analyse the failure modes
5. Study on the flexural strength of the developed composites using three point bending test
6. Study on the impact strength testing of the composites
7. To identify the fibre volume fraction of the composites
8. Designing and Manufacturing moulds using prepreg materials

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: fabricate composites using hand layup, vacuum bagging, and compression moulding techniques.

CO2: evaluate and analyze the mechanical properties of composites, including tensile strength, flexural strength, and impact strength.

CO3: design and manufacture moulds using prepreg materials to produce complex composite shapes, and apply their knowledge to real-world engineering applications.

Course Articulation Matrix

Course Outcomes	Program Outcome														
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	3	2	-	-	2	-	2	-	-	3	2	3	2
CO2	2	2	3	2	-	-	2	-	2	-	-	3	2	3	2
CO3	2	2	2	2	-	-	2	-	2	-	-	3	2	3	2
Overall CO	2	2	2.6	2	-	-	2	-	2	-	-	3	2	3	2

TT23S06 REPURPOSING OF TEXTILE MATERIALS

L	T	P	C
0	0	4	2

OBJECTIVES:

To enable the students to apply creative reuse techniques to transform old clothing and repurposed materials into innovative textile products, including accessories, composites, and interior design elements

LIST OF EXPERIMENTS

1. Design and develop new accessories from used clothes using creative reuse techniques.
    a. trims
    b. bags
    c. scarves
    d. fashion accessories
2. Develop textile composites from repurposed materials, enhancing performance.
3. Design and develop home textile products
    a. Pillow covers
    b. Wall hangings
    c. Mittens
    d. Floor mat

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the student shall be able to

CO1: design and develop unique and creative accessories, such as trims, bags, scarves, and fashion accessories, demonstrating expertise in creative reuse techniques from used clothes..

CO2: develop composite from the used clothes

CO3: design and develop creative home textile based products

Course Articulation Matrix:

Course Outcomes	Program Outcome														
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	3	3	-	-	2	-	2	-	-	3	2	3	2
CO2	2	2	3	3	-	-	2	-	2	-	-	3	2	3	2
CO3	-	-	3	3	-	-	2	-	2	-	-	3	2	3	2
Overall CO	2	2	3	3	-	-	2	-	2	-	-	3	2	3	2

OPEN ELECTIVE

TT23901 BASICS OF TEXTILE TECHNOLOGY

L	T	P	C
3	0	0	3

OBJECTIVES:

To enable the students to learn about the basics of fibre forming, yarn production, fabric formation, coloration of fabrics and garment manufacturing

UNIT I NATURAL FIBRES 9

Introduction: Definition of staple fibre, filament; Classification of natural and man-made fibres, essential and desirable properties of fibres. Production and cultivation of Natural Fibers: Cultivation of cotton, production of silk (sericulture), wool and jute – physical and chemical structure of these fibres

UNIT II REGENERATED AND SYNTHETIC FIBRES 9

Production sequence of regenerated and modified cellulosic fibres: viscose rayon, Acetate Rayon, high wet modulus and high tenacity fibres; synthetic fibres – chemical structure, fibre forming polymers, production principles.

UNIT III BASICS OF SPINNING 9

Spinning – principle of yarn formation, sequence of machines for yarn production with short staple fibres and blends, principles of opening and cleaning machines; yarn numbering – calculations

UNIT IV BASICS OF WEAVING 9

Woven fabric – warp, weft, weaving, path of warp; looms – classification, handloom and its parts, powerloom, automatic looms, shuttleless looms, special type of looms; preparatory machines for weaving process and their objectives; basic weaving mechanism - primary, secondary and auxiliary mechanisms

UNIT V BASICS OF KNITTING AND NONWOVEN 9

Knitting – classification, principle, types of fabrics; nonwoven process –classification, principle, types of fabrics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of this course, the students shall be able to

CO 1: Understand the classification, properties, and production methods of staple and filament natural fibres such as cotton, silk, wool, and jute.

CO 2: Comprehend the production processes and chemical structures of regenerated and synthetic fibres including viscose rayon, acetate rayon, and various synthetic polymers.

CO 3: Demonstrate knowledge of yarn formation principles, spinning machinery, and yarn numbering calculations for short staple fibres and blends.

CO 4: Identify the components and mechanisms of woven fabric production, including the operation of different types of looms and preparatory machines.

CO 5: Recognize the principles, classifications, and fabric types in knitting and nonwoven processes.

TEXTBOOKS:

1. Mishra S. P. , “A Text Book of Fibre Science and Technology”, New Age Publishers, 2000, ISBN: 8122412505 2.
2. Marks R., and Robinson. T.C., “Principles of Weaving”, The Textile Institute, Manchester, 1989, ISBN: 0 900739 258.
3. Spencer D.J., “Knitting Technology”, III Ed., Textile Institute, Manchester, 2001, ISBN: 185573 333 1.

REFERENCES:

1. Hornberer M., Eberle H., Kilgus R., Ring W. and Hermeling H., “Clothing Technology: From Fibre to Fabric”, Europa LehrmittelVerlag, 2008, ISBN: 3808562250 / ISBN: 978-3808562253.
2. Wynne A., “Motivate Series-Textiles”, Maxmillan Publications, London, 1997.
3. Carr H. and Latham B., “The Technology of Clothing Manufacture” Backwell Science, U.K., 1994, ISBN: 0632037482 / ISBN:13: 9780632037483.
4. Klein W., “The Rieter Manual of Spinning, Vol.1”, Rieter Machine Works Ltd., Winterthur, 2014, ISBN 10 3- 9523173-1-4 / ISBN 13 978-3-9523173-1-0.
5. Klein W., “The Rieter Manual of Spinning, Vol.2”, Rieter Machine Works Ltd., Winterthur, 2014, ISBN 10 3-9523173-2-2 / ISBN 13 978-3-9523173-2-7. 5. Klein W., “The Rieter Manual of Spinning, Vol.1-3”, Rieter Machine Works Ltd., Winterthur, 2014, ISBN 10 3-9523173-3-0 / ISBN 13 978-3-9523173-3-4.
6. Talukdar. M.K., Sriramulu. P.K., and Ajgaonkar. D.B., “Weaving: Machines, Mechanisms, Management”, Mahajan Publishers, Ahmedabad, 1998, ISBN: 81- 85401-16-0.
7. Morton W. E., and Hearle J. W. S., “Physical Properties of Textile Fibres”, The Textile Institute, Washington D.C., 2008, ISBN 978-1-84569-220-95
8. Gohl E. P. G., “Textile Science”, CBS Publishers and distributors, 1987, ISBN 0582685958

Course Articulation Matrix:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	-	-	-	-	-	-	-	2	1	-	1	1	-	1	-
2	-	-	-	-	-	-	-	2	1	-	1	1	-	1	-
3	-	-	-	-	-	-	-	2	1	-	1	1	-	1	-
4	-	-	-	-	-	-	-	2	1	-	1	1	-	1	-
5	-	-	-	-	-	-	-	2	1	-	1	1	-	1	-
Overall CO	-	-	-	-	-	-	-	2	1	-	1	1	-	1	-

TT23E05 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FUNDAMENTALS

L T P C
2 0 2 3

OBJECTIVES:

The main objectives of this course are to:

1. Understand the importance, principles, and search methods of AI
2. Provide knowledge on predicate logic and Prolog.
3. Introduce machine learning fundamentals
4. Study of supervised learning algorithms.
5. Study about unsupervised learning algorithms.

UNIT I INTELLIGENT AGENT AND UNINFORMED SEARCH 6

Introduction - Foundations of AI - History of AI - The state of the art - Risks and Benefits of AI - **Intelligent Agents** - Nature of Environment - Structure of Agent - Problem Solving Agents - Formulating Problems - **Uninformed Search** - Breadth First Search - Dijkstra's algorithm or uniform-cost search - Depth First Search - Depth Limited Search

UNIT II PROBLEM SOLVING WITH SEARCH TECHNIQUES 6

Informed Search - Greedy Best First - A* algorithm - Adversarial Game and Search - **Game theory** - Optimal decisions in game - Min Max Search algorithm - Alpha-beta pruning - **Constraint Satisfaction Problems (CSP)** - Examples - Map Coloring - Job Scheduling - Backtracking Search for CSP

UNIT III LEARNING 6

Machine Learning: Definitions – Classification - Regression - approaches of machine learning models - Types of learning - Probability - Basics - Linear Algebra – Hypothesis space and inductive bias, Evaluation. Training and test sets, cross validation, Concept of over fitting, under fitting, Bias and Variance - **Regression**: Linear Regression - Logistic Regression

UNIT IV SUPERVISED LEARNING 6

Neural Network: Introduction, Perceptron Networks – Adaline - Back propagation networks - **Decision Tree:** Entropy – Information gain - Gini Impurity - classification algorithm - Rule based Classification - **Naïve Bayesian classification** - **Support Vector Machines** (SVM)

UNIT V UNSUPERVISED LEARNING 6

Unsupervised Learning – Principle Component Analysis - **Neural Network**: Fixed Weight Competitive Nets - Kohonen Self-Organizing Feature Maps – **Clustering**: Definition - Types of Clustering – Hierarchical clustering algorithms – k-means algorithm

TOTAL : 30 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

Programs for Problem solving with Search

1. Implement breadth first search
2. Implement depth first search
3. Analysis of breadth first and depth first search in terms of time and space
4. Implement and compare Greedy and A* algorithms.

Supervised learning

5. Implement the non-parametric locally weighted regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

6. Write a program to demonstrate the working of the decision tree based algorithm.
7. Build an artificial neural network by implementing the back propagation algorithm and test the same using appropriate data sets.
8. Write a program to implement the naïve Bayesian classifier.

Unsupervised learning

9. Implementing neural network using self-organizing maps
10. Implementing k-Means algorithm to cluster a set of data.
11. Implementing hierarchical clustering algorithm.

Note:

- Installation of gnu-prolog, Study of Prolog (gnu-prolog).
- The programs can be implemented in using C++/JAVA/ Python or appropriate tools can be used by designing good user interface
- Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

OUTCOMES:

CO1: Understand the foundations of AI and the structure of Intelligent Agents
CO2: Use appropriate search algorithms for any AI problem
CO3: Study of learning methods
CO4: Solving problem using Supervised learning
CO5: Solving problem using Unsupervised learning

TOTAL PERIODS: 60

TEXT BOOK

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, Fourth Edition, 2021
2. S.N.Sivanandam and S.N.Deepa, Principles of soft computing-Wiley India.3 rd ed,

REFERENCES

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. I. Bratko, “Prolog: Programming for Artificial Intelligencell, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. C. Muller & Sarah Alpaydin, Ethem. Introduction to machine learning. MIT press, 2020.

TT23E06 IOT CONCEPTS AND APPLICATIONS L T P C
2 0 2 3

OBJECTIVES:

- To apprise students with basic knowledge of IoT that paves a platform to understand physical and logical design of IOT
- To teach a student how to analyse requirements of various communication models and protocols for cost-effective design of IoT applications on different IoT platforms.
- To introduce the technologies behind Internet of Things(IoT).
- To explain the students how to code for an IoT application using Arduino/Raspberry Pi open platform.
- To apply the concept of Internet of Things in real world scenario.

UNIT I INTRODUCTION TO INTERNET OF THINGS 5

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT Models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT

UNIT II COMPONENTS IN INTERNET OF THINGS 5

Functional Blocks of an IoT Ecosystem – Sensors, Actuators, and Smart Objects – Control Units - Communication modules (Bluetooth, Zigbee,Wifi, GPS, GSM Modules)

UNIT III PROTOCOLS AND TECHNOLOGIES BEHIND IOT 6

IOT Protocols - IPv6, 6LoWPAN, MQTT, CoAP - RFID, Wireless Sensor Networks, BigData Analytics, Cloud Computing, Embedded Systems.

UNIT IV OPEN PLATFORMS AND PROGRAMMING 7

IOT deployment for Raspberry Pi /Arduino platform-Architecture –Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

UNIT V IOT APPLICATIONS 7

Business models for the internet of things, Smart city, Smart mobility and transport, Industrial IoT, Smart health, Environment monitoring and surveillance – Home Automation – Smart Agriculture

30 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Introduction to Arduino platform and programming
2. Interfacing Arduino to Zigbee module
3. Interfacing Arduino to GSM module
4. Interfacing Arduino to Bluetooth Module
5 Introduction to Raspberry PI platform and python programming
6. Interfacing sensors to Raspberry PI
7. Communicate between Arduino and Raspberry PI using any wireless medium
8. Setup a cloud platform to log the data
9. Log Data using Raspberry PI and upload to the cloud platform
10.Design an IOT based system

OUTCOMES:

CO 1: Explain the concept of IoT.
CO 2: Understand the communication models and various protocols for IoT.
CO 3: Design portable IoT using Arduino/Raspberry Pi /open platform

CO 4: Apply data analytics and use cloud offerings related to IoT.
CO 5: Analyze applications of IoT in real time scenario.

TOTAL PERIODS:60

TEXTBOOKS

1. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017
2. Samuel Greengard, The Internet of Things, The MIT Press, 2015

REFERENCES

1. Perry Lea, “Internet of things for architects”, Packt, 2018
2. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012
3. IOT (Internet of Things) Programming: A Simple and Fast Way of Learning, IOT Kindle Edition.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
5. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
6. https://www.arduino.cc/
   https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

TT23E07 **DATA SCIENCE FUNDAMENTALS** **L T P C**
2 0 2 3

COURSE OBJECTIVES:

- Familiarize students with the data science process.
- Understand the data manipulation functions in Numpy and Pandas.
- Explore different types of machine learning approaches.
- Understand and practice visualization techniques using tools.
- Learn to handle large volumes of data with case studies.

UNIT I INTRODUCTION **6**

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – data preparation - Exploratory Data analysis – build the model – presenting findings and building applications - Data Mining - Data Warehousing – Basic statistical descriptions of Data

UNIT II DATA MANIPULATION **9**

Python Shell - Jupyter Notebook - IPython Magic Commands - NumPy Arrays-Universal Functions – Aggregations – Computation on Arrays – Fancy Indexing – Sorting arrays – Structured data – Data manipulation with Pandas – Data Indexing and Selection – Handling missing data – Hierarchical indexing – Combining datasets – Aggregation and Grouping – String operations – Working with time series – High performance

UNIT III MACHINE LEARNING **5**

The modeling process - Types of machine learning - Supervised learning - Unsupervised learning - Semi-supervised learning- Classification, regression - Clustering – Outliers and Outlier Analysis

UNIT IV DATA VISUALIZATION **5**

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn

UNIT V HANDLING LARGE DATA **5**

Problems - techniques for handling large volumes of data - programming tips for dealing with large data sets- Case studies: Predicting malicious URLs, Building a recommender system - Tools and techniques needed - Research question - Data preparation - Model building – Presentation and automation.

30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

LAB EXERCISES

1. Download, install and explore the features of Python for data analytics.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Basic plots using Matplotlib
5. Statistical and Probability measures
    a) Frequency distributions
    b) Mean, Mode, Standard Deviation
    c) Variability

d) Normal curves
e) Correlation and scatter plots
f) Correlation coefficient
g) Regression

6. Use the standard benchmark data set for performing the following:
a) Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
b) Bivariate Analysis: Linear and logistic regression modelling.
7. Apply supervised learning algorithms and unsupervised learning algorithms on any data set.
8. Apply and explore various plotting functions on any data set.

Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

COURSE OUTCOMES:

At the end of this course, the students will be able to:

CO1: Gain knowledge on data science process.
CO2: Perform data manipulation functions using Numpy and Pandas.
CO3 Understand different types of machine learning approaches.
CO4: Perform data visualization using tools.
CO5: Handle large volumes of data in practical scenarios.

TOTAL PERIODS:60

TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

REFERENCES

1. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
2. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press,2014.

TT23E08 AUGMENTED REALITY/VIRTUAL REALITY L T P C
2 0 2 3

OBJECTIVES:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internals of the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

UNIT I INTRODUCTION 7

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System**.**

UNIT II VR MODELING 6

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNIT III VR PROGRAMMING 6

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT IV APPLICATIONS 6

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.

UNIT V AUGMENTED REALITY 5

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation-Navigation-Wearable devices

30 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection types by handling camera.
3. Download objects from asset store and apply various lighting and shading effects.
4. Model three dimensional objects using various modelling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.

7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walkthroughs and visualization of historic places.
9. Develop AR enabled simple applications like human anatomy visualization, DNA/RNA structure visualization and surgery simulation.
10. Develop simple MR enabled gaming applications.

TOTAL PERIODS:60

OUTCOMES:

On completion of the course, the students will be able to:

CO1: Understand the basic concepts of AR and VR

CO2: Understand the tools and technologies related to AR/VR

CO3:Know the working principle of AR/VR related Sensor devices

CO4: Design of various models using modeling techniques

CO5: Develop AR/VR applications in different domains

TEXTBOOKS:

1. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create compelling VR experiences for mobile”, Packt Publisher, 2018
2. Dieter Schmalstieg, Tobias Hollerer, “Augmented Reality: Principles & Practice”, Addison Wesley, 2016
3. John Vince, “Introduction to Virtual Reality”, Springer-Verlag, 2004.
4. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design”, Morgan Kaufmann, 2003

CO’s – PO’s & PSO’s MAPPING

CO’s	PO’s												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	3	2	2	-	3	-	-	-	2	2	1	2	2	1	2	
2	3	2	2	1	3	-	-	-	3	2	2	3	3	1	2	
3	3	3	2	2	3	-	-	-	3	2	1	2	3	2	2	
4	3	3	3	2	3	-	-	-	3	2	2	3	3	2	2	
5	3	3	3	3	3	-	-	-	3	3	3	3	3	3	3	
AVg.	3.00	2.60	2.40	2.00	3.00	-	-	-	2.80	2.20	1.80	2.60	2.80	1.80	2.20	