Himachal Pradesh Technical University, Hamirpur (H.P.)

CURRICULUM(CBCS)

TEXTILE ENGINEERING

(3rd to 8th Semester)

Teaching and Examination Scheme

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H.P. Technical University
Hamirpur - 177001

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

CURRICULUM
OF
B.TECH TEXTILE ENGINEERING

1. *Credit System:* A system enabling quantification of course work, with *one credit being assigned to each unit* after a student completes its teaching-learning process, followed by passing in both Continuous Internal Assessment *CIA & Semester End Examination (SEE);* Further, *Choice Based Credit System (CBCS)* to be helpful in customizing the course work for a student, through *Core &Electives.*

2. *Credit Courses:* All Courses registered by a student in a *Semester is to* earn *credits.* In a widely accepted definition, students to earn *One Credit* by registering and passing:

- One hour/week/Semester for *Theory/Lecture (L) Courses;* and,
- Two hours/week/Semester for *Laboratory/Practical (P) Courses* or *Tutorials (T).*

NOTE: Other student activities not demanding intellectual work or enabling proper assessment like, practical training, study tour and guest lecture not to carry *Credits.*

3. Credit Representation**:** Credit values for different courses is as given in Table 1:

Lectures (hrs./wk./Sem.)	Tutorials (hrs./wk./Sem.)	Practical Work (hrs./wk./Sem.)	*Credits* (L: T: P/D)	Total *Credits*
3	0	0	3:0:0	3
2	2	0	2:1:0	3
2	0	2	2:0:1	3
2	2	2	2:1:1	4
0	0	6	0:0:3	3

*4.Course Load**:*** Every student to register for a set of *Courses* in each *Semester,* with the total number of their *Credits* being limited by considering the permissible *weeklyContactHours (typically: 30/Week);* For this, an average *Course Load* of 24*Credits/Semester* (e.g., 6-7 *Courses*) is generally acceptable. A typical course load per semester which shall be adopted is given in Table. (2) Below:

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Table 2: Typical Course Load in a Semester

Courses	*Credits*/Course	Total *Credits*	*Contact Hours/Week* *
Three Lecture Courses	3:0:0	6	6
Two Lecture Courses	2:2:0	6	6
Three Lec +one Tut Courses	3:1:0	8	10
Three Lec elective Course	3:0:0	3	3
Two Lab Courses	0:0:2	2	4
One *Mandatory* Course	*0:0:3*	2	3
Total Courses: Six + one	17:3:2	24+3	+ 30

* Widely accepted figure ~ 30 hours/week, to enable the students to engage in homework assignments, self-learning outside the Class rooms/Laboratories, Extra/Co-Curricular activities and *add-on Courses*, if any, for their overall development;

5. Curriculum Structure:

All B.E./B.Tech degree courses will have a curriculum with Syllabi consisting of following type of courses:

I. **Foundation courses (FC):** Include Mathematics, Basic Sciences, Engineering Sciences, Skill Based and Humanities and Social Sciences Courses.

II. **Program Core Courses (PC):** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These courses are employability enhancement courses relevant to the chosen program of study. Program core comprises of theory, practical, Project, Seminar etc. Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem and a candidate studies such a course on his own with an advisory support by a teacher/faculty member. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

III. **Elective Courses:** Elective course is generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure

to some other discipline/subject/domain or nurtures the candidate's proficiency/skill. Accordingly, elective courses may be categorizes as:

(a) Program Elective Courses (PE): Program elective courses include the courses relevant to the chosen program of study. These courses may be offered by the main discipline/subject of study.

(b) Open Elective Courses (OE): An **o**pen elective course is generic in nature and is chosen generally from an unrelated discipline/subject, with an intention to seek exposure. A core course offered in a discipline /subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Open Elective.

IV Mandatory Courses (MC): Mandatory courses are essentially ability and skill enhancement courses. The ability enhancement courses are wherein familiarity is considered mandatory and are recommended by the regulatory bodies such as AICTE, UGC, etc. Environmental Science, English/Communication, etc. are such courses and are mandatory for all disciplines. The skill based or value-based courses on the other hand are aimed at providing hands-on-training, competencies, skills, etc.

V Audit Courses (AC): Audit courses if any shall be offered to supplement the students' knowledge/ skills outside the range of credits.

The list of courses under different categories is as under:

1.	**Foundation Courses (Theory)**	**L**	**T**	**P/D**	**Credits**
1.	Engineering Math – I	3	1	0	4
2.	Engineering Math – II	3	1	0	4
3.	Engineering Physics	3	1	2	5
4.	Engineering Chemistry	3	1	2	5
5.	Engineering Mechanics	2	2	0	3
6.	Principles of Electrical Engg.	2	2	2	4
7.	Introduction to Computer Fundamentals and Programming in C++	2	2	2	4
8.	Fundamentals of Electronics Engg.	2	2	2	4
9.	Probability and Statistics	2	2	0	3
10.	Industrial Economics and Management	3	2	0	3
11.	Optimization and Calculus of Variations	2	2	0	3
12.	Human Values and Professional Ethics	2	2	0	3

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	Total Credits				**45**
2.	**Professional Core Courses**				
1.	Textile Machines and Processes	2	2	0	3
2.	Natural Fibre	3	0	0	3
3.	Yarn Manufacture-I	2	2	2	4
4.	Fabric Manufacture - I	3	2	2	5
5.	Introduction to Textile Engineering Laboratory	0	0	2	1
6.	Textile Fibre Laboratory	0	0	2	1
7.	Man Made Fibre	2	2	0	3
8.	Textile Chemical Processing- I	3	0	2	4
9.	Yarn Manufacture-II	2	2	2	4
10.	Fabric Manufacturing-II	3	0	2	4
11.	Theory of Textile Machines	3	2	0	4
12.	Textile Testing-I	2	2	2	4
13.	Textile Chemical Processing- II	3	0	2	4
14.	Non-Conventional Yarn Manufacture	2	2	2	4
15.	Non-Conventional Fabric Manufacturing	3	0	2	4
16.	Properties of Fibre	3	0	0	3
17.	Textile Testing-II	2	2	2	4
18.	Non Woven Technology	3	0	0	3
19.	Textile Design and Analysis	2	2	2	4
20	Garment Technology	3	0	2	4
21.	Theory of Textile Structure	3	2	0	4
22.	Mechanics of Textile Process	3	2	0	4
23.	Knitting Technology	2	2	2	4
24.	Technical Textile	3	0	0	3
25.	Mill Management and Maintenance	2	2	0	3
26	Statistics and Quality Control for Textile Industry	3	2	0	4
	Total Credits				**92**
3.	**Programe Electives**				
1.	Programme Elective – I	3	0	0	3
2.	Programme Elective – II	3	0	0	3

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3.	Programme Elective – III	3	0	0	3
4.	Programme Elective – IV	3	0	0	3
	Total Credits				**12**
4.	**Open Electives**				
1.	Open Elective – I	2	0	0	2
2.	Open Elective – II	2	0	0	2
3.	Open Elective – III	2	0	0	2
	Total Credits				**6**
5.	**Mandatory Courses**				
1.	English Communication Skills	2	0	2	3
2.	Business Communication	2	0	0	2
3.	Engineering Drawing & Graphics	2	0	3	3
4.	Workshop Technology	2	0	3	3
5.	Environmental Sciences	2	0	0	2
6.	Disaster Management	2	0	0	2
7.	Oral and Written Communication Skills Lab-II	0	0	2	1
8.	Extra-curricular activity (viva voice)	0	0	2	1
9.	Community Project	0	0	2	1
10.	Special Module in Textile Engineering	0	2	0	1
11.	Technical Seminar	0	0	2	1
12.	Special Module in Textile Engineering	2	0	0	2
13.	Technical Seminar	0	0	2	1
14.	Industrial /Practical Training(Viva-Voce)	0	0	4	2
15.	Project Work - I	0	0	4	2
16.	Project Work - II	0	0	16	8
	Total Credits				**35**

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SUMMARY OF CREDITS									
Category	**Sub-Category**	**Semester**							**Total**
		I & II	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
FC	Basic Sciences & Math (BSM)	18	3	3	0	0	0	0	24
	Humanities & Social Sciences (HS)	0	3	3	0	0	0	0	6
	Engineering Science (ES)	15	0	0	0	0	0	0	15
PC	Program Core (PC)	0	17	15	23	23	14	0	92
PE	Program Electives (PE)	0	0	0	0	3	3	6	12
OE	Open Electives (OE)	0	2	2	2	0	0	0	6
P	Project work(P)	0	0	0	0	0	2	8	10
MC	Mandatory Courses (MC)	15	0	2	2	1	5	0	25
	Total	**48**	**23 +2**	**23 +2**	**25 +2**	**24 +3**	**21 +3**	**8+6**	**190**

6. **Course Plan:** As per AICTE recommendations, a course work of 180 Credits, with 22 credits per Semester on an average with built-in flexibility shall be adequate for the degree. **This course work consist of total 190 credits and to attain 180 credits student has to opt for two Program Elective subjects (PE) out of four and one Open Elective subject out of three in any semester.**
7. The courses need to be completed successfully by a student to qualify for the award of the UG degree. The suggested plan for sequencing the Course Work is given in Table (5)

Table 5: Typical Sequencing Plan for Courses:

Semester	**Subject Area Coverage**
I & II	Foundation Courses common for all Branches; Mandatory Courses;

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III& IV	Foundation Courses common for all Branches(to be continued); Also, Mandatory Courses(to be continued, if required);Program(Hard/Soft) Courses in two/three groups (like Electrical, Non-Electrical); Area wise Orientation; Add-On (Audit) Courses
V-VII	Program Courses (Hard/Soft), Program Elective and Open Elective Courses; Branch-wise Orientation; Add –On(Audit) Courses; Seminar
VIII	Program Elective and Open Elective Courses; Project work and Dissertation, Internship, Seminar; Add-On (Audit) Courses; Final wrap-up of Programme

Assessment and Evaluation:-

(i) Theory Courses		
Component	**Category**	**Max. Marks**
I	(a) Teachers Assessment (Assignments/Quizzes)	16
	(b) Mid- Semester Examinations/Tests (Two mid-term tests of 2 hrs duration)	20
	(c) Attendance	04
II	End-Semester Examination	60
	Total	100
(ii) Laboratory Courses		
Component	**Category**	**Marks**
I	(a) File work and lab performance	15
	(b) Vive-voce (two mid-term viva-voce tests)	10
	(c) Attendance	5
II	End-Semester viva-voce Examination	20
	Total	50

Note: The laboratory and project courses will be evaluated by the teachers(s) associated with the course and an external examiner not in the service of the university at the time of examination. In case the external examiner does not turn up for the examination, the head of the department concerned, in

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consultation with the course in-charge, shall call another person to act as the external examiner, even from within the College/other Institutions/University, if necessary.

(iii) Project/Seminar		
Component	**Category**	**Marks**
I	Internal Assessment – The distribution and weight age to be decided by course co-coordinator	50
II	End-Semester Examination	50
	Total	100

Note: The Project and Seminar courses will be examined by the teacher(s) associated with the course and one or more Examiners from amongst the teachers of the department to be recommended by the Board of Studies of the department concerned.

(iv) Industrial/Practical Training		
Component	**Category**	**Marks**
I -Marks to be awarded by the respective Industrial/Practical training organization	Technical Quality of the work	25
	Attendance, discipline, involvement, etc.	15
	Interest shown by the student	10
	Sub Total	50
II- Marks to be awarded by the Department/Centre	Project Report	15
	Project Work	15
	Viva Voce & Presentation	20
	Sub Total	50
	Total	100

(v)Audit Courses		
Course Status	**Marks Obtained**	**Grade Awarded**
Audit Pass	≥ 40%	S (Satisfactory)
Audit Fail	< 40% ,	U, Candidate has to repeat the course

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SCHEME OF TEACHING AND EXAMINATION B.TECH TEXTILE ENGINEERING										
SEMESTER – III										
S. N.	**Categ.**	**Course Code**	**Subject**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/ D**		**I.A Marks**	**ESE Marks**	**Total Marks**
1	FC	MA-301	Probability and Statistics	2	2	0	3	40	60	100
2	FC	HS – 305	Industrial Economics and Management	3	0	0	3	40	60	100
3	PC	TE - 301	Textile Machines and Processes	2	2	0	3	40	60	100
4	PC	TE - 302	Natural Fibre	3	0	0	3	40	60	100
5	PC	TE - 303	Yarn Manufacture-I	2	2	0	3	40	60	100
6	PC	TE - 304	Fabric Manufacture-I	3	2	0	4	40	60	100
7	OE	-	Open Elective-I	2	0	0	2	40	60	100
Labs:										
1	PC	TE – 305	Introduction to Textile Engineering Laboratory	0	0	2	1	30	20	50
2	PC	TE – 306	Textile Fibre Laboratory	0	0	2	1	30	20	50
3	PC	TE – 307	Yarn Manufacture-I Laboratory	0	0	2	1	30	20	50
4	PC	TE – 308	Fabric Manufacture-I Laboratory	0	0	2	1	30	20	50
			Total	15	8	8	23 + 2			

OPEN ELECTIVE – I										
S. N.	**Categ.**	**Subject Code**	**Title**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/D**		**I.A Marks**	**ESE Marks**	**Total Marks**
1	HS	HS-306	Sociology & Elements of Indian History for Engineers	2	0	0	2	40	60	100
2	HS	HS-307	German Language - I	2	0	0	2	40	60	100
3	HS	HS-308	French Language - I	2	0	0	2	40	60	100

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B.TECH TEXTILE ENGINEERING

SEMESTER – IV

S. N.	Categ.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/ D		I.A Marks	ESE Marks	Total Marks
1	FC	MA-401	Optimization and Calculus of Variations	2	2	0	3	40	60	100
2	FC	HS-409	Human Values and Professional Ethics	2	2	0	3	40	60	100
3	PC	TE - 401	Man Made Fibre	2	2	0	3	40	60	100
4	PC	TE - 402	Textile Chemical Processing-I	3	0	0	3	40	60	100
5	PC	TE - 403	Yarn Manufacture-II	2	2	0	3	40	60	100
6	PC	TE - 404	Fabric Manufacture-II	3	0	0	3	40	60	100
7	OE	-	Open Elective-II	2	0	0	2	40	60	100
Labs:										
1	PC	TE-405	Textile Chemical Processing- I Laboratory	0	0	2	1	30	20	50
2	PC	TE -406	Yarn Manufacture-II Laboratory	0	0	2	1	30	20	50
3	PC	TE -407	Fabric Manufacture-II Laboratory	0	0	2	1	30	20	50
4	MC	MC- 401	Oral and Written Communication Skills Laboratory -II	0	0	2	1	30	20	50
5	MC	TE -408	Extra-curricular activity(viva-voice)	0	0	2	1	30	20	50
			Total	14	8	10	23 + 2			

OPEN ELECTIVE – II

S. N.	Categ.	Subject Code	Title	Teaching Hours Per Week			Credits	Examination		
				L	T	P/D		I.A Marks	ESE Marks	Total Marks
1	HS	HS-410	Law for Engineers	2	0	0	2	40	60	100
2	HS	HS-411	German Language - II	2	0	0	2	40	60	100
3	HS	HS-412	French Language - II	2	0	0	2	40	60	100

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SEMESTER – V										
S. N.	**Categ.**	**Course Code**	**Subject**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/ D**		**I.A Marks**	**ESE Marks**	**Total Marks**
1	PC	TE - 501	Theory of Textile Machines	3	2	0	4	40	60	100
2	PC	TE - 502	Textile Testing-I	2	2	0	3	40	60	100
3	PC	TE – 503	Textile Chemical Processing-II	3	0	0	3	40	60	100
4	PC	TE - 504	Non-Conventional Yarn Manufacture	2	2	0	3	40	60	100
5	PC	TE - 505	Non-Conventional Fabric Manufacture	3	0	0	3	40	60	100
6	PC	TE -506	Properties of Fibre	3	0	0	3	40	60	100
7	OE	-	Open Elective-III	2	0	0	2	40	60	100
Labs:										
1	PC	TE-511	Textile Testing-I Laboratory	0	0	2	1	30	20	50
2	PC	TE-512	Textile Chemical Processing-II Laboratory	0	0	2	1	30	20	50
3	PC	TE-513	Non-Conventional Yarn Manufacture Laboratory	0	0	2	1	30	20	50
4	PC	TE-514	Non-Conventional Fabric Manufacture Laboratory	0	0	2	1	30	20	50
5	MC	TE-515	Community Project	0	0	2	1	30	20	50
6	MC	TE-516	Special Module in Textile Engineering	0	2	0	1	30	20	50
			Total	16	8	10	25 + 2			

OPEN ELECTIVE – III (For students of other Department)										
S. N.	**Categ.**	**Subject Code**	**Title**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/D**		**I.A Marks**	**ESE Marks**	**Total Marks**
1	OE	TE-507	Geotextiles	2	0	0	2	40	60	100
2	OE	TE-508	Filters and Filtration Textiles	2	0	0	2	40	60	100
4	OE	TE-509	Fashion Designing	2	0	0	2	40	60	100

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***Note**: The course (Special Module in Textile Engineering) aims at introducing new or highly specialized technological aspects in Textile Engineering. The course topic and content is likely to change with each offering depending upon the current requirement and expertise available with the department including that of the visiting professionals.*

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B.TECH TEXTILE ENGINEERING

SEMESTER – VI

S. N.	Categ.	Course Code	Subject	Teaching Hours Per Week			Credits	Examination		
				L	T	P/ D		I. A Marks	ESE Marks	Total Marks
1	PC	TE – 601	Textile Testing-II	2	2	0	3	40	60	100
2	PC	TE – 602	Textile Design and Analysis	2	2	0	3	40	60	100
3	PC	TE – 603	Garment Technology	3	0	0	3	40	60	100
4	PC	TE – 604	Non-Woven Technology	3	0	0	3	40	60	100
5	PC	TE – 605	Theory of Textile Structure	3	2	0	4	40	60	100
6.	PC	TE - 606	Mechanics of Textile Process	3	2	0	4	40	60	100
7	PE	-	Program Elective-I	3	0	0	3	40	60	100
Labs:										
1	PC	TE-611	Textile Testing-II Laboratory	0	0	2	1	30	20	50
3	PC	TE-612	Textile Design and Analysis Laboratory	0	0	2	1	30	20	50
4	PC	TE-613	Garment Technology Laboratory	0	0	2	1	30	20	50
5	MC	TE-614	Technical Seminar	0	0	2	1	50	50	100
			Total	16	8	8	24 + 3			

PROGRAM ELECTIVE – I

S. N.	Categ.	Subject Code	Title	Teaching Hours Per Week			Credits	Examination		
				L	T	P/ D		I.A Marks	ESE Marks	Total Marks
1	PE	TE-607	Post Spinning Operation	3	0	0	3	40	60	100
2	PE	TE-608	Process and Quality Control in Spinning & Weaving	3	0	0	3	40	60	100
3	PE	TE-609	Apparel Marketing & Merchandising	3	0	0	3	40	60	100
5	PE	TE-610	Advanced Fabric Structure and Design	3	0	0	3	40	60	100

Note:

1. *Technical Seminar: In the beginning of the semester, every student of the class will be assigned a seminar topic in the emerging / perspective field in the area of textiles such as Spinning, Weaving, Fibres, Testing, Chemical processing and alike. Seminar should be based on the literature survey on any topic of textiles.*
2. *Industrial /Practical Training after VI Semester of six weeks duration*

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SEMESTER – VII										
S. N.	**Cat.**	**Course Code**	**Subject**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/ D**		**I. A Marks**	**ESE Marks**	**Total Marks**
1	PC	TE - 701	Knitting Technology	2	2	0	3	40	60	100
2	PC	TE –702	Technical Textile	3	0	0	3	40	60	100
3	PC	TE –703	Mill Management and Maintenance	2	2	0	3	40	60	100
4	PC	TE –704	Statistics and Quality Control for Textile Industry	3	2	0	4	40	60	100
5	PE	-	Program Elective-II	3	0	0	3	40	60	100
Labs:										
6	PC	TE-711	Knitting Technology Laboratory	0	0	2	1	30	20	50
7	MC	TE-712	Industrial /Practical Training(Viva-Voce)	0	0	0	2	50	50	100
8	MC	TE-713	Project Work -I	0	0	4	2	50	50	100
	MC	TE-714	Special Module in Textile Engineering	2	0	0	2	30	20	50
9	MC	TE-715	Technical Seminar	0	0	2	1	30	20	50
			Total	12	6	8	21 + 3			

PROGRAM ELECTIVE – II										
S. N.	**Categ.**	**Subject Code**	**Title**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/ D**		**I.A Marks**	**ESE Marks**	**Total Marks**
1	PE	TE-705	Process and Quality Control in Apparel Manufacture	3	0	0	3	40	60	100
2	PE	TE-706	Functional Finishes	3	0	0	3	40	60	100
3	PE	TE-707	Processing of Man Made Fibres and Blended Textiles	3	0	0	3	40	60	100
4	PE	TE-708	Fashion Art and Design	3	0	0	3	40	60	100
5	PE	TE-709	Textured Yarn Technology	3	0	0	3	40	60	100

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Note:

1. *The course* ***(Special Module in Textile Engineering****) aims at introducing new or highly specialized technological aspects in Textile Engineering. The course topic and content is likely to change with each offering depending upon the current requirement and expertise available with the department including that of the visiting professionals*
2. ***Technical Seminar****: In the beginning of the semester, every student of the class will be assigned a seminar topic in the emerging / perspective field in the area of textiles such as Spinning, Weaving, Fibres, Testing, Chemical processing and alike. Seminar should be based on the literature survey on any topic of textiles.*

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SCHEME OF TEACHING AND EXAMINATION B.TECH TEXTILE ENGINEERING										
SEMESTER – VIII										
S. N.	**Categ.**	**Course Code**	**Subject**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/D**		**I. A Marks**	**ESE Marks**	**Total Marks**
1	PE	-	Program Elective-III	3	0	0	3	40	60	100
2	PE	-	Program Elective-IV	3	0	0	3	40	60	100
3	MC	TE – 811	Project Work - II	0	0	16	8	50	50	100
			Total	6	2	16	8 +6			
OR										
2	MC	TE – 812	Industrial Project	0	0	16	8	50	50	100
			Total	0	0	16	8+6			

PROGRAM ELECTIVE – III										
S. N.	**Categ.**	**Subject Code**	**Title**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/D**		**I.A Marks**	**ESE Marks**	**Total Marks**
1	PE	TE – 801	Textile Reinforced Composite	3	0	0	3	40	60	100
2	PE	TE – 802	High Performance and Specialty fibres	3	0	0	3	40	60	100
3	PE	TE – 803	Application of CAD/ CAM in Textile	3	0	0	3	40	60	100
4	PE	TE – 804	Application of Nanotechnology in textile	3	0	0	3	40	60	100
5	PE	TE – 805	Smart Textile	3	0	0	3	40	60	100

PROGRAM ELECTIVE – IV										
S. N.	**Categ.**	**Subject Code**	**Title**	**Teaching Hours Per Week**			**Credits**	**Examination**		
				L	**T**	**P/D**		**I.A Marks**	**ESE Marks**	**Total Marks**
1	PE	TE – 806	Waste Management and Pollution Control in Textile	3	0	0	3	40	60	100
2	PE	TE – 807	Energy Management and Conservation in Textile Industry	3	0	0	3	40	60	100
3	PE	TE – 808	Clothing Comfort	3	0	0	3	40	60	100
4	PE	TE – 809	Green Processing Of Textiles	3	0	0	3	40	60	100
5	PE	TE – 810	Financial Management In Textile Industry	3	0	0	3	40	60	100

Note: *Industrial Project of Four month's duration is to be carried out by the student exclusively in industry under the joint supervision of faculty advisers from institution as well as from the industry.*

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SEMESTER-III
MA-301: PROBABILITY AND STATISTICS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Probability and Random Variables:** Introduction, Basic concepts–Sample space, Events, Counting sample space, Conditional Probability and Independence, Permutations and Combinations, Rules of Probability, Bayes' Theorem. Random Variables – Concept of Random Variable, Percentiles, Probability Distributions – Discrete & Continuous, Mean, Variance and Covariance of Random Variables, Chebychev's inequality.	6
II	**Standard Probability Distributions:** Discrete distributions- Uniform, Binomial, Multinomial, Hyper geometric, Poisson, Negative Binomial, Poission; Continuous distributions - Normal, Exponential, Gamma, Weibull and Beta distributions and their properties -Function of Random variables.	6
III	**Sampling Distributions:** Random sampling, Sampling Distributions of Means, Estimation, Properties of point estimators, Confidence interval, Maximum likelihood and Bayes estimators, Prediction intervals.	6
IV	**Testing of Hypothesis:** Sampling distributions – testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions, tests for independence of attributes and Goodness of fit.	6

	Linear Correlation and Regression Analysis: Introduction, Linear Regression model, Regression coefficient, Lines of correlation, Rank correlation.	

Text Books:

1. Gupta, S.C, and Kapur, J.N., "***Fundamentals of Mathematical Statistics",*** Sultan Chand, Ninth Edition, New Delhi,1996.
2. Johnson. R. A., ***"Miller & Freund's Probability and Statistics for Engineers",*** Sixth Edition, Pearson Education, Delhi, 2000.
3. Douglas C. Montgomery and George C. Runger, ***"Applied Statistics and Probability for Engineers***", 5th Edition, 2011.

Reference books:

1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, ***"Probability and Statistics for Engineers and Scientists",*** Seventh Edition, Pearson Education, Delhi, 2002.
2. Lipschutz. S and Schiller. J, "***Schaum's outlines - Introduction to Probability and Statistics***", McGraw-Hill, New Delhi, 1998.
3. S. M. Ross, "***Introduction to Probability and Statistics for Engineers and Scientists***" 4th edition.

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HS 305: INDUSTRIAL ECONOMICS AND MANAGEMENT

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction to Engineering Economics** - Technical efficiency, economic efficiency - cost concepts: elements of costs, opportunity cost, sunk cost, private and social cost, marginal cost, marginal revenue and profit maximization. **Supply and Demand:** Determinants of demand, law of demand, determinants of supply, law of supply, market equilibrium - elasticity of demand - types of elasticity, factors affecting the price elasticity of demand. **National Income Concepts:** GDP and GNP, per capita income, methods of measuring national income. Inflation and deflation:	**8**
II	**Value Analysis** - Time value of money - interest formulae and their applications: single-payment compound amount factor, single-payment present worth factor, equal-payment series compound amount factor, equal-payment series sinking fund factor, equal-payment series present worth factor, equal-payment series capital recovery factor, effective interest rate. **Investment Analysis:** Payback period—average annual rate of return, net present value; Internal rate of return criteria, price changes, risk and uncertainty.	**8**
III	**Principles of Management:** Evolution of management theory and functions of management organizational structure - principle and types - decision making - strategic, tactical & operational decisions, decision making under certainty, risk & uncertainty and multistage decisions & decision tree. **Human Resource Management:** Basic concepts of job analysis, job evaluation,	**8**

	merit rating, wages, incentives, recruitment, training and industrial relations.	
IV	**Financial Management**: Time value of money and comparison of alternative methods; costing – elements & components of cost, allocation of overheads, preparation of cost sheet, break even analysis - basics of accounting - principles of accounting, basic concepts of journal, ledger, trade, profit & loss account and balance sheet. **Marketing Management:** Basic concepts of marketing environment, marketing mix, advertising and sales promotion. **Project Management:** Phases, organization, planning, estimating, planning using PERT & CPM.	**8**

Text Books:

1. Panneer Selvam, R, "***Engineering Economics***", Prentice Hall of India Ltd, New Delhi.
2. Dwivedi, D.N., "***Managerial Economics****, 7/E"*, Vikas Publishing House.

Reference Books:

1. Sullivan, W.G, Wicks, M.W., and Koelling. C.P., ***"Engg. Economy 15/E***", Prentice Hall, New York, 2011.
2. Chan S. Park, ***"Contemporary Engineering Economics***", Prentice Hall of India, 2002.
3. F. Mazda, "***Engg. Management"***, Addison Wesley, Longman Ltd., 1998.
4. O. P. Khanna, "***Industrial Engg. and Management"***, Dhanpat Rai and Sons, Delhi, 2003.
5. P. Kotler, "***Marketing Management, Analysis, Planning, Implementation and Control***, Prentice Hall, New Jersey, 2001.
6. VenkataRatnam C.S & Srivastva B.K, ***Personnel Management and Human Resources***, Tata McGraw Hill.
7. Prasanna Chandra, ***Financial Management: Theory and Practice***, Tata McGraw Hill.
8. Bhattacharya A.K., ***Principles and Practice of Cost Accounting***, Wheeler Publishing.
9. Weist and Levy, ***A Management guide to PERT and CPM***, Prantice Hall of India.
10. Koontz H.,O'Donnel C.,& Weihrich H, ***Essentials of Management***, McGraw Hill.

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TE – 301: TEXTILE MACHINES AND PROCESSES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To introduce the various stages involved in the process of conversion of fibres into yarn, fabric garment and to explain the various processes employed in textile chemical processing sector.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**General and Numbering Systems**: - Topic including job and entrepreneurial opportunities of textile technologist, general nomenclature related to textile. Flow chart of conversion of fiber into finished garment. Direct and indirect system, relationship among different numbering systems. **Fibres**: Classification of natural and manmade fiber, basic requirement of fiber forming polymer and fibres. Elementary idea of polymerization, crystallinity and orientation	**8**
II	**Yarn Formation:** Objectives of spinning, conventional and non-conventional methods of yarn formation. Elementary idea of conversion of fiber into yarn, objectives of all the processes and machineries involved in it viz. blow room, card, comber, draw frame, speed frame, ring frame. Function of twist on plied yarns. Different methods for the production of synthetic yarn. Difference between staple and filament yarn. **Preparatory Process:** Objectives of winding, doubling, warping, beam and sectional warping, sizing drawing in process	**9**
III	**Fabric Formation**: Weaving, knitting and non-woven. Idea of conventional and non-conventional weaving, basic motions of weaving, basic weaves and designs. **Chemical Processing:** Elementary ideas of singeing, desizing, scouring, bleaching, mercerization. Dyeing: classification and brief methodology its type. Printing: various methods and styles of printing, introduction to J-box, padding mangle, jigger, winch.	**9**
IV	**Finishing**: Classification of finishes, elementary idea of calendaring, sanforization, softening, easy care, flame retardant, anti-static, anti-pilling, water repellent, oil	**8**

	repellent, anti-bacterial and UV protective finish. **Garment Manufacturing:** Garment industry and general nomenclature of garment industry. Main processes required for conversion of fabric into finished garment.	

Text Books:

1. Gohl E P G and Valensky, "***Textile Science,***" 2nd Ed., CBS Publisher, New Delhi (1999).
2. Shenai V A, "***Textile fiber***", Vol.1, 2nd Ed., Sevak Publication, Bombay (1991)

Reference Books:

1. Pattabhiram T K, "***Essential Elements of Textile calculations***", 3rd Ed., Mahajan Publishers Ahmedabad (1985).
2. Klein W, "***Manual of Textile Technology***", Vol.1, 1st Ed., The Textile Institute, Manchester (1995).
3. Trotman E R, "***Dyeing and Chemical Technology of Textile Fibres***", Charles Griffin and Co. Ltd, London (1975)

TE – 302: NATURAL FIBRE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the fundamentals of natural fibres, their cultivation and to impart knowledge on the identification of different natural fibres on the basis of their physical and chemical properties..

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction**: Historical Evolution of Textiles. Definition of Textiles, Fibre, Staple fibre, Filament, Yarn, Thread, Fabric and Clothing. Essential and desirable properties of textile fibres. Requirement of fibre forming polymers. Classification of textile fibres. **Polymers:** Degree of Polymerization. Types of polymer, Orientation and crystallinity in fibres. Micro-structure of textile fibre and filament	**8**
II	**Cotton** – Varieties: Genetically modified Cotton, Organic Cotton & Coloured Cotton, Cultivation and harvesting, Chemical composition, Chemical structure, Morphological structure, Physical properties, Chemical properties and uses. **Bast Fibres:** Jute: Cultivation, Retting, Fibre Extraction and Properties. Ramie: Chemical composition, properties and processing of Ramie fibre. Hemp: Physical and chemical properties, Structure, Primary processing of Hemp stalk and Retting. Sisal: Chemical composition, Properties, Fibre structure, Production and early processing. Mudar fibre: Properties and composition. Varieties and uses –Kenaf, Banana and coir fibre	**9**
III	**Protein Fibres:** Wool – Types, Fibre extraction, Chemical Composition, Chemical structure, Morphological structure, Physical properties, Chemical properties and uses.Silk – Types, Production of Raw silk, Wild silk, Spun silk, Chemical composition, Chemical structure, Physical properties, Chemical properties and uses. Spider Silk: Types and Properties. **Regenerated Protein Fibres**-Principle of manufacture. Casein fibre. Vicara fibre. Ardil fibre. General properties.	**9**
IV	**Regenerated Cellulosic Fibres**-Principle of manufacture, Viscose rayon production, Purification of viscose fibre, Physical properties, Chemical properties	**8**

	& Uses. Modification of viscose rayon. Other regenerated cellulosic fibres – Tencel, Modal and Bamboo. Unconventional natural fibres. **Identification of Fibres:** Feeling Test. Burning test. Microscopic test Staining Test. Chemical test and Density measurement.	

Text Books:

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

Reference Books:

1. Bernard P Corbman, "***Textiles: Fibre to Fabric,***" McGraw Hill Book Co., Singapore, (1983). ISBN:0070131376
2. Marjory L Joseph, "***Essentials of Textiles",*** CBS College Publishing, New York, (1984), ISBN:0030627389

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TE – 303: YARN MANUFACTURE – I

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

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

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Ginning:** Objective of ginning, study of ginning machineries, Pre and post ginning, baling of fibers, latest developments. **Blow Room:** Objectives, principles of mixing and blending, types of mixing and blending, mixing and blending machineries, blending performance, latest developments in blending machinery.	8
II	**Blow room Principles:** Principle of opening and cleaning and its machinery, classification, study of opening and cleaning machine and its modern developments. Details of lap forming mechanism, feed regulating motion, calendar roller pressure, length measuring device, lap build, lap defects and its remedies. Chute feed to card. **Single line processing**: Degree of opening and cleaning. Performance assessment of blow room line. Machine and labour productivity, Norms. Calculations pertaining to blow room	9
III	**Carding:** Objectives, principles of roller and clearer card, flat card, detail study of flat card and its components. Licker-in, cylinder, doffer and flats. Transfer of fiber. Card clothing. Web stripping and coiler system. **Semi high production card**. High production card. Neps in carding web. Autoleveller in card. Latest developments. Machine and labour productivity. Norms. Performance assessment and calculations pertaining to carding.	9
IV	**Drawing:** Objectives, principles of drawing and doubling. Detailed study of draw frame machine. Top and bottom rollers, top roller cots, roller weighting, drafting wave, roller slip and roller eccentricity. **Drafting:** Various drafting system, modern drawframe, autoleveller in Drawframe,	8

	Machine and labour productivity. Norms. Performance assessment and calculation pertaining to draw frame machine	

Text Books:

1. Klein W, "***Manual of Textile Technology", Vol. I – III***, The Textile Institute, UK (1987)
2. Oxtoby E, ***"Spun Yarn Technology***", Butterworth and Co. Ltd. (1987).

Reference Books:

1. Foster G A K, ***"Manual of Cotton Spinning",*** Vol. I –IV, The Textile Institute, Manchester (1958).
2. Salhotra K R, ***"Spinning of Man Made Fibres and Blends on Cotton Spinning System***", The Textile Association, Mumbai (1989).
3. Khare A R, "***Elements of Blowroom, Carding and Drawframe",*** Sai book Centre, Mumbai (1999).

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TE – 304: FABRIC MANUFACTURE – I

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 Hrs

COURSE OBJECTIVE:

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

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction to weaving**: weaving process flow chart, Winding: Objectives, types of packages, types of winding machines, uniform buildup of cones, Mechanical and electronic type yarn clearer. Yarn tensioner: Additive, multiplicative, combined and compensating type. **Patterning**: Reasons and remedies. Yarn path with different traverse ratio, Auto winders Autoconer: Objective, machine parameters. Doubling: Objective and types, TFO: Objectives, machine parameters, properties of TFO yarn, Yarn fault classifying systems, Pirn winding: Objectives, types of pirns, Hacooba pirn winding machine.	**9**
II	**Warping:** Objectives, types of warping, conditions for warping, comparison of beam warping with sectional warping, basic features of warping machine, different types of creels, reeds, leasing systems, derivation for volume of yarn to be stored on beam, actors effecting warp quality on beam. Calculations related to warping **Sizing:** Objectives, flow chart of sizing process with different zones, sizing machines: Twin and multi cylinder, Features of sizing machine, machine elements, sizing ingredients, size preparation, control points, Latest developments. Performance assessment and calculations.	**9**
III	**Drawing In**: Importance, manually and automatic drawing process, design with its drawing and lifting plan. Calculation of heald and reed count. Weaving: History of weaving with manual and automatic loom, and modern loom revolutions. Overall concept about looms and its elements. Different motions of looms: Primary, secondary and auxiliary motions.	**8**

	Shedding: Objective, Different types of shedding: Tappet, dobby, jacquard with advantage and disadvantages. Tappet shedding: its limitations, positive and negative shedding, types of shed, early and late shedding, shed timing, importance of bending factor.	
IV	**Picking:** Objective, Types of conventional picking: over picking and under picking with its mechanism, advantages and disadvantages, different picking accessories and their functions, Calculation of shuttle velocity and derivation for energy of picking, picking force. Picking timing such as late picking and early picking, reasons of false picking and shuttle fly. **Beat up**: Objective, Movement of sley, beat up, sley eccentricity and the factors which influence it, derivation for kinematic movement of sley, effects of distance, velocity and acceleration with respect to sley eccentricity on beat up force and timing available for shuttle passage. Calculation based on shedding, picking, sley movement, production, efficiency.	**9**

Text Books:

1. Talukdar M K, Srirammulu P K and Ajgaokar D B, "***Weaving – Machine, Mechanism and Management***", Mahajan Publisher Private Ltd., Ahmedabad, India (1998).
2. Mark R, Robinson A T C, "***Principles of Weaving***", The Textile Institute, Manchester (1986).

Reference Books:

1. Booth J E, "***Textile Mathematics", Part III***, Textile Institute, Manchester (1977).
2. Dr.Sabit Adanur, "***Hand book of weaving***" Technomic Publishing Company Inc Lancaster, Basel, UK (2001)
3. ***Winding,*** BITRA Monograph Series, Bombay Textile Research Association, Bombay (1981).
4. ***Warping and Sizing***, BTRA Monograph Series, Bombay Textile Research Association, Bombay (1981).
5. ***Woven Fabric, Manufacture – I,*** NCUTE, New Delhi (2002)
6. Lord P R and Mohamad M H, "***Weaving: Conversion of Yarn to Fabric",*** Merrow Technical Library, UK (1988).

HS-306: SOCIOLOGY AND ELEMENTS OF INDIAN HISTORY FOR ENGINEERS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction to sociological concepts**- structure, system, organization, social institution, Culture social stratification (caste, class, gender, power). **Understanding social structure and social processes -** Perspectives of Marx and Weber.	**6**
II	**Political economy of Indian society** - Industrial, Urban, Agrarian and Tribal society. **Social change in contemporary India** - Modernization and globalization, Secularism and communalism.	**6**
III	**Introduction to Elements of Indian History -** What is history? ; History Sources - Archaeology, Numismatics, Epigraphy and Archival research. **Indian history and periodization -** evolution of urbanization process: first, second and third phase of urbanization.	**6**
IV	**From feudalism to colonialism -**the coming of British; Modernity and struggle for independence. **Issues and concerns in post-colonial India (upto 1991) -** Issues and concerns in post-colonial India 2ndphase (LPG decade post 1991)	**6**

Text Books:

1. Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan.
2. Giddens, A (2009), Sociology, Polity, 6thEdition.

3. Chandoke, Neera& Praveen Priyadarshi (2009), contemporary India: Economy, Society and Politics, Pearson.

Reference Books:

1. Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan.
2. Haralambos M, RM Heald, M Holborn (2000), Sociology, Collins.
3. Sharma R. S..(1965), Indian feudalism, Macmillan.
4. Gadgil, Madhab & Ramchandra Guha (1999) - This Fissured Land: An Ecological History of India, OU Press.

HS 307: GERMAN LANGUAGE – I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Wichtige Sprachhandlungen:** Phonetics – Sichbegrüßen - Sich und and erevorstellenformell / informell - Zahlen von 1 bis 1 Milliarde – verstehen & sprechen. **Grammatik:** regelmäßigeVerbenimPräsens - "sein" und habenimPräsens - PersonalpronomenimNominativ.	**6**
II	**WichtigeSprachhandlungen:** Telefon Nummernverstehen und sprechenUhrzeitenverstehen und sagenVerneinung "nicht und kein" (formell und informell) **Grammatik**: Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/NeinFrage) Nomenbuchstabieren und notierenbestimmter und unbestimmterArtikelundNegativartikelim Nom. &Akkusativ	**6**
III	**WichtigeSprachhandlungen:** Tageszeitenverstehen und überTerminesprechen-Verabredungenverstehen - AufgabenimHaushaltverstehen **Grammatik:** PersonalpronomenimAkkusativ und Dativ - W-Fragen "wie, wer, wohin, wo, was usw.-Genitivbei Personennamen - ModalverbenimPräsens "können, müssen,möchten"	**6**
IV	**WichtigeSprachhandlungen:** Sichaustauschen, was man kann, muss – BezeichnungenLebensmittel – Mengenangabenverstehen – PreiseverstehenundEinkaufzettelschreiben	**6**

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	Grammatik: Wortstellung in SätzenmitModalverben – Konnektor ”und” – “noch”-kein-------mehr – “wieviel, wieviele, wie alt, wielange” – PossessivartikelimNominativ.	
V	**WichtigeSprachhandlungen:** Freizeitanzeigenverstehen – Hobbysund Sportarten Anzeigenfür Freizeitpartnerschreibenbzw. daraufantworten –Vorlieben und Abneigungenausdrucken **Grammatik:** Verbenmit Vokalwechselim Präsens – ModalverbenimPräsens“dürfen, wollen und mögen - “haben und sein” imPräteritum – regelmäßigeVerbenimPerfekt – Konnektoren “denn, oder, aber.	**6**

Text Books:

1. Studio d A1. Deutsch alsFremdsprache with CD.(Kursbuch und Sprachtraining).

Reference Books:

1. German for Dummies
2. Schulz Griesbach

HS-308: FRENCH LANGUAGE – I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Grammar and Vocabulary:** Usage of the French verb "se presenter", a verbof self-introduction and how to greet a person- "saluer". **Listening and Speaking:** The authentic sounds of the letters of the French alphabet and the accents that play a vital role in the pronunciation of the words. **Writing:** Correct spellings of French scientific and technical vocabulary. **Reading:** Reading of the text and comprehension – answering questions.	**6**
II	**Grammar and Vocabulary:** Definite articles, "prepositions de lieu" subject pronouns. **Listening and Speaking:** Pronunciation of words like Isabelle, presentezandla liaison – vousetes, vousappelez and role play of introducing each other –group activity. **Writing:** Particulars in filling an enrolment / registration form. **Reading Comprehension:** reading a text of a famous scientist and answering questions.	**6**
III	**Grammar and Vocabulary:** Verb of possession "avoir' and 1st group verbs"er", possessive adjectives and pronouns of insistence- moi, lui..and numbers from 0 to 20. **Listening and Speaking: N**asal sounds of the words like feminine, ceinture, parfum and how to ask simple questions on one's name, age, nationality, address mail id and	**6**

	telephone number. **Writing:** Conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person. **Reading Comprehension:** reading a text that speaks of one's profile and answering questions.	
IV	**Grammar and Vocabulary:** Negative sentences, numbers from 20 to 69, verb"aimer"and seasons of the year and leisure activities. **Listening and Speaking:** To express one's likes and dislikes and to talk of one's pastime activities (sports activities), je fais du ping-pong and nasalsounds of words – janvier, champagne. **Writing-**Conjugations of the irregular verbs: faire and savoir and their usage. Paragraph writing on one's leisure activity- (passé temps favori). **Reading:** a text on seasons and leisure activities – answering questions.	**6**
V	**Grammar and Vocabulary:** les verbes de direction- to ask one's way and to give directions, verbes- pouvoir and vouloir and 2nd group verbs, a droite, lapremiere a gauche and vocabulary relating to accommodation. **Listening and Speaking:** To read and understand the metro map and henceto give one directions – dialogue between two people. **Writing:** Paragraph writing describing the accommodation using the different prepositions like en face de, derriere- to locate. **Reading Comprehension:** A text / a dialogue between two on location and directions- ouest la poste/ la pharmacie, la bibliotheque?.....	**6**

Text Book:

1. Tech French

Reference Books:

1. French for Dummies.
2. French made easy-Goyal publishers
3. Panorama

TE – 305: INTRODUCTION TO TEXTILE ENGINEERING LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester:

List of Experiments

1. Preparation of lea and hank and calculation of fineness
2. Calculation of count of yarn using different instruments
3. Determination of twist.
4. To study the objectives of different beaters/openers.
5. To study the working principle of trash analyzer.
6. To study the working principle and path of the material in a carding machine.
7. To study the working principle and path of the material in a draw frame.
8. To study the working principle and path of the material in a roving frame
9. To study the working principle and path of the material in a ring frame.
10. To study the working principle and path of the material in a winding machine.
11. To study the working principle of conventional weaving machine.
12. To study the working principle of non-conventional weaving machine.
13. To study the working principle and yarn path of circular and flat knitting machine.
14. Study of all the processing machines.
15. Dyeing of fabric/yarn with direct dyes.
16. Study of different techniques of printing.
17. Study of Non-Conventional spinning machine used in Textile industry.

TE – 306: TEXTILE FIBRE LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practicals as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester:

List of Experiments

Physical and Chemical identification of following Textile fibre(s)

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

Identification of fibres in blend and % fibre content in blend

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

TE – 307: YARN MANUFACTURE - I LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester:

List of Experiments

1. Study of general outline of opener and clearer machine employed in B/R line process.
2. Study of following in Shirley trash analyser machine.
   - Chief organs.
   - Gearing arrangements.
   - Teeth inclination and teeth per inch.
3. Determination of trash content and analysis of waste by using trash analyzer machine.
4. Study of carding machine with technical details.
5. Study of gearing mechanism calculation of the speed of different organs of carding machine.
6. Calculation of draft between different zone and production of carding machine.
7. Study of card settings for different fibre lengths and types.
8. Maintenance and overhauling of carding machine.
9. Study of distribution of fibrous waste in a carding machine.
10. Study of the `NEP -COUNT' in a card.
11. Study of drafting arrangement and top roller weighting system of draw frame machine.
12. Calculation of the total draft and its distribution in draw frame machine.
13. Effects of break draft and roller settings on sliver uniformity.
14. Measurement of nip-load pressure, roller eccentricity and shore hardness of top roller drafting Rollers.
15. Maintenance and overhauling of draw frame machine.

TE – 308: FABRIC MANUFACTURE - I LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester:

List of Experiments

1. Study of the motion transmission system in winding machine.
2. Study of the effect of slub catcher, yarn tensioner and yarn guide on package formation.
3. Study of Package stop motion in cone winding machine.
4. Calculation of winding speed on grooved drum winding system and study of anti- patterning system incorporated to it.
5. Study of precision winding machine and mechanism of package building.
6. Study of the motion transmission system in Pirn winding machine.
7. Study of working principle of TFO machine and silent features of machine with yarn characteristics.
8. Study of working of Autoconer automatic winding machine with its machine elements.
9. Analysis of various fabric design with its drafting and lifting plan.
10. Construction of sections in sectional working machine and plan the width of a section according to the give striped fabric keeping in view the pattern.
11. To study the passage of yarn on a sizing machine and the features of various parts/ mechanism of the sizing machine.
12. To select the proper reed and heald for a weaver's beam keeping in mind the beam, loo size and fabric construction.
13. Study of shedding mechanism of shuttle loom and cam positioning with respect to loom cycle.
14. Study of picking mechanism of shuttle loom with picker movement in relation with crank shaft rotation and calculation of average velocity of shuttle.
15. Study of sley movement, construction and calculation of sley eccentricity

SEMESTER-IV

MA-401: OPTIMIZATION AND CALCULUS OF VARIATIONS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction:** A survey of some simplified examples of common real world situations leading to optimization problems, basic formulation and theory of optimization problems. **Linear programming:** Linear programming (optimization of linear functions subject to linear constraints): basic theory; simplex method; duality, practical techniques.	6
II	**Linear programming:** Basic LPP - solution techniques (Simplex, Artificial Basis), Complimentary Slackness Theorem, Fundamental theorem of Duality, degenerate solutions, cycling; Applications - elements of dynamic programming including Hamiltonian, Bellman's optimality principle. **Transportation and Assignment Problems:** Solution of a balanced transportation problem, degeneracy in transportation problems and alternate solutions, Mathematical problems in formulation of assignment problems.	7
III	**Nonlinear programming:** Nonlinear programming (optimization of nonlinear functions subject to constraints) with Lagrange multipliers, Karush-Kuhn-Tucker optimality conditions, convexity, duality. **Approximation methods for nonlinear programming:** Line search methods, gradient methods, conjugate gradient methods; Networking techniques – PERT and CPM.	6

IV	**Calculus of Variations:**Basic definitions - functionals, extremum, variations, function spaces; Necessary conditions for an extremum, Euler-Lagrange Equation, convexity and it's role in minimization, minimization under constraints; Existence and nonexistence of minimizers; Applications - Isoperimetric problems, Geodesics on the surface.	**6**

Text Books:

1. C. B. Gupta, "Optimization Techniques in Operation Research," I. K. International Publishing House Pvt. Ltd.
2. A. S. Gupta, Calculus of Variations and Applications, PHI Prantice hall India.
3. Mukesh Kumar Singh, "Calculus Of Variations" Krishna Prakashan Media (P) Ltd.
4. J. K. Sharma, Operations Research – Problems and Solutions, Macmillian Pub.

Reference books:

1. I. M.Gelf and S. V. Fomin, "Calculus of Variations" Dover Publications IncMineola, New York.
2. Purna Chand Biswal, "Optimization in Engineering, Scitech Publications India Pvt. Ltd.
3. B. S. GREWAL, Higher Engineering Mathematics, Krishna Publications.
4. G. Hadly, Linear Programming, Narosa Publishing House.
5. KantiSwarup, P. K. Gupta and Manmohan, "Operations Research," Sultan Chand & Sons.

HS-409: HUMAN VALUES AND PROFESSIONAL ETHICS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction –Need and Basic Guidelines** 1. Understanding the need , basic guidelines, content and process of value Education 2. Self-Exploration – purpose, content and process, 'Natural Acceptance' and Experiential Validation – as the mechanism for self-explanation.	6
II	**Process for Value Education** 1. Continuous Happiness and Prosperity – A look at basic Human Aspirations. 2. Right Understanding, Relationship and Physical Facilities – basic requirements for fulfillment of aspirations of every human being with their correct priority. 3. Understanding Happiness and prosperity – A critical appraisal of the current scenario. 4. Method to fulfill the human aspirations; understanding and living in harmony at various levels.	7
III	**Harmony in Human Beings** 1. Understanding human being as a co-existence of the self and the body. 2. Understanding the needs of Self ('I') and 'Body' – Sukh and Suvidha. 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)	7

IV	**Harmony in Myself and body** 1. Understanding the characteristics and activities of 'I' and harmony in 'I' 2. Understanding the harmony of I with the Body: Sanyam and Swasthya: correct appraisal of Physical needs, meaning of Prosperity in detail.	**6**
V	**Harmony in Family, Society and Nature** 1. Understanding harmony in the family, society and nature. 2. Understanding values in human relationship; meaning of Nyaya and Program for its fulfillment to ensure Ubhay-tripti. 3. Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.	**6**

Text Books

1. R R Gaur, RSangal and GP Bagaria, A Foundation Course in value Education, Published by Excel Books (2009).
2. R R Gaur, R Sangal and G P Bagaria, Teacher's Manual (English), 2009.

Reference Books

1. E.F. Schumacher, Small is Beautiful; a study of economics as if people mattered, Blond & Briggs, Bratain, 1973.
2. PL Dhar, RR Gaur, Science and Humanism, common wealth publishers, 1990.
3. A.N. Tripathy, Human values, New Age International Publishers, 2003.
4. E.G. Seebauer& Robert, L BERRY, Foundational of Ethics for Scientists &Engineers, Oxford University Press, 2000.
5. M. Govindrajran, S.Natrajan& V.S. Senthi Kumar, Engineering Ethics (including human Values), Eastern Economy Edition, Prentice hall of India Ltd.
6. B.L. Bajpai, 2004, Indian Ethos and Modern Management, New Royal book Co; Lucknow, 2004, Reprinted 2008.

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TE – 401: MAN MADE FIBRE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To educate on the difference between manmade and natural fibres and to describe different methods of manmade fibre manufacturing and explain how the process parameters can affect fibre properties and characteristics

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction** to man-made fibres: Definition of man-made fibres. Brief history of manmade fibres. Relative merits and demerits of manmade fibres and natural fibres. Synthesis of raw materials from petrochemicals: Elementary idea of synthesis of raw materials viz. DMT, TPA, MEG, Caprolactam, Acrylonitrile, propylene. Raw materials for rayons. **Polymer Production**: PET through TPA and DMT route, Nylon 66 and Nylon 6 - Acrylic - Polypropylene - Elastomeric - Polyvinyl and Aramid fibres.	**9**
II	**Fundamentals of the fibre spinning process**: Physical fundamentals of the fibre spinning process - spinnability of liquids, rheology of spinning, mechanics of spinning, formation of fibre structure . **Melt Spinning Equipments**: Melting device, Grid and extruder, Static mixer, Pre-filtration, Manifold, Spin pack, Spinneret, Quenching chamber, Spin finish application, Take-up winding. Staple fibre line production details, high speed spinning - Polyester, Polyamide and Polypropylene.	**9**
III	**Wet and Dry Spinning**: Preparation of dope, extrusion and fibre formation. Comparison of wet and dry spinning processes. Dry-jet-wet spinning, Gel spinning. Viscose rayon and variants. **Drawing and Heat Setting**: Neck drawing, drawing systems, influence of drawing on structure and properties of fibres. Types of heat setting, influencing parameters on heat setting, influence of heat setting on fibre behaviour.	**9**
IV	**High performance fibres:** Polymerization, spinning of high performance fibres and their applications. Modified Synthetic Fibres: Differentially dyeable fibres,	**9**

	Antistatic fibres, Flame retardant fibres, Micro fibres Bicomponent fibres - Cationic dyeable polyester, Polyblend fibres, Tencel . **Quality Control:** Methods for Molecular weight measurements, Thermal characteristic measurements. Testing of filament yarns and staple fibres- denier, tenacity, elongation modulus. - draw force, shrinkage force.	

Text Books:

1. Vaidya A A, "***Production of Synthetic fibres***", Prentice-Hall of India Pvt. Limited., New Delhi (1988).
2. Mclntyre. J.E, " Synthetic Fibres", Univ of Leeds, UK,(2000)

Reference Books:

1. Gupta V R and Kothari V K, "***Manufactured fibre Technology***", Chapman & Hall Pubilication, (1997).
2. Klein W, "***Man Made Fibres and their processing***", Vol.6, The Textile Institute, (1996)

TE- 402: TEXTILE CHEMICAL PROCESSING-I

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart overall knowledge about the concepts of textile wet processing, pretreatment before wet processing for textiles and to teach dyeing technology, printing technology and finishing technology for textiles.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Overview, flowsheet and justification of chemical processing of textile materials and blend, prelims of preparation: grey testing-stamping-mending-stitching, Overview on the chemical processing of knitted fabrics. **Singeing and Desizing:** Objectives, suitability of material. Singeing methods: plate, roller and gas singeing, merits and demerits, precautions, advancement, bio-singeing. Objectives and methods of desizing: hydrolytic & oxidative processes, viz. rot, acid, enzyme, chlorine. Chlorite and bromire methods, influence of controlling parameters, merits and demerits of each method; mechanism of removal of starch in all these processes, evaluation of desizing efficiency.	**8**
II	**Scouring:** Objective, impurities in cotton and their chemical nature and possible methods of removal, importance of alkali scouring, surfactants, enzymatic scouring. Factors affecting scouring, methods of scouring, different scouring equipment e.g., High pressure kier, steamer, their construction, working principle, capacity, solvent scouring, scouring of colored cotton, method of evaluation of scouring efficiency **Bleaching:** Objective, classification of bleaching methods, different bleaching agents, their relative merits and demerits, hypochlorite, chlorite, peroxide bleaching, their mechanisms, bleaching parameters, methods of bleaching, role of chemicals used in bleaching, method of evaluation of bleaching efficiency, principle/mechanism, properties, and method of application of optical whitening agents.	**9**
III	**Mercerization:** Objectives, mechanism related to various physical and chemical changes in cotton during mercerization.Process parameters and operation, causticization.	**9**

	Barium activity number, its determination& interpretation. Wet and hot mercerizati on. Ammonia treatment of cotton. Performance of different mercerization processes Treatment with liquid ammonia: Objective, methods, relative merits and demerits, evaluation. **Heat setting:** Objectives, types, mechanism of setting in each type. Heat setting conditions, controls and efficiency. Heat setting of polyester, nylon, acetate and their blends, machines involved in heat setting, Evaluation of heat setting efficiency	
IV	**Mechanical Finishes**: Introduction to finishing, its importance and classification. Physical and chemical softening processes, selection of chemical and evaluation of softening. Calendaring – objectives, its types, construction and function of various calendaring m/c; Influencing parameters of calendaring. Sanforizing – objectives, method, mechanism and machineries involved. Evaluation of sanforizing. **Chemical finishes:** Problem of creasing, anti-crease finish on cotton. Choice of chemical, catalyst and process parameters. Drawback and advantages associated with use of various anti-crease chemicals. Measures to reduce release of formaldehyde. Water repellency and water repellent finishes on cotton. Evaluation of water repellency, flame retardant finish, anti-static, anti-pilling, Novel finishing techniques: elementary idea of enzymatic finish, plasma treatment, Nano finishing and micro-encapsulation	**8**

Text Books:

1.Shenai V.A, ***"Technology of Bleaching and Mercerisation***", Sevak Publications, Mumbai (1991)

2.Peters R. H, "***Textile Chemistry***", Vol - II, Elsevier Publishing Company, London (1967).

3.Karmakar S R, ***Chemical Technology in Pre-Treatment Processes of Textiles***, Elsevier, Publishing Company, London (1999).

Reference Books:

1. Nunn D M, "***The Dyeing of Synthetic Polymer and Acetate Fibres***", Dyers Company Publication Trust, London (1979).
2. Mittal R M and Trivedi S S, "***Chemical Processing of polyester / cellulosic Blends***", Ahmedabad Textile Industries Research Association, Ahmedabad, India.

TE – 403: YARN MANUFACTURE-II

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the design, constructional details and working principles of spinning machines (comber, speed frame, ring frames, alternative spinning systems) and to educate the inter-relationship of the process of conversion of fibres to yarns and the related machinery features.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Combing process**: Objectives, combing for shorter and medium varieties of cotton, cottons suitable for combing, preparation of stock for combing, combing cycle, role of machine components and settings. **Noil extraction** at backward feed and forward feed comber, mathematical problems, norms, performance assessment. Machine and labour productivity. Recent developments	**9**
II	**Process related to roving formation**: Objectives, functions of different machine components and high drafting system, roving twist in speed frame, winding principles and equations related to bobbin leading and flyer leading, **Building motion**: Cone profile, numerical problems, norms, performance assessment. Machine and labour productivity. Developments in speed frame	**8**
III	**Ring spinning Process**: Function and mode of operation of ring frame, role of drafting system, yarn guiding devices, forces acting between ring and traveler, yarn tension variation, balloon tension at maximum diameter, tasks of traveller, limiting speed, classification, form of traveler, traveler mass and material, different ring-traveller combinations, fiber lubrication, running on new-ring. **Winding process:** Cop building, cylinder and conical tip, spinning geometry, causes of end breaks, numerical problems, norms, and performance assessment. Machine and labour productivity. Latest developments including compact spinning.	**9**

IV	**Non-conventional spinning processes**: Principle of open end spinning, rotor spinning, chief organs and their functions, yarn properties in comparison with ring-spun yarn. **Friction and air jet spinning**: Principle of friction spinning, function of chief organs, yarn properties and comparison of Dref-II and Dref-III friction spinning machines, basic principle to air jet spun yarn, functions of chief organs, yarn properties, numerical problems, norms, performance assessment. Machine and labour productivity.	**8**

Text Books:

1. Klein W, "***Manual of Textile Technology***", The Textile Institute (1995).
2. Khare A R, "***Elements of Combing***", Sai book center, Mumbai (1999).

Reference Books:

1. Khare A R "***Elements of Ring Frame and Doubling***", Sai book Centre, Mumbai (2000).
2. Salhotra K R, "***Spinning of Man Mades and Blends on Cotton System***", The Textile Association of India, Mumbai (1989).
3. Chattopadhyay R and Rengasamay R, "***Spinning: Drawing, Combing and Roving***", NCUTE-Pilot Programme (1999).

TE – 404: FABRIC MANUFACTURE-II

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the design, constructional details and working principles of spinning machines (comber, speed frame, ring frames, alternative spinning systems) and to educate the inter-relationship of the process of conversion of fibres to yarns and the related machinery features.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Let-off System**: Objective and types, types of tension variation, Warp and cloth control, different types of let-off systems, control of tension variation. **Take-up:** Objective, Types of take-up and their mechanisms, periodic faults, anti crack motion, dividend calculation, and control of pick density, calculation related to it.	**8**
II	**Warp Stop**: Objective, Types of warp stop motions and their functioning, mechanism, advantage and disadvantage. Weft Stop: Objective, Types of weft stop motions and their functioning, mechanism, advantage and disadvantage. **Warp protector**: Objective, Types of warp protector motions and their functioning, mechanism, advantage and disadvantage. Temple: objective, importance and types.	**9**
III	**Weft Replenishment System**: Pirn replenishment mechanism: Cimmco and Ruti C, its limitations, different types of feelers used for it. Shuttle changing mechanism, bobbin loader mechanism and automatic loom winder. **Box changing motion**: Objective, types, its advantage and disadvantage, Working mechanism of multiple box motions: weft mixing, cow burn, sliding gear box, pick at will	**8**
IV	**Dobby:** Scope of dobby, different types of dobby: Keighley, climax, cam, paper, rotary, positive, cross border and their mechanism pegging system as per design of weave. **Jacquard:** Scope of jacquard, working of different types of jacquards: single lift	**9**

	single cylinder, double lift single cylinder, double lift double cylinder and electronic jacquard. Harness ties and design ties, card punching machine**.**	

Text Books

1. Mark R and Robinson A T C, "***Principles of Weaving",*** The Textile Institute, Manchester (1986).
2. Talukdar M K, Srirammulu P K and Ajgaokar D B, "***Weaving – Machine, Mechanism and Management***", Mahajan Publisher Private Ltd., Ahmedabad, India (1998).

Reference Books:

1. Aswani K T, "***Fancy Weaving mechanism***", Mahajan Publisher Private Ltd., Ahmedabad, India (1990)
2. Lunenschloss J and Albrecht W, "***Non-woven Bonded Fabric***", Ellis and Horwood Ltd, U.K. (1985).
3. Lord P R and Mohamad M H, "***Weaving: Conversion of Yarn to Fabric***", Merrow Technical Library, UK (1988).

HS-410: LAW FOR ENGINEERS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Constitutional Law:** Nature of Indian Constitution (features), fundamental rights, duties and directive Principles of State Policy (DPSP's), forms of Governments, structure of Government of India, role and responsibility of executive, legislature/parliament and judiciary, nature of Indian federal system, center state and relations. Basic structure of the Indian constitution, basic features of the Indian, constitutional amendments – Golak Nath, Keshwananda Bharti, Maneka Gandhi (1978) and S.R. Bommai case (1994), (floor test).	6
II	**Law of contract:** General principles of Indian Contract Act, 1862, kinds of Government contracts and dispute settlement, standard and printed form of contract, essential elements of valid contract proposal, acceptance communication and revocation thereof, relevance of time in contractual obligation. Main objectives of Arbitrates and Conciliation Act-1996, tort and law of tort, general principles of tort law, classifications of torts: property vs. person.	6
III	**Administrative Law:**Evolution, nature and its scope, conceptual objection against growth of administrative rule of law and separation of power, clarification of administrative actions, judicial review of administrative actions, exclusion of judicial review and concept of "Ombudsman";Right to Information Act, 2005 (Sub Section 1 - 20). **Environmental Law:**Definition, meaning and its nature, environmental (Protection) Act-1986, Water (Preservation and Control of Pollution) Act-1974, Air (Prevention	8

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	and Control of Pollution) Act-1981; Environmental pollution, overall remedies and procedures.	
IV	**Human Rights:** Legality of human rights, universal declaration of human rights, 1948, difference between civil and political rights, individual and human rights - human rights of child, weaker section of society, prisoners, and refugees, International Human Rights Commission.	**6**

Text Books:

1. D.D. Basu, Shorter Constitution of India, Prentice Hall of India, (1996).
2. Meena Rao, Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset, (2006).
3. H.O. Agarwal, International Law and Human Rights, Central Law Publications, (2008).

Reference Books:

1. H.M. Seervai, Constitutional Law of India, Tripathi Publications, (1993).
2. S.K. Kapur, Human Rights under International Law and Indian Law, Central Law Agency, (2001).
3. Neelima Chandiramani, The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mum, (2000).
4. Avtarsingh, Law of Contract, Eastern Book Co., (2002).
5. Anson W.R.(1979), Law of Contract, Oxford University Press.

HS-411: GERMAN LANGUAGE – II

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs
Prerequisite							
HS 302: GERMAN LANGUAGE - I							

COURSE CONTENTS:

Unit	Contents	No. of hours
I	Wichtige Sprachhandlungen: Zimmersuche, Möbel **Grammatik**: VerbenmittrennbarenVorsilbenim Präsens und Perfekt. Verbenmittrennbaren Vorsilben und Modalverbenim Präsens. Verbenmituntrennbaren Vorsilbenim Perfekt. Unregelmäßige undgemischte VerbenimPerfekt.	**6**
II	Wichtige Sprachhandlungen: Kleidung ,Farben, Materialien. **Grammatik:** formelleImperativsätzemit "Sie" informelleImperativsätzeVorschlägemit "wir" – "sollen/wollenwir" - Sollich? Modalpartikeln "doch""mal" "doch mal.	**6**
III	WichtigeSprachhandlungen: Sehenswürdigkeite (Prater, BrandenburgerTör,Kolossium, Eifeltürm) **Grammatik:**OrtsangabenmitAkk. undDativ "alle","man" Indefinitepronomen"etwas", "nichts".	**6**
IV	WichtigeSprachhandlungen: Essen und TrinkenimRestaurant, Partyvorbereitung und Feier.	**6**

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	Grammatik: NomenausAdjektivennach “etwas”und “nichts” NomenausdemInfinitiv von Verben, zusammegesetzteNomen und ihreArtikel. Adjektiveim Nom.und Akk.nachunbestimmten Artikel, Negativartikel und Possessivartikel.	

Text Book:

1. Studio d A1. Deutsch alsFremdsprache with CD.(KursbuchundSprachtraining).

Reference:

1. German for Dummies
2. Schulz Griesbach

HS-412: FRENCH LANGUAGE - II

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs
Prerequisite							
HS 303: FRENCH LANGUAGE - I							

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Grammar and Vocabulary**: The second group verbs: Finir, rougir, grossir, grandir. "Les preposition de temps": à, en, le, de 7h à 8h, jusqu' à, vers. Listening and Speaking – the semi- vowels: Voilà, pollutant. Writing - thedays of the week, months, technical subjects, time, "les spécialitésscientifiques et l' annéeuniversitaire, paragraph writing about time table. **Reading:** Reading of the text and comprehension – answering questions.	**6**
II	**Grammar and Vocabulary**: The adjectives, the nationality, feminine & masculinenoun forms "les métiersscientifiques". Listening and Speaking – Vowels: soirée, année, près de, très. Writing: Countries name, nationality, "les métiersscientifiques", numbers from:69 to infitive and some measures of unit. Reading Comprehension: reading a text.	**6**
III	**Grammar and Vocabulary:** near future, The demonstrative adjectives, Express the aim by using the verb, Listening and Speaking –"La liaison interdite – enhaut". Writing – some scientific terms, French expressions to accept an invitation. Sentence framing. Reading Comprehension – reading a text.	**6**
IV	**Grammar and Vocabulary:**the verbs: manger, boire, the partitive articles **Listening and Speaking:** "le 'e' caduc Writing- the food, the ingredients, fruits,	**6**

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	vegetables, expression of quantity, paragraph writing about food habits. Reading – reading a text.	

Text Book:

1. Tech French

Reference:

1. French for Dummies.
2. French made easy: Goyal publishers.
3. Panorama.

TE- 405: TEXTILE CHEMICAL PROCESSING-I LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester:

List of Experiments

1. Desizing of cotton material.
2. Scouring of cotton goods
3. Scouring of polyester goods
4. Scouring of P/C blended goods
5. Scouring of wool fibre
6. Scouring of woven cotton fabric using Jigger
7. Bleaching of cotton with H2O2
8. Bleaching of cotton with NaClO2
9. Bleaching of cotton with NaOCl
10. Bleaching of Polyester
11. Bleaching of P/C blend
12. Bleaching of jute yarns / fabric
13. Bleaching of knitted cotton fabric using Winch
14. Degumming of silk
15. Mercerisation of cotton material

TE – 406: YARN MANUFACTURE - II LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. To estimate head to head difference in noil level & study the effect of feed per nip on percentage in nep level during combing. (mill based study).
2. To study the drafting, twisting and winding zone of speed frame.
3. To study the building motion in speed frame & the differential motion of speed frame.
4. Calculation of bobbin speed, break draft constant, draft constant and twist constant and production of speed frame.
5. To study the influence of machine and process parameters on roving unevenness (mill based study).
6. To study the drafting, twisting, winding zone and the building motion in ring frame.
7. Calculation of draft constants, twist constant, coils per inch and production of ring frame.
8. To ascertain the effect of break draft and total draft on yarn unevenness and strength (mill based study).
9. Estimation of spinning tension as a function of traveller weight, yarn count and balloon height (mill based study).
10. To perform various settings and maintenance operation on ring frame such as:
    - ❖ Ring rail levelling
    - ❖ Spindle gauging
    - ❖ Spindle eccentricity
    - ❖ Lappet eccentricity
11. To study the influence of spindle speed and traveller weight on hairiness.
12. Study the chief organs, mechanism and calculations of open end and friction spinning machines.
13. To study the timing diagram of a comber and the nature of movement of nipper assembly
14. To study the function of top comb and its depth of penetration with reference to noil extraction and fractionating efficiency (mill based study).
15. To study the effect of type of feed and detachment setting on noil percentage and fractionating efficiency.

TE – 407: FABRIC MANUFACTURE - II LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. Study of take up motion and calculation of loom take up constant.
2. Study of let-off system in a loom.
3. Study of warp stop motion in a loom.
4. Study of weft stop mechanism.
5. Study of Warp protection motion in a loom.
6. Study of temple motions in a loom.
7. Study of selvedge formation in shuttle loom.
8. Study of pirn changing mechanism in a loom.
9. Study of loom winder mechanism in a loom.
10. Study of shuttle changing mechanism in a loom.
11. Study of multiple box motion in a loom.
12. Identification of fabric faults by fabric inspection machine.
13. Study of Dobby loom
14. Study of Jacquard loom.
15. Preparation of various designs by using Jacquard Punching Machine.

MC – 401: ORAL AND WRITTEN COMMUNICATION SKILLS LABORATORY –II

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Practicals:

1. Phonetics: Organs of speech, speech sounds, symbols, articulation of speech sounds- stress and intonation.
2. SWOT analysis (Personal / Organization)
3. Group discussion
4. Debate
5. Vocabulary improvement programs
6. Technical write up based on critical thinking (On subject allocated by coordinator)
7. Telephonic etiquettes: Preparing, Controlling and Follow up.

RECOMMENDED BOOKS:

1. Developing Communication Skills: by Krishan Mohan & Meera Bannerji
2. Group Discussions by Sudha Publications And Ramesh Publishing House, New Delhi
3. Vocabulary Improvement: Words Made Easy: by Diana Bonet
4. Word Power Made Easy: by Norman Lewis

SEMESTER – V

TE – 501: THEORY OF TEXTILE MACHINES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 Hrs

COURSE OBJECTIVE:

To know about various machine parts, its mechanisms, benefits of different cams and follower motions scheme and to construct cylindrical cam profiles graphically. To impart Knowledge on kinematic properties of gears, design of several types of belt and chain drives balancing and also about basic concepts of vibrations caused due to unbalance of rotating mass.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Basic concepts**: Kinematics of machine, kinematics link and their different type, types of kinematics pair, degree of freedom, kinematics chain, mechanism and inversion of four bar chain, single slider and double slider crank mechanism. **Velocity Analysis**: Motion of a link, velocity of a point on a link by relative velocity method, velocities of four bar mechanism, single slider crank mechanisms, rubbing velocity at a pin joint. Velocity of a point on a link by instantaneous centre method, properties and types of I-centre, Kennedy theorem and methods of locating I-centres in a mechanism.	**10**
II	**Belt, rope and chain drive**: Types of belt drives, velocity ratio, law of belting, concept of slip and creep, length of belt, ratio of driving tensions for flat belt and v-belt, power transmitted, effect of centrifugal tension on power transmission, condition for maximum power transmission, initial tension in the belt. Use of V-belt, rope, chain, chain length and angular speed ratio, relative advantage and disadvantage of chain and belt drives. **Gears**: Classification of gears, terminology used in gear, law of gearing, velocity of sliding, forms of teeth, construction, properties and comparison of an involute and cycloidal teeth, effect of centre distance variation on the velocity ratio, length of path of contact, arc of contact, number of pairs of teeth in contact, interference, minimum number of teeth on the pinion and wheel to avoid interference, minimum number of teeth on the pinion for involute rack to avoid interference, undercutting, terminology of helical and worm gears.	**9**

III	**Gear trains:** Definition, types: simple, compound, reverted and epicyclic gear trains, velocity ratio of epicyclic and compound epicyclic gear trains. **Cams and follower**: Types of cams and followers, cam terminology, types of motion of the follower, analysis of motion of the follower, analysis of motion of the follower for cams with specified contours.	**9**
IV	**Flywheels**: Turning moment diagram for steam engine, four stroke internal combustion engines, fluctuation of energy, maximum fluctuation of energy, coefficient of fluctuation of energy, energy stored in flywheel, use of flywheel. **Application in Textiles**: Belts, chains and gear drives in textile machines. Different types of cam and followers used in textile machines.	**8**

Text Books:

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

Reference Books:

1. Ghosh A and Mallik A K, "***Theory of mechanism and machines***", Affiliated East West Press Pvt. Ltd, New Delhi, 198
2. Bevan T, "***The Theory of Machines***", CBS Publishers and Distributors, New Delhi, 2002.

TE – 502: TEXTILE TESTING-I

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the working principle and standard test procedures of various testing instruments for measuring the properties of fibre/yarn and to educate on the analysis and the interpretation of test results for taking appropriate further actions.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction**: Aim and scope of testing, Sample and Population, Sampling techniques for fibre, yarn and fabrics, Sampling Error **Moisture in Textiles**: Absolute humidity, Relative Humidity, Moisture content, Moisture regain, Factors affecting regain of textile materials, effect of moisture on fibre properties, measurement of atmospheric conditions, Shirley moisture meter.	**8**
II	**Testing of Fibres**: Measurement of Length distribution of Cotton fibre, fineness, maturity, neps, strength, elongation, trash-content, fibre contamination measurement, grading of different cotton, application of HVI and AFIS, measurement of fiber friction and crimp	**8**
III	**Testing of Yarn**: Yarn numbering and conversion system, Importance and measurement of Yarn twist in continuous filament, spun and plied yarns. Tensile testing: Properties, various type of measuring instruments and their working principles, factors affecting tensile properties, elastic recovery, effect of impact loading and fatigue behavior, yarn friction.	**9**
IV	**Evenness testing** of yarns, nature and causes of irregularities, principles and methods of evenness testing, evaluations and interpretation of evenness results, concept of index of irregularity, variance length curves and spectrogram analysis. Yarn faults, classification, Classimat fault analysis utility and principle of different types of instruments. Yarn hairiness, principle of measurement, measuring instruments.	**9**

Text Books:

1. Saville B P, ***"Physical Testing of Textiles***", Woodhead Publishing Ltd, Cambridge (2002)

2. "***Textile Fibers: Developments and Innovations"***, Ed V K Kothari, IAFL Publications, New Delhi (2000).

Reference Books:

1. Booth J E, "***Principles of Textile Testing***", CBS Publishers and Distributors, New Delhi (1999).
2. Angappan P and Gopalakrishnan R, "***Textile Testing***", SSM Institute of Textile Technology, Komarapalayam (2002).
3. Basu A, "***Textile Testing***", SITRA Coimbatore (2002).

TE – 503: TEXTILE CHEMICAL PROCESSING- II

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge about colour measurements, dyeing and printing of textile materials and to teach the design, constructional and operational features of textile dyeing and printing machinery.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Theories of Colour and Dyeing:** Additive and subtractive theories. Primary, secondary, tertiary, complementary and contrasting colours. Tristimulus values. Metamerism/ isomerism, colour-co-ordinates, CIELAB values, Reflectance factor, Kubelka-Munk equation, computer colour matching. Dye-fibre interaction, free volume theory. **Dyeing of Textiles**: Introduction to thermodynamics and kinetics of dyeing, Dyeing technology of natural and manmade textiles with direct, reactive, vat, insoluble azoic, Sulphur and indigosol, acid, metal-complex, basic and disperse dyes. Auxiliaries used in dyeing, Dyeing with Pigments. Dyeing machinery	**9**
II	**Dyeing of Blends:** Classification of blends, shades and methods for dyeing of blends. Suitability of each method for dyeing of specific blend. **Denim Processing:** Introduction. Denim fabric construction. Indigo dyeing machines – rope, sheet and loop form. Dyeing technology for denim with indigo. Precautions in Indigo dyeing. Yarn requirements for quality denim fabrics. Finishing and washing of denim fabric. Types of denim fabrics.	**8**
III	**Styles of printing:** Direct, Resist (mechanical and chemical) and Discharge printing on natural and synthetic fabric. Printing of cotton with reactive dyes, wool, silk, nylon with acid and metal complex dyes, Printing of polyester with disperse dyes. **Methods of printing:** Block –Flat-bed Screen – Rotary – Roller – Ink-Jet (digital) – Transfer (wet and heat) – Photographic printing. Pigment printing – Printing of blends. Printing thickeners and auxiliaries. After treatment for printed materials	**9**
IV	**Identification of dyes:** Identification of dye on dyed natural and manmade textiles.	**8**

	Washing and drying: Importance, Washing ranges, Fabric handling devices, Drying: Introduction and types. Mechanical drying mangling, suction drying and centrifuging. Thermal drying – cylinder drying, stenter drying and radiation drying; merits and demerits of each method.	

Text Books

1. J N Chakraborty "***Fundamental and Practices in Coloration of Textiles"*** Published by Woodhead Publishing India Pvt. Ltd.
2. Miles L W C, "***Textile Printing***", Dyers Company Publication Trust, Bradford, England (1981).
3. Shenai V A, "***Technology of Printing***", Sevak Publications, Mumbai (1990).

Reference Books:

1. Hall A J, "***Textile Finishing***", Haywood Books, London (1996).
2. Shenai V A and Saraf N M, "***Technology of Textile Finishing***", Sevak Publications, Mumbai (1990).
3. Nunn D M, "***The Dyeing of Synthetic Polymer and Acetate Fibres"***, Dyers Company Publication Trust, London (1979).

TE – 504: NON - CONVENTIONAL YARN MANUFACTURE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the design, constructional details and working principles of Non – conventional spinning machines (rotor, air-jet, friction, compact and other spinning systems) and to educate about the difference and inter-relation among the properties of different yarn structures.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Fibre characteristics requirements for different leading spinning technologies. Possibilities and limitations of different spinning technologies.	9
II	**Rotor Spinning**: Principle and raw material preparation. Specifications of different organs and effect of each on the process and product quality. New developments. Assessment of Rotor spun yarn structures and properties **Air-jet Spinning**: Principle and raw material preparation. Process and machine parameters affecting product quality. Principle of vortex yarn manufacture. Difference between air jet spun and vortex spun yarn structure.	8
III	**Friction Spinning**: Principle and raw material preparation, process and machine parameters affecting product quality. Assessment of DREF-II and DREF-III yarn structures and properties. **Compact Spinning**: Principle and raw material preparation. Comparative assessment of the structure and performance with respect to ring yarn.	8
IV	**Other Spinning system**: Self twist, twist less, warp spinning, Electrostatic spinning, Core spinning, Siro spinning, Bobtex yarn manufacture, solo spun yarn manufacture. New Developments	9

Text Books:

1. Salhotra K R and Ishtiaque S M, "***Rotor Spinning: Its advantages, limitations and prospects In India***", 1st Ed; National Information Centre for Textile and Allied Subjects (1995).
2. Klein W, "***Manual of Textile Technology***: ***New Spinning Systems***", 1st Ed; The Textile Institute, Manchester, UK (1993).

Reference Books:

1. Lawrence C A, ***"Fundamentals of Spun Yarn Technology***", 1st Ed; CRC Press LLC, Florida, USA (2003)
2. Chattopadhyay R and Ishtiaque S M, "***Advances in Yarn Manufacturing Process***", Department of Textile Technology, IIT Delhi (1991).
3. Hearle J W S, Hollick L and Wilson D K, "***Yarn Texturing Technology***", Woodhead Publishing Ltd., UK (2002).

TE – 505: NON - CONVENTIONAL FABRIC MANUFACTURE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the design, constructional details and working principles of Non – conventional spinning machines (rotor, air-jet, friction, compact and other spinning systems) and to educate about the difference and inter-relation among the properties of different yarn structures.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Preparation of Yarn for Shuttle less weaving**: Winding, warping, sizing and weft preparation Limitation of shuttle looms-parameters affecting productivity-Classification of shuttleless looms- Comparison of shuttle and shuttleless looms - warp and weft yarn requirement for shuttleless weaving. Knotting machines - Weft accumulators – types- Formation of unconventional selvedges – tuck-in, leno, chain, fused and adhesive. Techno economics of Shuttleless weaving.	8
II	**Gripper projectile machines**: Working elements and weft insertion cycle in projectile loom, Torsion bar picking mechanism-Weft selection device-Salient features of projectile machine, Loom timing diagram, Loom timing, Fabric defects and remedies. Weft insertion rate and calculation related to torque, selvedge formation. **Air jet weaving Machine** - Principle of air jet weaving, Sequence of weft insertion in air jet loom. Types of confuser guide, nozzles, profile reed. Air requirements. Loom timing diagram Problem in air jet weft insertion. Fabric defects and remedies. Weft insertion rate and production calculation. Waterjet weaving Machine Principle of water jet weaving – Weft insertion system – Nozzles - Water requirements – Loom timing diagram, Fabric defects and remedies. Weft insertion rate and production calculation.	9
III	**Rapier Machines**: - Classification of rapier weaving machines: Flexible, Rigid rapiers, Principles of tip and loop transfer-Weft insertion cycle-Rapier drives-Salient features, two phase double acting rapier. Velocity of the rapier. Loom timing. Fabric defects and remedies. Weft insertion rate and production calculation **Multi-phase Weaving Machine**: Basic concept of multiphase weaving. Shedding	9

	operation in warp way and weft way multiphase loom. Advantages and disadvantages of multiphase weaving process, circular loom, yarn path and weft insertion in circular loom.	
IV	**Narrow Fabric Loom:** Different type of narrow fabrics. Mechanism of weft insertion and fabric formation in narrow fabric weaving machine. **Carpet Weaving**: Woven carpet, design and process of manufacturing carpets, raw material used technical specifications and its uses.	**8**

Text Books:

1. Marks R and Robinsons A T C, "***Principles of weaving***", Textile Institute, UK (1986).
2. Lord P R and Mohamad M H, "***Weaving: Conversion of Yarn to Fabric***", Merrow Technical Library, UK (1988).

Reference Books:

1. Ormerod A, "***Modern preparations and weaving machinery***", Buttersworth and co., UK (1983).
2. Talavasek O and Svaty V, "***Shuttleless weaving machine***", Elsevier Scientific Publishing Co., Amsterdam (1981).
3. Lunenschloss J and Albrecht W, "***Non-Woven Bonded Fabric***", Ellis and Horwood Ltd., UK (1985)
4. ***Woven Fabric Production*** – II, NCUTE, New Delhi 2002
5. Textile Design and Colour, Book by William Watson
6. Watson's ***Advanced Textile Design*** by Z Grosicki

TE – 506: PROPERTIES OF FIBRE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

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

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Fiber structure**: Traditional view of fibre structure- Two-phase models: The fringed micelle, The fringed fibril, Chain folding, Continuous structure models and Intermediate views. Degree of order and degree of orientation. **Structure investigation**: Methods of investigation of fibre structure. Identification of chemical structure by IR spectroscopy. Identification of physical structure by X-ray, Electron Microscopy, NMR.	9
II	**Moisture absorption**: Definitions of humidity, moisture regain and moisture content. Relation between regain and relative humidity. Effect of stress and temperature on regain. Heat of sorption. Swelling of fibres. Quantitative theory of moisture absorption. **Fibre friction**: Technological importance. Static and Kinetic Friction, Nature of Friction, Fibre on Fibre Friction and Fibre on other material Friction. Measurement of friction. Factors affecting Coefficient of friction, Effect of load and area of contact, Lubrication	9
III	**Tensile properties**: Ideal Stress-strain behavior, Deviation from ideal stress strain behavior, stress strain behaviour of commercial fibres, effect of external and structural factors on stress-strain behaviour of fibres, Different experimental methods, Factors influencing results of tensile experiment. Weak link effect theory. Elastic recovery. Effect of test conditions on recovery. Cyclic testing. Fibre fracture and fatigue. **Viscoelastic Properties**: Molecular mechanism of viscoelastic behaviour, Creep and stress relaxation. Models of viscoelastic behaviour: Kelvin and Maxwell	9

	model. Bending and torsional properties of fibre. Structural effect on extension behaviour. Dielectric properties: Definition and effect of different parameters on dielectric properties.	
IV	**Electrical Properties:** Basic concept of Electrical conductivity, Electrical conductivity of polymer fibres, effect of different factors on the electrical resistance of fibres. Static electricity: Introduction and significance. Measurement of static electricity. Explanation of static phenomena. Anti-Static treatment. **Optical properties**: Polarization and Light, Refractive index and birefringence. Birefringence and orientation of fiber. Reflection and lustre, Absorption and dichroism. Thermal properties: Thermal methods: DSC, DMA/TMA & TGA. Structural changes on heating. Thermal transitions: first and second order transition. Free volume theory, factors affecting glass transition temperature. Melting, Factors affecting melting temperature	**9**

Text Books:

1. Zhang X, " ***Fundamental of fibre Science***", DEStech Publications, Inc (2014)
2. Morton W E and Hearle J W S, "***Physical Properties of Textile Fibres***", 1st reprint, The Textile Institute, Manchester (1993)

Reference Books:

1. Gupta V B and Kothari V K, "***Manufactured Fibre Technology***", 1st Ed., Chapman and Hall, London (1997)
2. Hearle J W S, "***Polymers and their properties",*** Vol. I, John Wiley and Sons, NY (1982)
3. Gedde U W, "***Polymer Physics***", Chapman Hall, London (1995).\

OPEN ELECTIVE-III

TE-507: GEOTEXTILES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge regarding Geotextile, selection of right type of fibre, yarn and fabric for the end-use application of geotextile. To teach about the pre-requisite performance properties of textiles to be used as Geotextile.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction**: Usefulness of geotextiles, Classifications, Essential properties of geotextiles **Geosynthetics** types, functions and application areas of geotextiles, fibres and fabric selection criteria for geotextile applications	7
II	**Natural Fibre Geotextiles**: Development of natural materials as geotextiles, Natural fibres Applications for natural geotextiles. **Engineering properties of geotextiles**, Performance of natural fibre geotextiles for soil strengthening	7
III	**Mechanics** of reinforcement, filtration and drainage by geotextiles and functions, material construction and manufacturing processes in case of geotextiles. **Evaluation** of geotextiles with and without soil, evaluation of filtration and drainage functions, reinforcement, creep, moisture barrier characteristics, durability and ageing.	7
IV	**Application of Geotextile**: Geotextiles and reinforced soil structures: Retaining walls, embankment, foundation. Geotextiles in roads and railways: separation, draining and filtering. **Geotextiles in environmental control**: covers and liners, landslides, and erosion control.	7

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Text Books:

1. Ed. A R Horrocks and S C Anand **"*Handbook of Technical Textiles*"**, Woodhead Publication Ltd., Cambridge, 2000.
2. Ed. G V Rao and G V S Raju, **"*Engineering with Geosynthetics*"**, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1990.
3. R. W. Sarsby, ***Geosynthetics in Civil Engineering***, Woodhead Publishing Series in Textiles No. 57, UK, 2011.

Reference Books:

1. S. Adanur, Wellington Sears **"*Handbook of Industrial Textiles*",** 6th edn, New York, Technomic, 1995.
2. John N W M, **"*Geotextiles*",** Blakie, Chapman and Hall, New York, USA, 1987.

TE-508: FILTERS AND FILTRATION TEXTILES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge in Filtration, mechanics of dust collection, Different types of filter media used, Purification & separation of Gases, solid, oil and Liquids.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Basic Principles**: Filtration and Separation, Contaminants, Surface and Depth Filtration. Filter Ratings and Filter Test, Dust collection – Theory and Principles, Practical implications, cleaning mechanisms Fabric design and selection considerations. **Filter Media**: Introduction, Absorbent, Adsorbent and Biological Filter Media, Paper and Fabrics, Woven Wire and Screens, Constructed Filter Cartridges, Membranes, Packed Beds. Types of Filters.	7
II	**Textile Filters & Finishing Treatments**: Fabric construction (woven fabrics, needlefelts, knitted fabrics), Heat Setting, Singeing, Raising, Calendaring, Chemical Treatments, Special Surface Treatments. **Liquid and Oil Filtration**: Water filters, Waste Water Treatments, Surface Treatment Chemicals. Oil and Hydraulic Systems: Engine filters, Oil-water separators, Oil cleaning and Hydraulic Systems. Gas filtration. Introduction, Engine Filters, Oil–water Separators, Oil Cleaning, Hydraulic Systems.	7
III	**Textile Filter in Solid-Liquid Separation** – Introduction, Fabric Design/Selection Consideration, Filtration Equipment Considerations. Yarn types and fabric constructions - Monofilaments, Multifilaments, Fibrillated tape ('split film') yarns, staple-fibre yarns.	7
IV	**Gas Filtration**: Introduction, Indoor Air Quality, Fume and Vapour Emissions, Dust Collectors, Machine Air Intake Filters, Vehicle Cabin Filters, Compressed Air Filtration, Pneumatic Systems, Sterile Air and Gas Filters, Respiratory Air Filters.	7

Text Books:

1. Ed. A R Horrocks and S C Anand ***"Handbook of Technical Textiles***", Woodhead Publication Ltd., Cambridge, 2000.

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2. A.K Sengupta, *"**Industrial Applications of Textiles: Textiles for Filtration & Coated Fabrics***, Vol. 14.
3. ***Progress in Textiles: Science & Technology*** (Vol: 3) edited by Dr V K Kothari and published by the Delhi-based IAFL Publications.

Reference Books:

1. Horrocks A R and Anand S C, **"*Handbook of Technical Textiles***", Woodhead publication and Textile Institute, England, 2000.
2. Ken Sutherland, **"*Filters and Filtration Handbook*",** Butterworth-Heinemann, Elsevier, Burlington, 2008.
3. Philip Brown Christopher Cox, "***Fibrous Filter Media***", 1st Edition, Woodhead Publishing

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TE-509: FASHION DESIGNING

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge on human body measurements, creating pattern, and to develop commercial pattern with design aspect by manipulating the basic pattern and to apply historic costume knowledge to modern fashion design construction.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction to textiles:** Natural and synthetic Fibers – Classification, uses. Types of Yarn and Fabric, fabric design, and uses. **Introduction to Fashion:** Introduction to fashion and apparel design. Origin of fashion, concept, analysis, trends and creations, style-fad-trends. Fashion theories-trickle down, trickle across and bottom up theory, Factors affecting fashion	7
II	**Elements of design**: Basic concept of design, elements of art, Definition of line shape, form, size, space, texture and colour. Structural and decorative dress designing, creating varieties through designs. **Principles of Design**: Definition Harmony, Proportion, Balance, Rhythm, Emphasis.	7
III	**Anatomy for designers:** Human Proportion and figure construction. Methods of determining individual proportions. **Psychology of Cloths:** First impression, role of socio- psychological and economical aspects.	7
IV	**Fashion promotion**, Display of fashion materials**:** Importance, source technique and window display, classic fashion shows. Important fashion centers of the world and India. **Cultural Knowledge:** Societal sense and aesthetics, Indian aesthetics, western medieval aesthetics, Modern and Postmodern aesthetics	7

Text Books:

1. E.P.G Gohl, "***Textile Science***" CBS Publishers & Distributors, New Delhi , (India)
2. Bernard P. Corbman, " ***Textiles Fiber to Fibric***" McGraw-Hill International Editions, Singapore
3. Erwin Model, "***Clothing for Moderns***", Mac Millan Publications, New York (1994).
4. Tate and Sharon Lee, "***Inside fashion design***", Harper Publication Inc., UK (1976).

Reference Books:

1. Mary Kefgen, "***Individuality in Clothing*** – Selection and Personal Appearance", Mac Millan Publications, New York (1981).
2. Mikell P, Grover and E Mory, "***Computer Aided Design and Manufacturing***", Prentice Hall of India Ltd. Delhi (1993).
3. Bhattacharya Anand, "***Garment Technology***", NCUTE, IIT, Delhi (2003)
4. Mikell P, Grover and E Mory, "***Computer Aided Design and Manufacturing***", Prentice Hall of India
5. Mehta P V and Bhardwaj S K, " ***Managing Quality in apparel industry***", Om Book Service, New Delhi
6. Cooklin Gerry, "***Garment Technology for Fashion Designers***", OM Book Service, New Delhi (1997).

TE – 511: TEXTILE TESTING-I LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. To prepare a Bear Sorter diagram and determine the following:
    - Mean Length
    - Effective length
    - Short fibres Percentage
    - Dispersion Percentage
2. Determine 2.5 % S.L., 50 % S.L., and uniformity ratio of a given cotton using fibrograph. Compare the fibrogram of manmade fibre with cotton.
3. Determine the micronaire value of a given cotton sample by Air-Flow method. Convert the result into SI units and give a suitable rating to the fibre sample.
4. Determine maturity coefficient and maturity ratio of a given sample by caustic soda method. Give appropriate rating to the fibre sample.
5. Determine Pressley Index of a cotton sample by Pressley Tester at zero and 3mm gauge length and convert result into tenacity. Compare and comment on the results at different gauge lengths.
6. Determine the bundle strength and elongation of a given manmade fibre using Stelometer. Study the effect of rate of loading on tensile properties of the fibre.
7. Study evenness and imperfection in the given yarn and compare the results with uster statistics. Study the spectrogram and irregularity trace to determine type of irregularity present.
8. Prepare yarns Appearance Boards and compare with ASTM standards.
9. Study the hairiness of a given yarns using Hairiness Tester. Compare the results of Evenness Tester and Hairiness Tester with ASTM grade.
10. Determine coefficient of friction of a spun yarn and see the effect of waxing on coefficient of friction.
11. Determine the Lea C.S.P by Lea CSP Tester and Autosorter and compare the results.
12. Determine the percentage crimp and corrected count with the help of crimp Tester.
13. Determine the crimp rigidity by using hot crimp contraction method.
14. Determine various parameters like 2.5 % S.L., 50 % S.L. Strength, fineness, maturity ratio, uniformity ratio, trash percentage etc by using HVI and AFIS.

TE – 512: TEXTILE CHEMICAL PROCESSING-II LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. To dye cotton with direct dye
2. To dye cotton with reactive dyes
3. To dye cotton with sulphur dyes
4. To dye cotton with vat dyes
5. To dye cotton with Azoic colours
6. To dye wool fibre with
   - Reactive dyes
   - Acid dyes
   - Metal complex dyes
7. To dye polyester with disperse dyes
8. To dye nylon with acid dyes / metal complex dye
9. To dye acrylic with basic dyes
10. To dye silk with acid dyes / acid mordant dyes
11. Identification of dyes on dyed textiles
12. To print cotton fabric with hand block method in direct style, discharge style and resist Style
13. Study of fastness properties of different dyed samples
14. Flame retardant finishing and Water proof finishing of cotton fabric using padding mangle
15. To finish cotton fabric with
    - Water repelling agent
    - Softening agent
    - Urea – formaldehyde
16. Study and working of Jigger, winch, jet and HTHP beam dyeing m/cs. Padding mangles, Garment Dyeing Machine, Fabric Dyeing Machine, Soft over Flow Dyeing Machine and Infra Color Dyeing Machnine. Singeing m/c, J-box, kier, mercerizing machine, loose fibre, yarn and package

TE – 513: NON - CONVENTIONAL YARN MANUFACTURE LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. Study of construction, material flow and working mechanism of rotor spinning.
2. Study of drafting, twisting and winding operation and determination of draft & production of rotor spinning.
3. Estimation of minimum twist required to spin yarn continuously in ring and rotor spinning. Estimation of twist loss in rotor spinning.
4. Effect of opening roller speed on rotor spun yarn characteristics and estimation of fibre breakage by the opening roller of rotor spinning machines
5. Study of operating principle, material flow and various parts of air jet spinning.
6. Study of drafting, twisting and winding operation of air jet spinning.
7. Study the chief organs, mechanism and calculations of friction spinning machines.
8. Study of drafting, twisting and winding operation of friction (Dref II and Dref III) spinning.
9. Study of Compact spinning, methods of fibre compacting, modification and attachments.
10. Assessment and control of variability in ring, rotor and air-jet spun yarns
11. Comparative study of ring, rotor and air jet yarn structure and properties
12. Study of time and motion study.
13. Study the construction, material flow and working mechanism of electrostatic spinning machine.

TE – 514: NON - CONVENTIONAL FABRIC MANUFACTURE LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. To study the positive and negative aspects of shuttle and shuttle less loom.
2. To study the different selvedge formation: Tuck-in, Leno, Fused and Knitted selvedge.
3. To study the working of positive let-off and electronic let-off and their advantages.
4. To study the accumulators used in Shuttleless weaving machines
5. Study of weft preparation for picking in Shuttle less weaving machines
6. To Study the weft insertion mechanism of projectile weaving machine with its advantages
7. Study of weft transmission process to the projectile loom
8. To study the working of Rapier loom system and sequence of weft insertion.
9. Study different methods to drive the Rapier head in a rapier loom
10. To study the working of Air jet loom and sequence of weft insertion in air jet weaving.
11. To study the working principle of confuser, relay nozzle and profile reed
12. To study about the mechanism of Water jet picking system and principle involved in the operation of weft supply system.
13. To study about the circular multi-phase weaving machine, merits and demerits of circular multi-phase weaving machine.
14. Study the mechanism of weft insertion and fabric formation in narrow fabric weaving machine.
15. Study the mechanism of carpet manufacturing process.

TE-515: COMMUNITY PROJECT

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	2	1	30	20	50	3 hrs.

Suggested List of Activities/Projects :

Students are expected to complete a project in groups or alone as deemed fit by the faculty and department. They should work under supervision of Faculty member/s of department, or in collaboration with other departments, or preferably with Industry. The project should demonstrate application of the fundamentals learnt during the course of study and should also be innovative.

TE – 516: SPECIAL MODULE IN TEXTILE ENGINEERING

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	2	0	1	30	20	50	3 Hrs

The course aims at introducing new or highly specialized technological aspects in textile engineering. The course topic and content is likely to change with each offering depending upon the current requirement and expertise available with the department including that of the visiting professionals.

SEMESTER – VI

TE – 601: TEXTILE TESTING-II

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the working principle and standard test procedures of various testing instruments for measuring the properties of fabric/garment and to educate on the analysis and the interpretation of test results for taking appropriate further actions.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Testing of yarn**: Innovations in yarn testing instruments (dynamic, continuous and on-line testing of yarn quality). Testing of Fabric: Measurement of fabric dimensions and other physical properties such as thickness, GSM, cover factor, crimp, and shrinkage. **Fabric Strength testing**: Tensile, Tearing and bursting strength tests, factors affecting test results, Evaluation and interpretation of tensile test results.	**9**
II	**Fabric Comfort**: Introduction, importance and classification of Comfort. Testing of Air Permeability, water permeability, thermal properties and flame resistance properties of fabric. **Fabric handle**: Fabric low stress mechanical properties such as smoothness, stiffness, softness and shear, drape behaviour, factors influencing fabric handle, Kawabata and FAST, Serviceability testing parameters such as abrasion resistance snagging test, honey dew and stickiness measurement.	**9**
III	**Test related to fabric appearance** such as pilling, crease and wrinkle recovery, colour fastness, Barre defect and other fabric defects. **Testing of Garments**: Tests related to garment appearance and performance such as measurement of seam pucker, seams slippage and seam strength etc.	**8**
IV	**Statistical Techniques:** Concept of reproducibility and repeatability, methods pertaining to fibre, yarn and fabric testing, concept of quality, quality assurance, textile product labelling, international quality parameters and standards like Uster standards, AATCC, JIS and ASTM.	**9**

Text Books:

1. Saville B P, "***Physical Testing of Textiles***", Woodhead Publishing Ltd, Cambridge (2002).
2. Booth J E, "***Principles of Textile Testing***", CBS Publishers and Distributors, New Delhi (1999).

Reference Books:

1. Angappan P and Gopalakrishnan R, "***Textile Testing***", SSM Institute of Textile Technology, Komarapalayam (2002).
2. Basu A, "***Textile Testing***", SITRA Coimbatore (2002).
3. "***Textile Fibers: Developments and Innovations***", Ed V K Kothari, IAFL Publications, New Delhi (2000).

TE – 602: TEXTILE DESIGN AND ANALYSIS

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the basics of fabric structure, fabric properties, different weaves and methods of production. To provide knowledge in order to apply colour theory.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Concept of fabric designing through fabric structure and textile printing. Importance of fabric structure and analysis, detection of directions of warp and weft, method of fabric presentation, weaving plans. **Basic Weaves:** Method of construction, features and uses of plain weave and its derivatives, twill weave and its derivatives, Satin and sateen weaves and their derivatives**. Colour Theory:** Light and pigment Theory, Tint, Hue and Shade. **Absorbent Fabrics:** Method of preparation, features and uses of Diamond and Diaper Weaves, Honey comb weaves, Huck-a-back and Mock leno weaves.	**9**
II	**Crepe Weave**: Special feature, construction of the weave, method of preparation of its derivatives and uses. Bedford Cord weaves**:** Method of construction, features, cross-sectional view, derivatives and uses. **Welts and piques:** Special features, construction of weave, mechanism of indentation formation **Stripe and Check Weaves:** Features, criteria for selection of weaves for combination, rules governing the joining of different weaves. Method of preparation and uses.	**8**
III	**Colour and Weave Effect:** Weave and colour combinations, features, method of preparation of Continuous line effect, Hounds tooth, Birds eye, Crows foot, Hair lines and Step pattern. **Terry Weaves:** Definition, classification, process of formation of pile, graphical representation of terry weave. Backed fabrics: Definition, features, classification and usage, warp backed and weft backed cloth, reversible backed fabric, wadded backed fabric.	**9**

	Backed fabrics: special features, construction, methods of insertion of stitch marks, different types of Backed fabrics.	
IV	**Gauze and leno weaves:** special features, mechanism of change in path of warp, methods to produce Gauze weaves, doup and characterstics. **Double Cloth:** Definition, features, classification and uses. Method of preparation of self-stitched and center stitched double cloths, salient feature and uses. Wadded double cloth. **Calculations:** Raw material calculations to produce different weaves. Technical specification of important fabrics.	**9**

Text Books:

1. Groscicki Z J, "***Watsons Textile Design and Colour***", Newnes Buttersworth (1988).
2. Groscicki Z J, "***Watsons Advanced Textile Design",*** Newnes Buttersworth (1989)
3. Gokarneshan N, "***Fabric Structure and Design***", New Age International, New Delhi (2004)

Reference Books:

1. Klibbe J W, "***Structural Fabric Design***", Revised edition, 1965, North Carolina State University.
2. Nisbeth H, "***Grammer of Textile Design***", 3rd Ed., D B Tarapore Wala sons and Co. (1994).

TE – 603: GARMENT TECHNOLOGY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the basics of fabric structure, fabric properties, different weaves and methods of production. To provide knowledge in order to apply colour theory.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Garment Manufacturing**: Introduction, Indian apparel industry. Different garment production systems. Selection of Fabrics: Garment from Woven, knitted and various other fabrics available in market, their characteristics and applications to suit to different purposes **Pattern making**: Introduction to pattern making and garment, Construction. Different terminologies. Drafting, Basic bodies blocks, Muslin pattern. Commercial pattern, Basic block construction, grading of pattern, size, size charts.	**8**
II	**Spreading and lay planning**: Introduction to symmetrical and asymmetrical fabrics, criteria of spreading, mode of fabric spreading, methods of spreading, spreading m/cs. Principles of lay plan, types of lay plan. Marker making Garment Cutting**:** Introduction to cutting room processes, cutting methods and their merit demerits. Bundling system. **Garment Sewing:** Introduction to sewing m/c and its parts, sewing room processes and working details. Different types of sewing m/c and its suitability, Different sewing m/c driving system. Attachment of sewing m/c, Sewing needle and its sizes.	**9**
III	**Sewing stitches and seams types**: Stitch formation, types of stitches, seam classification, seam geometry seam strength and slippage, seam puckering. Thread calculation and its consumption **Trimming and Garment accessories**: Definition, types, trimming methodologies and accessories application. Garment finishing: Fasteners, thread tucking, care and size labeling system, checking, pressing, folding and packing, packing standards for domestic and export markets.	**9**

IV	**Garment Processing**: Preparatory processes. Apparel dyeing, printing, washing and finishing processes. Apparel dyeing machines **Quality Control in Garment manufacturing:** Control in pattern making, grading, fabric laying, marking, sewing and finishing, control of garment defects. Computer Application in Garment Manufacturing: Application in pattern making, grading, lay planning, sewing and finishing. Concepts of computer integrated manufacturing (CIM) to the garment industry.	**8**

Text Books:

1. Carr H and Lantham B, ***"The Technology of Clothing Manufacture***", Om Book Service.
2. Mehta P V and Bhardwaj S K, " ***Managing Quality in apparel industry***", Om Book Service,

Reference Books:

1. Aldrich W, "***Metric Pattern Cutting***", OM Book Service, New Delhi (1998).
2. Cooklin Gerry, "***Garment Technology for Fashion Designers***", OM Book Service, New
3. Eveleyn M and Ucas, "***Clothing Construction***", 2nd Ed., Hughton Mifflin Co, Boston (1974)

TE- 604: NON - WOVEN TECHNOLOGY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach fundamentals of the various production processes in the manufacture of nonwovens, different methods of finishing nonwovens and to enumerate the various applications of nonwovens.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Definitions of nonwovens, Classification of Non-Woven fabrics, nonwoven properties and applications including environmental considerations. Development of nonwoven industry and future perspective**.** **Raw materials:** Natural and Synthetic fibres, Bonding agents, Types of bonding agents, Basic structure of bonding agent formulation, Characteristic properties of polymer dispersions, thermo-sensibility, cross linking, Adhesive fibres, Soluble fibres.	**8**
II	**Web formation techniques**: Fibre prepration, Dry laying, wet laying, Polymer Laid, Laying Techniques: - Parallel laying, Cross laying and random laying methods, Spunlaying, Melt blowing, SM, SMS fabrics. **Mechanical Bonding**: Needle punching technology, needle punching machine, Felting needles, needle classification and their specifications, Developments in needle punching technology, Factors affecting the properties of needle punched fabrics, Spunlacing technology, factors affecting the spunlaced fabric, Stitch bonding technique.	**9**
III	**Chemical Bonding:** Adhesive Bonding, Methods of bonding agent application, Cohesive bonding, Drying by convection, conduction, radiation, infra-red drier and high frequency driers. **Thermal bonding:** Thermal bonding techniques, Area bonding, Point bonding and their properties.	**9**
IV	**Finishing of nonwoven fabrics:** Shrinkage, Calandering, Pressing, Splitting, Grinding, Washing, Dyeing, Printing, Softening, Coating and Laminating**.**	**8**

	Applications: Medical and Hygeine, Apparel, Household and Home Textiles, Geotextiles, Filtration, automotive textiles, agriculture, leather industry. Testing of Nonwoven fabrics: Standards and methods of testing nonwoven fabrics	

Text Books:

1. Lunenschloss J and Albrecht W, "***Non-Woven Bonded Fabric***", Ellis and Horwood Ltd., UK (1985).
2. Albrecht W, Fuchs H and Kittelmann, "***Nonwoven Fabrics***", Wiley-VCH Weinheim (2003).

Reference Books:

1. Mrstina V and Fejgal F, "***Needle punching textile technology***", Elsevier (1990).
2. Krcma Radco, "***Manual of nonwovens",*** Textile Trade Press, UK (1971)
3. Gulrajani M L, "***Book of Papers of International Conference on Nonwovens***", The Textile Institute, UK (1992)

TE – 605: THEORY OF TEXTILE STRUCTURE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to understand the fundamentals of the yarn and fabric structure, measures of structural parameters and factors influencing them and to provide an elementary idea about tensile, bending, shear and drape behaviour of fabric.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Yarn Structure:** Types of yarn, the idealized helical yarn structure, yarn count and twist factors, twist contraction and retraction, Limit of Twist, packing of fibres in yarn: closed and open.	8
II	**Fibre Migration:** Ideal migration, Parameters affecting migration, characterization of migration behaviour, mechanism of migration in single and plied structure, techniques of determining the position of fibre in a yarn. **Structural Mechanics:** Extension of yarn under small load. Analysis of tensile forces of yarn under stress. Prediction of breakage, Nature of rupture for continuous filament yarn. Extension and breakage of spun yarn: Traditional view and approach by Hearle and E1-Sheikh	9
III	**Fabric Geometry:** Engineering approach to the analysis of fabric, Peirce and Olofsson models, relationship between h, p, c, Crimp interchange, Jammed Structure, concept of similar cloth. Minimum possible cover factor. Kemp model, close limit of weaving concept of pierce elastic thread model, Geometry of plain knitted fabric	9
IV	**Blended Yarn:** Blended yarn structure, Humburgers Theory. Structure property relationship of ring, rotor, air-jet, friction spun yarn. Mathematical models and their applications in the study of tensile, bending, shear, compression and buckling of woven fabrics	9

Text Books:

1. Hearle J W S, Grosberg P and Backer S, "***Structural Mechanics of Fibres Yarns and Fabrics"***, Wiley Interscience, New York (1969).

2. Goswami B C, Martindale J G and Scardino F, "***Textured yarn technology, structure and applications***", Wiley Interscience Publisher, New York (1995).

Reference Books:

1. Peirce F T and Womersley J R, "***Cloth Geometry***", reprint, The Textile Institute, Manchester (1978).
2. Hearle J W S, Thwaites J J and Amirbayat, "***Mechanics of Flexible Fibre Assemblies***", Sijthff and Noordhoff International Publishers BV, Alphen aan den Rijn, Netherlands (1980).

TE – 606: MECHANICS OF TEXTILE PROCESS

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 Hrs

COURSE OBJECTIVE:

To educate on the basic concepts in machine dynamics, automation opportunities in spinning mills, various design concepts on shedding tappets, speed frame cone drums and ring frame. To describe the influence of different processing parameters on the performance, efficiency, properties and quality of yarn/fabric produced

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Processes Opening and cleaning:** Elementary ideas of tuft opening and dust and foreign matter separation. Analysis of piano feed regulating motion. Evaluation of Blow Room performance. **Carding**: Mechanics of fibre entanglement and hook formation during carding. Theories of carding. Transfer mechanism of fibres. Cylinder load and transfer efficiency. Fibre configuration and estimation of degree of disorder. Effect of different parameters on hook formation.	**9**
II	**Draw frame:** Role of draw frame on yarn quality and process parameters. Hook removal inroller drafting. Drafting Force and its impact on drawing quality. **Combing**: Theoretical aspects of combing. Fractionation in combing. Parameters affecting FEI and combing efficiency and theoretical estimation of FEI	**8**
III	**Speed frame:** Mechanism of package building and twisting in speed frame. Differential Gearing and Designing of cone drums in Speed Frame **Ring Spinning:** Drives on modern ring frames. Yarn tension in ring spinning. Balloon theory in spinning.	**8**
IV	**Preparatory to Weaving:** Mechanics of package building during winding, Winding rate, relationship between bobbin diameter and winding rate, relationship between bobbin diameter and spindle speed, Splicing and yarn tension during unwinding, Cone angle and traverse in sectional warping, Stretch control in sizing, Pirn sloughing, **Weaving:** Kinematics of sley and heald motion, Shed depth and interference	**9**

	factor, Shedding cam design, Mechanism of picking, Shuttle retardation and its importance, Causes of pick variation, Cloth fell equation, Bumping condition**.**	

Text Books:

1. Booth J E, "***Textile Mathematics***", vol. 3 1st ed, The Textile Institute, Manchester (1975).
2. Chattopadhyay R, "***Advances in Technology of Yarn Production***", 1st Ed, NCUTE, IIT Delhi (2002).

Reference Books:

1. **"*Winding"***, BTRA Monograph series, The Bombay Textile Research Association, Bombay (1981).
2. "***Warping and Sizing***", BTRA Monograph Series, The Bombay Textile Research Association, Bombay (1981
3. Marks R and Robinson ATC, "***Principle of Weaving***", The Textile Institute, Manchester (1986).

PROGRAM ELECTIVE-I

TE – 607: POST SPINNING OPERATION

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the design, constructional details and working principles of post pinning machines and to educate on the need and different methods of texturing.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Introduction and objective of post spinning operation. Operations involved in post spinning. Drawing: Introduction of drawing filament/fibre. Theoretical considerations of drawing. Concept of neck drawing. Prediction of neck formation. Significance and stabilization of neck. Drawing unit. Drawing behavior of thermoplastic polymers. Influence of drawing parameters on structure and properties of fibres. High speed spinning and spin draw process. Drawing of pre-oriented yarns and draw-warping.	8
II	**Heat-setting:** Introduction and concept of heat-setting. Objective of heat-setting. Different nature of set. Heat-setting behaviour of fibres. Methods of heat-setting. Influence of heat-setting parameters on structure and properties of fibres. Settability and measurement of set. **Tow conversion:** Introduction of Tow to Top conversion. Different methods for tow to top conversion.	9
III	**Bulk yarn:** Introduction of bulk yarn. Objectives of producing bulk yarns. Different methods of producing bulk yarns. Principles of manufacturing acrylic high bulk yarn. Concept and classification textured yarns. **Texturing Methods:**Different texturing methods and brief working principles of different texturing methods. Principles of false twist texturing. Material and Machine variables and their influence on the structure and properties of false twist textured yarn.	9
IV	**Concept of air-jet texturing.** Material and process variables in air-jet texturing and their influence on the structure and properties of air-jet textured yarns. Testing and evaluation of textured yarns. Recent developments in texturing. Air	8

	entanglement process.	

Text Books:

1. Gupta V B and Kothari V K, "***Manufactured Fibre Technology***", Chapman and Hall, London (1999).
2. Vaidya AA, "***Production of Synthetic Fibres",*** 1nd Ed., Prentice Hall of India, NewDelhi (1988).

Reference Books:

1. Hearle J W S, Hollick L and Wilson D K, " ***Yarn Texturing Technology***", Woodhead Publishing Ltd., UK (2002).
2. Goswami B C, Martindle J G and Scardino F L, "***Textile Yarns Technology***, Structure and Applications", Wiley-Interscience Publication, New York (1976).

TE – 608: PROCESS AND QUALITY CONTROL IN SPINNING & WEAVING

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to understand and apply process and quality control measures during spinning of yarn and weaving of fabric and to educate the students to select appropriate parameters of fibre quality and process parameters for maintaining and improving the product quality and process performance

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Raw Material Quality:** Introduction - Definition and scope of process and quality control in textiles- norms and standards. Mixing- fibre selection, mixing quality and cost. Bale management techniques - Contamination removal techniques. Significance of modern developments on mixing quality. **Waste and Neps in Blow Room, Carding and Combing:** Yarn realization – Types of waste, control of invisible loss. Blow room - Control of waste, Nep generation and Fibre rupture. Carding - control of waste, Nep removal efficiency and fibre rupture in carding, Online monitoring and control of neps on modern cards. Comber - control of comber waste and nep removal, optimization of comber noils. Influence of machine and process parameters on waste removal.	9
II	**Yarn Quality:** Count variation - Assessment of within and between bobbin count variations, control of count variations in preparatory machines. Strength variation – assessment and causes, process variability, causes, control of variability. Unevenness and imperfections-measurement and assessment, analysis and interpretation of diagram. **Productivity Analysis:** Factors affecting the productivity in ring spinning. Productivity indices. Methods for maximizing production in spinning machinery – Factors affecting spinning tension in ring spinning - Control of yarn end breakage rate in ring spinning - Factors affecting yarn end breakage rates in ring spinning - Control of fly generation and twist variations in ring spinning.	9
III	**Weaving Preparatory:** Winding-quality of knots and splices, process parameters. Pirn winding, improving build of the pirn, process parameters, control of productivity. Warping- process parameters, control of end breakages, warp beam	8

	quality and productivity. Sizing- approach, scope, control and optimization. Drawing-In and Warp Tyeing - Control of extra ends on the weaver's beam, selection & care of reeds.	
IV	**Loom Shed:** Loom shed – Controlling loom productivity, efficiency and fabric quality - Online process control, quality control and monitoring in weaving - Cost control in weaving process parameters, Control of hard waste in ring frame, winding, warping, sizing, drawing in, pirn winding and loom shed. Analysis and Control measures for woven and knitted fabric defects.	**8**

Text Books:

1. Garde A R and Subramanian T A, "***Process Control in Spinning***", ATIRA, Ahmedabad, 1989,
2. Paliwal M C and Kimothy P D, "***Process Control in Weaving***", ATIRA, Ahmedabad, 1983.
3. Majumdar A, Das A, Alagirusamy R, and Kothari V K, "***Process Control in Textile Manufacturing***", Woodhead Publishing, Cambridge, UK, 2012.
4. Booth J E, "***Principles of Textile Testing***", CBS Publishers and Distributors, New Delhi, 1996.

Reference Books:

1. Furter R, "***Evenness Testing in Yarn Production: Part I and Part II***", The Textile Institute, Manchester, 1982.
2. Barella A and Manich A M, "***Yarn Hairiness : A Further update***", Textile Progress, Vol. 31 No.4, 2000.
3. "***Warping & Sizing***", BTRA Publications, Mumbai, 1983. 8. "Winding", BTRA Publication, Mumbai, 1986.

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TE – 609: APPAREL MARKETING & MERCHANDISING

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To acquaint the students about the concepts of marketing and merchandizing in the apparel industry in India and procedure involved in the export of apparel.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Marketing:** Marketing Management Demand states and Marketing tasks. Marketing Concepts. Marketing system, Marketing Environment. Marketing organization **Marketing Research**: Procedure and characteristics of good marketing research. Forecasting and Demand Measurement. Measures of Market Demand. Estimating current demand and future demand	**8**
II	**Buying Behavior:** Factors influencing buying behavior, Stages of decision buying process. Marketing Strategy: Strategic Planning. Competitive Marketing Strategies**.** **Market Segmentation:** Levels. Patterns. Procedure. Effective segmentation. Market targeting. Product Life Cycle: Concept. Marketing strategies for various stages of life cycle. New Product Development**:** Stages of new product development.	**8**
III	**Product and Branding Strategy:** Product–line decisions–product–line analysis, product– line length and line modernization, Featuring and Pruning. Brand decisions – branding challenges, brand–name decision, brand – building tools, brand strategy decision, brand asset management and brand auditing and repositioning. Packaging and Labeling. **Pricing Strategies:** Price setting – steps. Price Adaptation Strategies – Geographical pricing, price discounts and allowances, promotional pricing, discriminatory pricing and product –mix pricing.	**9**
IV	**Managing Retailing, Wholesaling & Market Logistics:** Retailing – types, marketing decisions and trends. Wholesaling – types, marketing decisions and	**9**

	trends. Market Logistics – objectives and decisions. **Merchandising:** Introduction. Dimensions of product change. Nature and timing of merchandising responsibilities – line planning, line development, product development and line presentation. **Materials Sourcing and Selection:** Introduction. Role of sourcing in an apparel industry. Materials sourcing processes. Selection of fabrics. Predicting aesthetics and performance. Evaluation of fabric quality.	

Text Books:

1. Philip Kotler, "***Marketing Management***", Prentice Hall Inc., New Delhi, 2006.
2. Ruth E.Glock and Grace I.Kunz, "***Apparel Manufacturing – Sewn Product Analysis***", Prentice Hall, New Jersey, 2000, ISBN: 0130846635**.**

Reference Books:

1. Philip Kolter, Kevin Lane Keller, Abraham Koshy and Mithileshwar Jha, "***Marketing Management – A South Asian Perspective***", Pearson Education India, New Delhi, 2006.
2. Easey M, "***Fashion Marketing***", Blackwell Sience, Oxford, 2002.
3. Evelyn C. Moore, "***Math for Merchandising***", Prentice Hall Inc, NewJersey , 1998

TE – 610: ADVANCED FABRIC STRUCTURE AND DESIGN

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to learn about structure of fabric, different types and methods of construction of pile fabrics and design the structure for different applications.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Gauze and Leno:** Basic shed formation - Different types of Doup healds - Russian Cords - Earing Mechanism - Madras - Muslin structure. **Warp Pile Fabrics:** Produced by various methods: (a) Face-to-Face Principle (b) with aid of Wires, All over or continuous pile structure – Figured pile structure.	**8**
II	**Narrow Fabrics:** Construction of ribbons and tapes - Zip fastener tapes**. Brocades** - Warp rib - Weft rib - Multi weft brocades. **Arrangement of Figures :** Unit Repeating Designs - drop design - half drop design - Half drop bases - diamond base - Ogee base - Diagonal waved line base - rectangular base - sateen system of distribution.	**9**
III	**Tapestry Structures:** Simple weft face tapestries – Repp-stitched weft face tapestry structures – Combined warp and weft tapestry structures **Figured Pique Fabrics:** Classification of the structure - loose back piques - half fast back piques.	**8**
IV	**Lappet Weaving:** Lappet wheel construction - Lappet Mechanism - Swivel weaving Mechanism. Special Jacquards: Self twilling - Sectional - Inverted hook - Border - Compound jacquards. **Spool and Gripper Axminster Carpets**: spool Axminster system – Gripper Axminster system – Spool – Gripper system	**9**

Text Books:

1. Grosziki Z J, "***Textile Design and Color***", Butterworths,- London, 2004
2. Turner.J.P, "***The Production and properties of Narrow Fabrics***", Textile Progress, Vol8, No.4, 2004

Reference Books:

1. Grosziki Z J, "***Advanced Textile Design and Color***", Butterworths, London, 2004

TE – 611: TEXTILE TESTING-II LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. Characterize a woven fabric with respect to its dimensional properties.
   a. thread density b. yarn number c. yarn crimp d. weave
   e. cover factor f. areal density g. skewness h. Thickness
2. Determine the tensile strength and elongation of a woven fabric and compare the load-elongation curve with non-woven and knitted fabric.
3. Determine the tear resistance of a fabric using Elmendorf Tear Tester.
4. Determine the bursting strength of a fabric on a hydraulic bursting tester.
5. Determine the abrasion resistance and pilling resistance of a fabric.
6. Determine the crease and wrinkle recovery of fabric and observe effect of loading time and recovery time on crease recovery.
7. Determine the Drape coefficient of a fabric sample.
8. Determine the Air permeability and Flammability of a fabric.
9. Determine the thermal resistance of a fabric by Guarded hot plate method.
10. Determine the stiffness of a fabric by Shirley stiffness tester.
11. Determine the Classimat fault analysis (yarn fault classifying system)
12. Determine the water permeability and water vapour permeability of a fabric.
13. Detrmine the moisture management property and drying rate of a fabric and analyze the wear comfort of clothing.
14. Determine and compare the seam strength, seam slippage and seam puckering of a fabric sewn with different types of sewing threads.
15. Study of various low stress mechanical properties of fabric by using FAST.

TE – 612: TEXTILE DESIGN AND ANALYSIS LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. **Analysis of different fabric samples to know their particulars as stated:-**

   A. For Yarns:-

   - Ends and Picks/inch
   - Warp and Weft Count
   - Warp Crimp and Weft Crimp
   - Ply and Twist.

   B. For Fabrics:-

   - Tape length,
   - Reed width,
   - Denting order,
   - Weight of warp and Weft and fabrics,
   - Weight per square yard,
   - Warp and weft cover,
   - Colour plan and use.

   Study of the following fabrics samples:-

   - Plain and derivatives
   - Twill and derivatives
   - Diamonds and Drapers
   - Honey comb
   - Huck-a-back
   - Mockleno
   - Welts and Piques
   - Single Knitted -Single Jersey structure
   - Knitted -Interlock Structure
   - Stripe and Cheques
   - Satin / Sateen
   - Crepe
   - Terry pile
   - Colour and Weave effect
   - Double Cloth
   - Corduroy
   - Double Knitted-Rib Struc ture

2. Art work development for Dobby / Jacquard design using computer and realization of production data
3. Evaluation of a CAD woven software**.**

TE – 613: GARMENT TECHNOLOGY LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. Study of sewing machine its types, its construction parts and functions and use of sewing machines.
2. Construction of hand stitches - Basting, Running, Hemming, Back stitch and its Variations
3. Construction of seams - Plain, French, Lapped, Flat fell, Hongkong, eased and Top stitched
4. Construction of Gathers, Pleats and Tucks
5. Development of patterns for simple designs using basic blocks
6. Construction of basic blocks to assemble a garment
7. Construction of garment stitching and finishing
8. Study of various types of cutting methods used for cutting a garment.
9. Study of Paper patterns - Types, Contents of paper patterns, uses of paper patterns.
10. Study of various Tools used in Garment construction - Measuring, Marking, embroidery, cutting, pressing, general tools.
11. To get the Knowledge and operation of CAD package for pattern making/digitizing/grading/ marker making
12. Study and prepare Body measurements charts and Direct and standard system of measurement.
13. Study and collect different woven fabrics, blended fabrics, and knitted fabrics used in garments and their use in garments.
14. Study about different collar types Peter pan, cape, mandarin, shirt, scalloped, sailor & rippled collar.
15. Study about Introduction to grading, grading principles, methods of grading, grading machine.

- Darts
- Placket - slit and seam
- Waist bands
- Neckline finish
- Pockets
- Sleeve attachments

TE – 614: TECHNICAL SEMINAR

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	50	50	100	3 Hrs

Topic

In the beginning of the semester, every student of the class will be assigned a seminar topic in the emerging / perspective field in the area of textiles such as Spinning, Weaving, Fibres, Testing, Chemical processing and alike. Seminar should be based on the literature survey on any topic of textiles.

Seminar Preparation and Presentation

Student will collect the information on the above subjects and submit the report on the dates specified by the concerned faculty. The seminar report will be of minimum 15 pages and maximum 25 pages. The spacing between the lines will be 1.5. The font size will be 12 point Times New Roman. The list of reference must be given at the end of seminar report. The list of reference should be written as per the Textile Research Journal format. The student has to present seminar in front of the faculty member of the department and his/her classmates. The faculty member, based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally.

SEMESTER-VII

TE – 701: KNITTING TECHNOLOGY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To provide thorough knowledge of the mechanism involved in warp, weft and flat knitting machines and to provide exposure to the latest developments in knitted fabric structure manufactured in advanced knitting machines

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Fundamentals of Knitting:** Process, comparison of weaving and knitting, warp and weft knitting, classification of weft knitting machines. Yam quality requirements for weft knitting. Mechanical elements of weft knitting-needles, and their types, sinkers, cams, cylinder, feeder and take-up, their function and operation, knitting cycle and yarn path. **Structural Elements of Weft Knitting**: Needle loop, sinker loop, technical face, technical back., open loop, closed loop, knit stitch, tuck stitch, purl stitch, miss stitch, course, wale, stitch density and loop length.	9
II	**Weft Knitted Structures**: Basic weft knitting machines- single jersey, rib, purl and interlock, their structures, machine construction, fabric characteristics, use and derivatives, notations and needle gaiting. **Flat Knitting Machines**: Process of loop formation, cam track, features, and structures produced.	8
III	**Patterning in weft knitting**: Devices for patterning in weft knitting, Electronic needle selection. Science of Knitting: Concept of loop length, knitting tension, spirality, fabric faults in weft knitting. **Weft knitted geometry and calculations**: Weft knitted fabric geometry, dimensional states and dimensional parameters such as stitch length, WPI, CPI, stitch density, GSM, Tightness Factor etc., Production calculation in weft knitting, calculation of optimum knitting conditions.	8
IV	**Warp Knitting**: Introduction, classification of warp knitting, Patterning in warp	9

	knitting, tricot and raschel machines description, stitches in warp knitting, and structures in warp knitting. Yarn preparation for warp knitting, let off and take up in warp knitting. **Warp Knit fabric geometry**: study of dimensional parameters such as stitch length, WP1, CPI, rack, run in, quality, areal density and structural ratio. Production calculation in warp knitting. Latest developments: Knitting machines, other structures in knitting, blanket manufacturing.	

Text Books:

1. Spencer D J, ***"Knitting Technology",*** 2nd Ed., Pergamon Press (1989)
2. Ajgaonkar D B, "***Knitting Technology***", Universal Publishing Corporation (1998).

Reference Books:

1. Booth J E, "***Textile Mathematics***", Vol. 3, Textile Institute, Manchester (1977).
2. Reichman Charles, Lancashire J B and Darlington K D, "***Knitted Fabric Primer***", National Knitted outwear Association, New York (1967).
3. Iyer C, Mammel B and Schach W, "***Circular Knitting***", Meisenbach Bamberg

TE – 702: TECHNICAL TEXTILE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To provide an overview on the concept, and various sectors of technical textiles and to impart knowledge of manufacturing of technical textiles and their properties.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Definition and scope for technical textiles, brief idea about technical fibres, role of yarn and fabric construction, composite material**.** **Filtration textiles:** Definition of filtration parameters, theory of dust collection and solid liquid separation, filtration requirements, concept of pore size and particle size, role of fiber, fabric construction and finishing treatments.	**8**
II	**Geotextiles:** Brief idea about geosynthetics and their uses, essential properties of geotextiles, geotextile testing and evaluation, application examples of geotextiles. **Medical textiles:** Classification and fibres used – requirements. Detailed study and application of textiles in: implantable – non-implantable – extracorporeal devices.	**9**
III	**Protective Clothing:** Brief idea about different type of protective clothing, Waterproof fabrics – breathable fabrics – Fire protection – Heat and cold protection – Ballistic protective clothing – Camouflage textiles – NBC protection **Sports and recreation textiles:** Functional requirement of different type of product and their construction	**8**
IV	**Automotive textiles:** Brief idea about the important properties and requirements in automotive textiles, Tyre cord design – Manufacturing techniques. Airbags: materials and properties – Manufacturing techniques – Seat belts and fabrics – liner fabrics. **Other uses of technical textile:** Textiles in agriculture, electronics, power transmission belting, hoses, canvas covers and tarpaulins**.**	**9**

Text Books:

1. **"*Handbook of Technical Textiles*"**, Ed. A R Horrocks and S C Anand, Woodhead Publication Ltd., Cambridge (2000).
2. "***Engineering with Geosynthetics***", Ed. G V Rao and G V S Raju, Tata McGraw Hill Publishing Co. Ltd., New Delhi (1990).

Reference Books:

1. **"*Industrial Textile*"**, Ed., J Svedova, Elsevier, New York (1990).
2. "***Modern Textile Characterization Methods***", Ed. M Raheel, Marcel Dekker, Inc. (1996).
3. Mukhopadhyay S K and Partridge J F, "***Automotive Textiles***", Vol. 29, No. ½, The Textile Institute (1999**).**

TE – 703: MILL MANAGEMENT AND MAINTENANCE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge on the fundamental principles of management as applied to the textile industry and to educate the students on the interaction of government and society with the textile industry and its effect and their management.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Location and Layout**: Plant location and site selection, Factors affecting location, Plant layout, Different types of layouts, Layout plan for spinning, weaving and process house.	8
II	**Air conditioning and humidification:** Humidification systems used in Textile Mills, Developments in humidification systems, Heat load, Calculations of total heat, air circulation required. **Machine Balancing**: Calculation for different machines required for carded and combed yarns, weaving, preparatory and chemical processing	9
III	**Costing:** Elements of cost, Cost sheet, costing the products, conversion cost, cost reduction techniques, impact of end breaks in ring spinning on productivity and cost. **Power consumption**: Energy consumption in textile machines, Measures to reduce power consumption.	8
IV	**Working environment**: Measures of good working environment, Different types of noise and remedial measures to minimize noise of different departments, terms related to lighting, illumination level required for different departments, lighting plan for different departments, Material handling equipments, Classification of material handling equipment, work load, work assignment. **Maintenance Management**: Maintenance systems, Maintenance cost, Maintenance schedules, Maintenance scheduling, Down time management, Accidents and safety engineering, Fire prevention and protection	9

Text Books:

1. Dudeja V D, "***Management of Textile Industry***", Textile Trade Press, Ahmedabad (1981).
2. Ormerod A, "***Textile Project Management***", The Textile Institute, Manchester UK (1992).

Reference Books:

1. Talukdar M K, Srirammulu P K and Ajgaokar D B, "***Weaving – Machine, Mechanism and Managemen***t", Mahajan Publisher Private Ltd., Ahmedabad, India (1998).
2. Garde A R and Subramanian T A, "***Process Control in Spinning***", 3rd Ed., ATIRA Ahmedabad, (1987).
3. Higgins, "***Handbook of Maintenance Management***", Prentice Hall New York (1999).

TE – 704: STATISTICS AND QUALITY CONTROL FOR TEXTILE INDUSTRY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to understand about total quality management, different TQM tools, techniques, Quality standards and to solve any problem of real situation probabilistically and able to classify the problem into continuous and discrete.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Quality Management:** Definition of quality and its importance, different approaches to quality, Description of Deming's fourteen points and Ishikawa's seven tools of quality, utility of statistical method for quality control and improvement, concept of Total Quality Management (TQM), ISO 9000 Standards, Quality Function Deployment (QFD) and Quality Costs. **Basic Approaches to Quality Control:** Definition of quality control, tools of quality control: flow chart, brain storming, fish bone diagram, check sheets, bar graph, charts, Pareto analysis, histogram, scatter diagram	9
II	**Statistical Quality Control:** Statistics as basis of quality control, variation as basis of statistical quality control, Population and sample, descriptive and inductive statistics, discrete and continuous variables, collection and classification of data, frequency distributions, measures of central tendency, measures of dispersion, random variables and probability distribution.	9
III	**Statistical Analysis for Continuous Function:** Population and sampling distribution of mean, statistical estimation theory, point's estimates, concept of single tail and double tail test, Student's t distribution, confidence limit, tests of hypotheses and significances, type I and type II errors, difference between two sample means. Test for single variance, Chi-square test, F distribution, test for the difference between two variances, confidence limits for variance and ratio of two variances, choice of sample size. **Statistical Analysis for Discrete Function:** Application of binomial and Poisson's distribution, normal approximation, test for a single proportion and difference between two proportions, application of chi-square distribution, contingency table.	9

	Subjective Tests**:** Rank correlation, tied rank, coefficient of concordance.	
IV	**Acceptance Sampling:** Basic idea about acceptance sampling, OC curve, producer's risk and customer's risk. Control Charts**:** Advantages using quality control charts, random and assignable causes, and action and warning limits, *X*, R, *p,* n *p* and *c* chart, Process Capability Ratio (CP and CPK), concept of 6 sigma process control, brief idea about CUSUM and EWMA chart. **Anova and regression:** Some basic concepts of analysis of variance, method of least squares, linear regression methodology, correlation and standard error.	**9**

Text Books:

1. Leaf G A V, "***Practical Statistics for the Textile Industry", Part I,*** The Textile Institute, Manchester, 1984.
2. Leaf G A V, "Practical ***Statistics for the Textile Industry", Part II,*** the Textile Institute, Manchester, 1987.
3. Meloun M and Militky J, "***Statistical data analysis: A practical guide***", Woodhead Publishing Ltd. UK, 2011.

Reference Books:

1. Hayavadana J, "***Statistics for textile and apparel management***", Woodhead Publishing Ltd., UK, 2012.
2. Akhnazarova S and Kafarov V, "***Experiment Optimization in Chemistry and Chemical Engineering***", Mir Publishers, Moscow, 1982.
3. Montgomery D C, "***Design and Analysis of Experiments***", John Wiley & Sons, New York, 1997.

PROGRAM ELECTIVE – II

TE – 705: PROCESS AND QUALITY CONTROL IN APPAREL MANUFACTURE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to understand about quality management in Apparel Manufacture, different levels of inspection and the importance of national and international standards.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Quality Specifications and Standards in Raw Materials**: Purchasing specifications- Testing and Inspection of raw materials-fabric-fabric inspection system-sewing threads-Zippers-Buttons-Interlining. **Quality Control in Spreading, Cutting and Bundling Products**: Spreading properties. Properties of fabrics- Plaids and naps- Tension in Spreading fabrics- Quality factors in cutting and drill- Bundling and ticketing as related to quality.	**8**
II	**Stitch and Seam Quality Measurement**: Stitch size- Stitch tension-Seam elasticity and elongation- Fabric distortions - Seam size- Seam slippage and Seam strength Fabric Sewability- Principles for selecting proper stitch and seam types. **Quality Factors in Sewing:** Control of sewing, seaming and assembly defects-In process inspection in sewing.	**8**
III	**Quality Control in Pressing and Packing**: Quality requirement for pressing operation- Quality control in functional package for apparel- Merchandise package- Stock storage shipping package. **Statistical Sampling**: Acceptable Sampling- Acceptable Quality level (AQL) - Single sampling- Double Sampling. Care Labelling of Apparel**:** American Care labelling System-British Care Labelling System- International Care Labelling System- Canadian Care Labelling System- Japanese Care labelling System - Symbols and meanings.	**9**
IV	**Quality Control Tools for Apparel Manufacture**: Flowcharts - Control charts- Cause and Effect diagrams-Pareto charts- Check sheets and scatter diagram.	**9**

	Quality Control Of Finished Garments: Visual inspection and definition of defects and tolerance- Method of measuring. Quality Management in Garment Industry: ISO series of standards- Introduction to TQM-Concepts of TQM Kaizen – Bench marking techniques	

Text Books:

1. Pradip v Mehta, Satish K Bhardwaj " ***Managing Quality in the Apparel Industry***" New age International Publishers, 2006
2. Solinger Jacob,"***Apparel Manufacturing Hand book - Analysis, Principles and Practice***", Columbia Boblin Media Corp., 1988.
3. Mehta, Pradip V, "***An Introduction to Quality Control for Apparel Industry***" ASQC Quality Press. 1992.

Reference Books:

1. Samuel. K.H. ., "***Encyclopedia of Managemen***t - TQM Vo1 3, Crest Publishing House 1999.
2. NMP Nambiar, "***A Guide on ISO 9000***", Systems and Resources, 1994.

TE – 706: FUNCTIONAL FINISHES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge about the different finishing treatment need to be given to textile materials and methods of application of those finishing treatment along with their merits and demerits.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Chemical and mechanical finishing. Challenges and importance of chemical finishing. Application of chemical finishes. Softening Finishes**:** Mechanisms of the softening effect. Types of Softeners. Compatibility and combinability of softeners. Evaluation and testing methods. Troubleshooting for softening finishes. **Hand Building Finishes:** The hand building effect, Textiles with hand building finishes. Evaluation methods. Trouble shooting for hand building finishes. Repellent finishes: Mechanisms of repellency, Repellent chemistry, Evaluation of textiles treated with repellent Finishes, Troubleshooting for repellent finishes	**8**
II	**Easy care finish:** Mechanisms of easy-care and durable press Finishing, Chemistry of easy-care and durable press finishes, Evaluation methods. Non-Slip Finishes**:** Mechanisms of non-slip finishes. Application methods and combinability. Evaluation, Trouble shooting for non-slip finishes. **Elastomeric Finishes:** Introduction. Mechanism of elastomeric effect. Evaluation. Trouble shooting for elastomeric finishes. Anti-Pilling Finishes: Pilling mechanism, chemistry of anti-pilling finishes, Evaluation of anti-pilling finishes	**9**
III	**Flame-retardant finishes:** Mechanisms of flame retardancy, Flame-retardant chemistry, flame retardants for various fibres. Anti-static finish: Mechanisms of antistatic finishes, Chemistry of antistatic finishes, Evaluation of antistatic finishes **Ultraviolet Protection Finishes:** Mechanism of UV protection. Evaluation. Trouble shooting for UV protection finishes, Antimicrobial Finishes: Properties of an effective antimicrobial finish. Mechanisms of antimicrobial finishes. Evaluation. Trouble shooting for antimicrobial finishes	**9**

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IV	**Novel Finishing techniques:** enzymatic finishes, plasma finishes, nano-finishing, microencapsulation. **Novel finishes** Anti-odour and fragrance finishes. Mosquito repellent finish, self-cleaning finish	**8**

Text Books:

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***", North Carolina State University, 1992.

Reference Books:

1. Perkins W S, "***Textile Colouration and Finishing***", Carolina Academic Press, U.K, 1996.
2. Menachem L and Stephen B S, "***Handbook of Fibre Science and Technology***", Volume II, Part B, Marcel Dekker Inc., New York, 1983.

TE – 707: PROCESSING OF MAN MADE FIBRES AND BLENDED TEXTILES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach the principles, processes and technologies employed for the chemical processing of manmade fibre, yarns and their blends.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Structural study of man-made and their blends Stability of man-made fibres against chemical treatment. Classification of blends: Objectives of blending. Classification, compatibility of components in a blend.	8
II	**Pretreatment of manmade and blends** : Pretreatment of polyester, nylon, acrylic, acetate fibres and their blends, viz. singeing, desizing, scouring, bleaching, mercerizing and heat setting. Dyeing of man-made: Dye-fibre attachment. Role of fibre structure in dyeing of man mades. Dyeing of polyester in HTHP machines, carrier dyeing, thermosol dyeing. Mechanism of carrier action. Dyeing of nylon with acid, metal complex, disperse, reactive and direct dyes. Dyeing of acrylic with disperse, acid and cationic dyes. Dyeing of differentially dye able man mades. **Dyeing of blends:** Characterization of fibre, blends, dyeing of primary, binary and ternary blends, viz. A, B, D, A-B, A-D, D-B and A-D-B.	9
III	**Blend dyeing methods**: Single bath single step, single bath two step and two bath two step methods to produce different shades. Blend dyeing shades: Reserve, cross, shadow and solid shades. Possibilities of producing various shades on a specific blend. **Printing of man-made and blends**: Direct, resist and discharge styles of printing of polyester and its blends. Pigment printing. Carbonized prints. Transfer printing of polyester, nylon, acrylic and their blends.	9
IV	**Finishing of man mades and blends**: Mechanical finishing of man-made. Optical whitening, anti-pilling and durable press finishes. Soil release, water repellent and flame retardant finishes on man-made and blends. Anti-static finish. **Finishing of terry-woolen textiles**: Crabbing, blowing, cropping, anti-felting,	8

	pressing and decatising	

Text Books:

1. Nunn D M, "The ***Dyeing of Synthetic Polymer and Acetate Fibres***", Dyers Company Publication Trust, London (1979).
2. Shore J, "***Colorants and Auxiliaries***", Vol- I and II, Society of Dyers and Colorists, Bradford, England (1990)

Reference Books:

1. Gulrajani M L, "***Polyester Textiles***", Book of papers: 37th National Textile Conference, The Textile Association (India), Mumbai (1980).
2. Gulrajani M L, "***Blended Textiles***", Book of papers: 38th National Textile Conference, The Textile Association (India), Mumbai (1981).
3. Datye K V and Vaidye A A, "***Chemical Processing of Synthetic Fibres and Blends***", John Wiley and Sons, New York (1984)

TE – 708: FASHION ART AND DESIGN

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge on colour theory, principles of fashion, human body measurements, creating pattern, fashion presentation, and to develop commercial pattern with design aspect by manipulating the basic pattern.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction** to Fashion, Fashion origin and evolution, Elements of Design – Lines, Dots, Shapes, form, Shape, size, texture, color, Prints, Color – meaning of color and its significance and uses, visible color spectrum, Hue, value, intensity, saturation, color theory – primary, secondary, complimentary, Compound colors. **Principles of fashion**, Fashion cycle and differentiation on the basis of length of fashion cycle. Fashion theories- trickle down, trickle across and bottom up theory, Factors affecting fashion, Fashion Inspiration, Levels of Fashion Acceptance- Fashion leader, fashion role model, fashion follower, Fashion victims.	**8**
II	**Anatomy for designers:** Human Proportion and figure construction. Methods of determining individual proportions. **Apparel construction**: elementary idea of conversion of fabrics to garments. Drafting and pattern making of basic body blocks. Structural and decorative dress designing, creating varieties through designs. Psychology of Clothes**:** First impression, role of socio- psychological and economical aspects	**9**
III	**Fashion communication:** An in-depth understanding of promotional activities, corporate journalism and publications, events planning, international public relations, communication plans. Understanding of web and multimedia design, computer graphics, illustration, product design, exhibition design, visualizing and art direction, typography and photography as communication tools. **Styling and its introduction**, Introduction to Fashion Journalism, Display and Exhibit design, and Fashion Communicative devices in commercial publicity: letter styles, designs, pictorial presentation, slogans, colour variations	**9**

IV	**Fashion Presentation:** Definition and basic elements in a mood board, Basic information needed in Client boards, ways to identify customer and their needs, Forecasting and Trend analysis, Color forecasting (pantone, etc) and use of fashion websites (WGSN, style sight, Trend stop, mud pie, etc.), Collage and its creation, Swatch cutting and preparing fabric for presentation, Fashion show, Basic preparation of Fashion show – sound, light, models, ramp, choreographer, buyer invites, hair & make-up, accessories, publicity/advertisement and invite design.	**8**

Text Books:

1. E.P.G Gohl, "***Textile Science***" CBS Publishers & Distributors, New Delhi , (India)
2. Bernard P. Corbman, " ***Textiles Fiber to Fibric***" McGraw-Hill International Editions, singapore
3. Erwin Model, "***Clothing for Moderns***", Mac Millan Publications, New York (1994).
4. Tate and Sharon Lee, "***Inside fashion design***", Harper Publication Inc., UK (1976).

Reference Books

1. Mary Kefgen, "***Individuality in Clothing – Selection and Personal Appearance***", Mac Millan Publications, New York (1981).
2. Mikell P, Grover and E Mory, "***Computer Aided Design and Manufacturing***", Prentice Hall of India Ltd. Delhi (1993).
3. Bhattacharya Anand, "***Garment Technology***", NCUTE, IIT, Delhi (2003)
4. Mehta P V and Bhardwaj S K, " ***Managing Quality in apparel industry***", Om Book Service, New Delhi
5. Cooklin Gerry, ***"Garment Technology for Fashion Designers",*** OM Book Service, New Delhi (1997).

TE – 709: TEXTURED YARN TECHNOLOGY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge on the science and technology of texturing, characteristics of raw materials and techniques and parameters required for formation of textured yarn and to familiarize with the applications of textured yarns and fabrics.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Basics of Texturization**: Purpose - Need for bulking of synthetic fibres -Types of texturized yarns - Classification of process - Comparison of texturised and untexturised yarns and fabrics –Application of texturised yarns - Role of spin finish on texturised yarns.– High speed spinning of synthetics fibre forming polymers, advantage and disadvantages of HSS, high speed spinning speeds, structure development during high speed spinning.	8
II	**Dimensional Stability**: Heat setting – need-factors involved – types -mechanism – effects on fibre morphology and mechanical properties – fundamentals of thermo-mechanical texturing – Helanca process. **Texturization Techniques**: Draw Texturising-Advantages - Simultaneous and sequence draw texturising - Working principles and machines, False Twist Texturising-Principle - Single heater and double heater - False twist texturising machines. Twisting elements – Factors influencing Twist - Properties of Textured yarn - Effect of feed material and process variables	9
III	**Air Jet Texturization**: Basics of air jet texturing – types of yarns produced – process variables -over feed, air pressure temperature and water content. Nozzles, evaluation of textured yarn – Measurement of shrinkage force - Crimp contraction and dye uniformity - Texturamat - M.Dynafil tester.	9
IV	**Developments in Texturization Methods**: Stuffer box and edge crimping methods – principles, limitations, and applications – knit-de-knit and gear crimping methods. Bi-component filament texturing – texturing of polypropylene and jute fibres – Chemo-mechanical and thermo-mechanical texturing.	8

Text Books:

1. Behery H.M. and Demir A., "***Synthetic Filament Yarn Texturing Technology***", Prentice Hall, 1996, ISBN 0134400259.
2. Hes L. Ursiny P., "***Yarn Texturing Technology",*** Eurotex, U.K., 1994.

Reference Books:

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. Gupta V.B. (Edr.), "***Winter School on Man-made Fibers – Production, Processing, Structure, Properties and Applications***", Vol. 1, 1988.
3. Wilson D.K. & Kollu T., "***Production of Textured Yarns by Methods Other than False Twist Technique***", Text. Prog., Vol. 16, No.3. Textile Institute, 1981.
4. Demir & H. El-Behery, "***Synthetic Yarn Production***", Prentice Hall Inc., 1996.1. Gulrajani M.L. (Edr.), "Annual Symposium of Texturing", I.I.T Delhi, 1977.

TE – 711: KNITTING TECHNOLOGY LABORATORY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Note: Practical as per the topics in the syllabus for the course will be conducted in the laboratory class. Following is the suggested list of exercises out of which a minimum of 8-10 experiments must be performed by a student during the semester

List of Experiments

1. To study the path of yarn through plain knitting machine.
2. To study the different knitting elements including the cam system.
3. To study the driving mechanism of plain knitting m/c.
4. To study the cloth take-up mechanism of plain knitting m/c.
5. To study the rib knitting m/c including arrangement of dial and cylinder needles, cam system and driving mechanism.
6. To study the Interlock knitting m/c including arrangement of dial and cylinder needles, cam system and driving mechanism.
7. To study cam system of V - bed rib knitting m/c.
8. To study driving mechanism of V - bed rib knitting m/c.
9. Preparation of Fabric sample (rib, circular, half cardigan and full cardigan) in V-bed rib knitting machine.
10. To study the effect on loop length with the change in cam setting in flat knitting machine.
11. To study the effect of variation in yarn input tension on the loop length in V-bed rib flat knitting machine.
12. To study plain, rib and Interlock knitted fabrics (course per inch, wales per inch, loop length etc.)
13. Study of Socks and fleece knitting machine

TE-712: INDUSTRIAL/PRACTICAL TRAINING

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	0	2	50	50	100	3 hrs.

Note: Industrial training of 6 weeks duration attended after 6th semester for 6 weeks during summer vacations, and evaluated in 7th semester.

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TE-713: PROJECT WORK-I

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	4	2	50	50	100	3 hrs.

Note: Students are expected to complete a project in groups or alone as deemed fit by the faculty and department. They should work under supervision of Faculty member/s of department, or in collaboration with other departments, or preferably with Industry. The project should demonstrate application of the fundamentals learnt during the course of study and should also be innovative.

TE – 714: SPECIAL MODULE IN TEXTILE ENGINEERING

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	30	20	50	3 Hrs

The course aims at introducing new or highly specialized technological aspects in textile engineering. The course topic and content is likely to change with each offering depending upon the current requirement and expertise available with the department including that of the visiting professionals.

TE – 715: TECHNICAL SEMINAR

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	3 Hrs

Topic

In the beginning of the semester, every student of the class will be assigned a seminar topic in the emerging / perspective field in the area of textiles such as Spinning, Weaving, Fibres, Testing, Chemical processing and alike. Seminar should be based on the literature survey on any topic of textiles.

Seminar Preparation and Presentation

Student will collect the information on the above subjects and submit the report on the dates specified by the concerned faculty. The seminar report will be of minimum 15 pages and maximum 25 pages. The spacing between the lines will be 1.5. The font size will be 12 point Times New Roman. The list of reference must be given at the end of seminar report. The list of reference should be written as per the Textile Research Journal format. The student has to present seminar in front of the faculty member of the department and his/her classmates. The faculty member, based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally.

SEMESTER-VIII

PROGRAM ELECTIVE - III

TE – 801: TEXTILE REINFORCED COMPOSITE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to learn about Reinforcements, matrices used for the composites, manufacturing process and application of composites

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction** Definition of composites, Classification of composites, Constituents-reinforcement, matrix, interface, Critical fibre length, Rule of mixtures. Application of composites.	8
II	**Basic Constituents Materials In Composites**: Types and Properties of reinforcements, Matrix Materials. Interface - mechanisms and theories. Prepregs: Introduction - Manufacturing techniques - property requirements, Compaction. Textile Preforms– weaving, knitting and braiding. Multi-axial multiply non-crimp fabrics	9
III	**Techniques for Manufacture of Composites:** Introduction - manufacturing processes – open mould process, closed mould process and continuous process. Metal matrix composites, Ceramic matrix composites - types-importance and processing.	8
IV	**Mechanical Properties of Textile Composites:** Testing of Reinforced Plastics – Tensile, flexural, Impact, Interlaminar shear and compression properties. **Application of Polymer Composites:** Composites application in aerospace, construction industry, and sports products. Electrical, Polymer composite for biomedical and vibration damping	9

Text Books:

1. Leonard Hollaway, "***Handbook of Polymer Composites for Engineering***", Wood head Publishing limited, 2007

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2. Long A C, "***Design and Manufacture of Textile Composites***", Wood head Publishing limited, 2005
3. Homgu Tatsuya & Phillips Glyn, "***New Fibres"***, Woodhead Pub. Ltd., England,2001
4. Rakesh K. Gupta, Elliot Kennel and Kwang-Jea Kim, "***Polymer Nanocomposites Handbook***", CRC Press Taylor & Francis, New York, 2010

Reference Books:

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***", Van Nostrand Reinhold Company, New York, 1969
3. Derek Hull, "***An introduction to composite materials"***, Cambridge University press.

TE – 802: HIGH PERFORMANCE AND SPECIALITY FIBRES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to learn about various high performance fibres which are used for technical textiles, their chemical structure, properties and production process.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Growth Patterns - Major attributes and advantages – Product development areas **Aramid And Aromatic Polyesters**: Fibres formation, Fibre & structure properties and performance, Application. Carbon and Graphite: Classification and Types, manufacturing processes from Polyacrylonitride, Rayon and pitch based fibres-properties	**9**
II	**Glass Fibres:** Types and Composition, Manufactures Processes, Fibre structures, Properties, Applications. **Optical Fibres**: Light Propagation, Fibre manufacture, Application	**8**
III	**Ceramic Fibres:** Classification and fibre formation, composition and structure, properties and application. Elastomeric Fibres: Manufacturing Processes, Fiber Properties, Application and future trends**.** **Polyethylene Fibres:** Manufacturing Processes, Fibre Properties, Application and future trends. Metallic Compound Fibres: Aluminium oxide fibres and Lead Fibers, Preparation and processes, Fibre structure, properties, Application	**8**
IV	**Speciality Fibres**: Highly aesthetic fibres – evolution, specialized non circular cross section - blending, mixed and conjugate spinning- super fine fibres. Spinning of ultrafine fibres. Spinning of continuous filament type- direct spinning, conjugate spinning with alternately arranged polymers. Random type spinning-melt blowing, and flash spinning	**9**

Text Books:

1. Hearle J W S, "***High Performance fibres***", Woodhead Publishing, Cambridge, England, 2001
2. Nakajima T, "***Advanced fiber spinning Technology***", Woodhead Publishing, UK, 1996.
3. Mukhopadhyay S K, "***High Performance Fibres***", Textile Progress Vol.25, Textile Institute, England, 1993.

Reference Books:

1. Menachan Lewis and Jack Preston, "***High Technology Fibres***", Part B, Mercel Dekkar Inc, New York, 1993.
2. Menachan Lewis and Jack Preston, "***High Technology Fibres***", Part D, Mercel Dekkar Inc, New York, 1996.
3. Menachan Lewis and Jack Preston, ***"High Technology Fibres***", Part A, Mercel Dekkar Inc, New York, 1988.

TE – 803: APPLICATION OF CAD/ CAM IN TEXTILE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To make the students familiar with software which are used to create weave and print designs, computer integrated weaving machines, Computer aided production planning in Textile and Garment Manufacturing and to build students confidence in controlling the computer integrated machines

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction to Computer Systems:** Computer Software-operating-Programming Languages-general Software Features and trends. **Data base management system**: Data processing Database Management system fundamentals-database design concepts. Introduction to Computer Algorithms and program logics	9
II	**Computerized Knitting & Weaving:** Concepts of CAD/CAM in Fabric Manufacturing. Features of Electronic Dobby & Electronic Jacquards. Electronic Dobby -- Working principle - Machine parameters – Microelectronics Design features - Drive arrangement - Systems for pattern data transfer - Design development. **Electronic Jacquards**: Electronic Jacquard Working principle - Constructional variants - Various electronic jacquard systems - Selection system - Pattern data - Transfer and management	9
III	**Basics of Weaving Design Software**: Algorithms of computerized Drafting, Lifting & Weft insertion Plan. Automatic Weft Colour selection. Computer Aided Fabric Design System Introduction to the operation of design software for woven, knitted and printed textiles – Exploration of basic structure, color and textural effects using design software. Development of Jacquard designs - Process of drafting - sketch design - Development of figures - Composition of design - Geometric ornamentation - Arrangement of figures - Weave simulation	9
IV	**Computerized Production Planning and process control:** Computer aided production planning in Textile and Garment Manufacturing: Application of	9

	Computer for purchase, inventory control and sales, computerized quality control and production control. Introduction to finite scheduling concept and fast react software. Creating product and order planning, concept of ERP, CIM, CAPP etc. updating. Elimination of late deliveries - General set up, Application of DBMS in Apparel Merchandising process. Control mechanisms - critical path and time tables. **Computerized Quality Control:** Introduction to image processing and imaging system-Fabric defect identification using image processing-Artificial neural networks – Data acquisition and fault classification. Yarn Scanner. Yarn Fault Identification	

Text Books:

1. Alexis Leon and Mathews Leon "***Fundamentals of Information Technology***" Leon press,1999
2. Dennis P Curtin "***Information Technology***", Tata McGraw hill Pvt Ltd 1999
3. James A Senn "***Information Technology in Business***", Prentice Hall of India Pvt Ltd 1998.
4. Stephen Gray " ***CAD / CAM in clothing and Textiles*** ", Gower Publishing Limited, 1998, ISBN 0-566-07673X.

Reference Books:

1. Compilation of papers presented at the Annual world conference Sep 26 -29, 1984 Hongkong, "***Computers in the world of textiles*** ", The textile Institute ISBN: 0-0900739-69X.
2. W.Aldrich, " ***CAD in clothing and Textiles*** ", Blackwell Science 2nd edition, 1992, ISBN: 0-63 - 3893 - 4
3. Jacob Solinger, "***Apparel Manufacturing Handbooks*** ", Van no strand and Reinhold Company, 1980,ISBN:0-442-21904-0.

TE – 804: APPLICATION OF NANOTECHNOLOGY IN TEXTILE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge on Nano technology, production of nano fibres by different process, nano composites and their properties and its application in textiles.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** History of Nanotechnology, definition, Bottom-up and top-down approaches For Synthesis of Nanoparticles. Application of nanotechnology in diverse fields (other than textiles) **Nanofibre Production:** Principle of electrospinning. Electrospinning of nanofibres – conditions, structure formation, properties, effect of process parameters upon fibre formation. Methods to produce continuous filaments. Electrospinning of polyamides and polyesters	**9**
II	**Carbon Nanotubes (CNT):** Definition, Synthesis, Characterization and properties of CNT. Application of CNT in polymer and textiles. Effect of process conditions upon CNT structure and properties. **Nanotube/ Nano fibre-polymer composites:** development of nanotube/ nano fibre polymer composites. Analysis of rheological properties and micro structure of nanotube/ nanofibre- polymer composites. Introduction to multi functional polymer nano composites	**9**
III	**Nanoparticles:** Preparation, characterization, and application of silver nanoparticles, Fe nanoparticles ZnO, TiO2, MgO, SiO2 & Al2O3 with PP or PE coating, Indium-tin oxide Nanoparticles, Ceramic Nano-Particles, Carbon black Nanoparticles, Clay nanoparticles, Cellulose Nanowhiskers and Nanoparticles. Self- assembled nanolayer films, Nano structuring of polymers with cyclo dextrins	**8**
IV	**Characterization of nanomaterials:** Different nanomaterials characterization techniques. Nano-finishing: self-cleaning of fabrics, UV Protection, antibacterial, water repellent, antistatic and wrinkle resistance.	**8**

	Ecological Aspects: Ecological considerations of nanoparticles and nanofibres. Human health hazards, hazard to environment, aquatics and to useful microbes responsible for biodegradation. Global regulation concerning nanoparticles and products	

Text Books:

1. Brown P J and Stevens K, "***Nanofibres and Nanotechnology in Textiles***", Woodhead Pub. Ltd., Cambridge, 2007.
2. Yury Gogotsi, "***Nanotubes and Nanofibres***", CRC Taylor & Francis, Boca Raton, 2006.

Reference Books:

1. Guazhong Cao, "***Nanostructure and nanomaterials***", Imperial College Press, USA, 2006.
2. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simons and Burkhard Raguse, "***Nanotechnology- Basic Science and Emerging Technologies***", Overseas Press, New Delhi, 2005.

TE – 805: SMART TEXTILES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To impart knowledge on the functional properties and applications of interactive textiles, responsive textiles and wearable electronics and to impart knowledge on the types and applications of smart textiles.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Smart technology for textiles and clothing**: Introduction and overview, Electrically active polymer materials: Polymer gel, application of non-ionic polymer gel and elastomers for artificial muscles **Thermally sensitive textiles**: Basics of Heat-storage, Thermally sensitive materials, designing and manufacture of thermo-regulated textiles and clothing, properties and applications	9
II	**Polymeric membranes:** PVA and PAAc network, Polymers prepared by plasma and radiation grafting. **Fiber Bragg gratings:** Fabrication of grating, Mechanical properties of FBG, Optical response of FBG sensors under various deformations, Applications, Smart textile composites integrated with fibre optic sensors	8
III	**Embroidery and smart textiles:** Adaptive and responsive textile structures (ARTS), Wearable motherboard: Manufacture, Properties and Applications **Wearable technology:** Wearable motherboard: Manufacture, Properties and Applications; Wearable technology for snow clothing	8
IV	**Tailor-made intelligent polymers for biomedical applications:** Fundamental aspects of shape memory materials, Concept of biodegradable shape memory polymers, degradable thermoplastic elastomers having shape memory properties, degradable polymer networks having shape memory properties **Textile scaffolds in tissue engineering**: Ideal scaffold system, Scaffold materials, textile scaffolds - Micro structural aspects, Mechanical aspects	9

Text Books:

1. "***Handbook of Industrial Textiles***", Ed. Sabit Adanur, Technomic Publishing Co. INC
2. "***Handbook of Technical Textiles***", Ed. A R Horrcks and S C Anand, Woodhead Publication Ltd, Cambridge, 2000
3. "***Textiles for protection***, Ed. Richard A. Scott, Woodhead Publication Ltd, Cambridge, U.K.

Reference Books:

1. "***Wearable Electronics and Photonics***, Ed. Xiaoming Tao, Woodhead Publication Ltd, Cambridge
2. Zhang Y P, Hu H P, Kong X D., ***Phase Change Heat Storage Theory and Application***, Hefei University of Science & Technology of China Publishing House, 1996

PROGRAM ELECTIVE - IV

TE – 806: WASTE MANAGEMENT AND POLLUTION CONTROL IN TEXTILE

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To describe the process parameters and control measures in each stage of yarn and fabric manufacturing process to produce quality product at reduced cost of production, create the awareness to control the effluents due to wet processing and to provide knowledge in different methods of treating the effluents from wet processing.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Spinning waste**: Its generation, classification, its re-use and management. Soft waste, hard waste. Different types of pollution in spinning industry. **Weaving waste**: Its generation, different types, its re-use and management. Different types of pollution in weaving industry. Its impact on human being	9
II	**Textile waste water characteristics**: Chemical nature of discharged bath after each process, contribution of chemicals to the waste water load. Concept of biological and chemical oxygen demand	8
III	**Textile waste water problem**: Effect of waste-water on sewage and land**.** **Chemical used in textile industry**: Toxicity of various chemicals, viz alkalis, oxidizing and reducing agents, acids, carriers, resins and bleaching agents etc. Role of each chemical on waste water load.	9
IV	**Treatment of textile effluents**: Primary, secondary and tertiary treatments in ETP. Colour removal, various chemicals used in ETP. **Effluent Testing**: Testing of BOD, COD, TOC and interpretation of results	8

Text Books:

1. Asolekar S, "***Environmental problems in chemical processing of textiles***"1st Ed. NCUTE, Department of Textile Technology, IIT-Delhi, 2000.
2. Padma Vankar, "***Textile Effluents***" 1st Ed. NCUTE, Department of Textile Technology, IIT-Delhi,2002.
3. Edmund B, "***The Treatment of Industrial Wastes***" 2nd Ed. McGraw-Hill kogaskusha, New Delhi,1976

Refernce Books:

1. Peavy, Rowe and Tchobanoglous, "***Environmental Engineering***"2nd Ed. McGraw-Hill, Singapore, 1985.
2. Vaidya A A," ***Production of Synthetic fibres***", Prentice-Hall India Ltd, New Delhi, 1988.

TE – 807: ENERGY MANAGEMENT AND CONSERVATION IN TEXTILE INDUSTRY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To make the students conversant with different sources of energy, Concept of energy management, energy conservation and energy consumption pattern in different production process in textile industry.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Sources of Energy**: Sources of Energy: hydro, thermal, wind, solar, biofuels and nuclear Limitations of Natural resources. Types of energy sources used in textile industry. Unexploited energy sources and problems in their exploitation. **Concept of energy management** - need for energy conservation- global energy scenario with specific reference to India -Demand side Management (DSM).	**8**
II	**Energy consumption patterns:** Present energy consumption trends, Growth and Demand pattern. Energy use in production processes – Fibre production, Spinning, Weaving, Knitting, Sizing Dyeing and Finishing, Clothing Manufacture. Energy use in Auxiliary Machinery – Boiler, Humidification plants, compressors. Component wise consumption - Specific energy consumption (UKG). Conservation of energy. **Energy Audit**: Concept, Types of audit, Instrumentation, methodology, analysis. Electrical and Thermal audit	**9**
III	**Energy Conservation**: Techniques of energy saving: Energy efficient equipment for various processing machines and ancillaries, Preparatory, Spinning, Post Spinning, Weaving Wet Processing - Humidification/Air conditioning, Lighting, Compressors, Boilers, Generators. Different types of fuels. Economics of energy conservation techniques.	**9**
IV	**Non-Conventional Energy Sources**: Solar energy: Different type of collectors – Photovoltaic cell - Wind energy - Bio energy - cogeneration. Environmental impact on energy. Analog - Digital - Computerized instruments Measurement techniques. Maintenance of instruments. Improving the efficiency of usage of Electricity Fuel and Steam. Utilization of heat exchanger	**8**

Text Books:

1. ***Energy Conservation in Textile Industry***, SITRA, Coimbatore,1997.
2. Vallier,P," ***Energy uses in the Textile Finishing Industry***", Eurotex, 1990
3. Palaniappan C et aL, "***Renewable Energy Applications to Industries***", Narose Publishing House, 1998.

Reference Books:

1. Proceedings of International Seminar cum Exhibition ASIA "***Energy Vision 2020" - sustainable energy supply***, November 15-17, 1996
2. Proceedings of the Seminar, "***Strategies for Sustainability of Energy Efficient and Environmental Friendly Technologies in Small and Medium Scale Sector***", PSG College of Technology, November 24, 2000.
3. Pradeep Chaturvedi & Shaltni Joshi," ***Strategy for Energy Conservation in India***", Concept Publishing Co., 1995.
4. "***Heat economy in Textile mills***", ATIRA, Ahmedabad, 1996.
5. Vallier,P., "***Energy uses in the textile finishing industry***", Eurotex, 1999. 86
6. Sang Yang Kim, Grady, P.L. and Hersh, S.P., "***Energy consumption and conservation in the fibre producing and textile industry***", Textile Progress , Vol. 13, No.3, Textile Inst., Manchester, 1983

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TE – 808: CLOTHING COMFORT

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students to learn about important characteristics of the fabric responsible for its comfort properties and different phenomena which take place in the fabric related to the comfort properties of the fabric.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Comfort** – types and definition; human clothing system; Psychology and comfort - perception of comfort, psychological research techniques, comfort sensory descriptors, psychophysics, scales of measurement, scales to measure direct responses, wear trial technique, comfort perception and preferences. T**hermo physiological comfort** - clothing and thermal comfort; Thermal comfort - thermoregulatory mechanisms of the human body, two-node model of thermal regulation, dynamic thermal interaction between the body and clothing, role of clothing on thermal regulations.	**9**
II	**Heat and moisture transfer** – wearer's temperature regulations, effect of physical properties of fibres, behavior of different types of fabrics, dynamic heat and moisture transfer in fabric, moisture exchange between fiber and air, boundary conditions, method of solution, moisture sorption of wool fabrics, behavior of fabrics made from different fibers.	**8**
III	**Psychological comfort** - Transient temperature and moisture sensations, coolness to the touch, warmth, dampness, clamminess and moisture buffering during exercise, environmental buffering; Neuro physiological comfort - basis of sensory perceptions; Measurement techniques - mechanical stimuli and thermal stimuli.	**8**
IV	**Fabric tactile and mechanical properties** - fabric prickliness, itchiness, stiffness, softness, smoothness, roughness, and scratchiness; Garment fit and pressure comfort; predictability of clothing comfort performance - prediction of fabric hand, prediction of clothing thermophysiological comfort, predictability of sensory comfort, predictability of subjective preferences; application of clothing comfort research.	**9**

Text Books:

1. Li Y, "***The Science of Clothing Comfort***", Textile Progress, Vol.31, No.1/2, The Textile Institute, Manchester
2. Hassan M. Behery, "***Effect of Mechanical and Physical Properties on Fabric Hand***", Wood head Publishing Ltd.
3. Apurba Das and Alagirusamy R, "***Science in Clothing Comfort***", Wood head Publishing India Limited, New Delhi, 2010.

Reference Books:

1. R.M.Laing, G.G. Sleivert, "***Clothing, Textile and Human Performance***, Textile Progress, Vol.32, The Textile Institute, Manchester
2. Guowen Song, "***Improving Comfort in Clothing***", Woodhead Publishing Limited, Cambridge, 2011.

TE – 809: GREEN PROCESSING OF TEXTILES

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To teach ecology related issues connected with the Textile Industry, their consequences and the Standards applicable and to impart knowledge on the technologies that are in line with preservation of ecology in the area of textile chemical processing

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Eco Standards and Eco-Labels**: Regulations concerning azo dyes- banned amines, Pesticides, Heavy metals, Formaldehyde and Pentachlorophenol in textiles. Global eco standards and eco-labels. Ecomark scheme of India. Criteria for an eco-label based on the life cycle. Eco-Management: Concept of eco-management, eco-audit, certification and labeling of ecofriendly textiles	8
II	**Eco-Testing of Textiles**: Testing of banned chemicals such as free formaldehyde, pesticides, pentachlorophenol, heavy metals, azo dyes containing aromatic amines & benzidine and halogen carriers. Principle of Instruments used – Chromatography (HPLC, GC) and Mass Spectrometry and Atomic Absorption/Emission Spectrometry. **Approach To Eco-Friendly Processing**: Concept of Sustainable Textiles, Fibre origin, Approach and Alternative methods/chemicals in Pretreatments, Eco-friendly dyes and dyeing, Eco-Friendly Finishing – formaldehyde free finishing, Halogen free FR finish, Comfort and Hygiene Finishing using natural agents like Neem - Aloe vera – Chitosan for anti-microbial finishing	9
III	**Advanced Processing Techniques**: Principle and advantages of dry processing. Plasma treatment – principle, plasma as a source of reducing the effluent and energy consumption, as a source of enhancing the dyeing properties, as a source of finishing of textiles in eco-friendly manner. Super critical carbon dioxide processing of textiles, Surface modification by VUV irradiation – VUV lamp, Laser modification, Dielectric Barrier Discharge, and Corona. Electrochemical reduction - Ultrasonic dyeing. Concept of low level application of chemicals	9
IV	**Enzymatic Processing of Textiles**: Enzyme treatments: Enzymes in preparatory	8

	processes - desizing, scouring, bleaching – Amylase, pectinase, protease, catalase, lipase etc. Enzymes used as discharging agents in printing – Laccase, Enzymes used in finishing – Bio finishing by cellulase. Enzymes for surface modification of natural and synthetic fibres	

Text Books:

1. "***Eco -Textiles, Special Report***", The Bombay Textile Research Association, Mumbai, 1996.
2. "***Eco-Friendly Textiles: Challenges to the Textile Industry***", Textiles Committee, Mumbai, 1996.
3. Chavan R B and Radhakrishnan J, "***Environmental Issues - Technology Options for Textile Industry"***, IIT Delhi Publication, 1998.
4. Asokan R, "***Eco-Friendly Textile Wet Processing***", NCUTE Publications, New Delhi, 2001

Reference Books:

1. Shishoo R, "***Plasma Technologies for Textiles***", Woodhead publishing limited, UK, 2007.
2. Cavaco-Paulo A and Gübitz G M, "***Textile Processing with Enzymes***", Woodhead Publishing Ltd., UK, 2003.
3. Miraftab M and Horrocks A R, "***Eco Textiles***", The Textile Institute, Woodhead Publishing Ltd., Cambridge, 2007.

TE – 810: FINANCIAL MANAGEMENT IN TEXTILE INDUSTRY

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 Hrs

COURSE OBJECTIVE:

To enable the students understand basics of financial management that is required for the textile industry and to learn about sources of capital, cost of capital and capital budgeting.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction to Financial Management:** Definition – Nature & Scope-Finance Functions – Goals of Financial Management - Financial Manager's Role. **Elements of Costs:** The cost of material, labor, overhead and waste in relation to textile production and finishing. Mill Organization in conjunction with the costing systems: Production Management	**9**
II	**Cost of Capital** Concept of cost of capital- Determining Component Cost of Capital- Specific Cost of Capital- Overall cost of capital – Capital Structure- Designing Capital Structure	**8**
III	**Working Capital Management** Principles and Concepts- Determinants - Operating Cycle - Cash Management- Short Term finance- Inventory Management- Receivable Management	**8**
IV	**Long Term Sources of Finance:** Long term finance: Shares, debentures and -term loans, lease, hire purchase, venture capital financing, Private Equity- Trade Credit- Bank Finance- Commercial Paper	**9**

Text Books:

1. M.Y. Khan and P.K.Jain "***Financial management, Text, Problems and cases***" Tata McGraw Hill, 5th edition, 2008.
2. I. M. Pandey "***Financial Management"***, Vikas Publishing House Pvt. Ltd., 8th edition, 2007.

Reference Books:

1. James C. Van Horne – "***Financial Management & Policy"*** Prentice Hall of India, .2009
2. I M Pandey - "***Financial Management"*** 9th Edition Vikas Publishing House2006
3. Prasanna Chandra – "***Fundamentals of Financial Management"*** Tata McGraw- Hill 2009.
4. Khan Jain – "***Financial Management***" Tata McGraw- Hill 2009.
5. Periyaswamy, - ***Financial Management***, Tata McGraw- Hill 2009

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TE – 811: PROJECT WORK – II

Teaching and Examination Scheme

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	16	8	50	50	100	3 Hrs

COURSE OBJECTIVE:

To enable the students understand basics of financial management that is required for the textile industry and to learn about sources of capital, cost of capital and capital budgeting.

The project involves the following:

- **Preparing a project - brief proposal including**
  - Problem Identification
  - A statement of system / process specifications proposed to be developed (Block Diagram / Concept tree)
  - List of possible solutions including alternatives and constraints
  - Cost benefit analysis
  - Time Line of activities
- **A report highlighting the design finalization [based on functional requirements & standards (if any)]**
- **A presentation including the following:**
  - Implementation Phase (Hardware / Software / both)
  - Testing & Validation of the developed system
  - Learning in the Project
- **Consolidated report preparation**

Project Report: Project report should be of 60 to 70 pages.

For standardization of the project reports the following format should be strictly followed.

Project report contents:

i. Title Sheet
ii. Certificate
iii. Acknowledgement
iv. Index
v. Abstract
vi. Introduction
vii. Literature survey
viii. Plan of Work.

ix. Results and Discussion
x. Conclusions
xi. References
xii. Annexures, etc if any.

The references should be given in the following standard format:

- For Books: “Authors”, “Title of Book”;; Publisher; Year of the Edition;
- For Papers: “Authors”, “Title of Paper”; “Name of journal”, “Year”, “Issue No,” Page No”.

Project report format:

i. Page size : Trimmed A4
ii. Left Margin – 1.5”
iii. Right Margin – 1”
iv. Top Margin – 1”
v. Bottom Margin – 1”
vi. Para Text : Times new roman 12 fonts
vii. Title:16 bold
viii. Sub title: 14 Bold
ix. Line Spacing : 1.5 Lines
x. Page Numbers: Right aligned at footer.
xi. The text should be justified.

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TE-812: INDUSTRIAL PROJECT

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	16	8	50	50	100	3 hrs.

Note: Industrial Project of Four months duration is to be carried out by the student in industry under the joint supervision of faculty advisers from institution as well as from the industry

Suggested List of projects:

1. Any productive project involving application of engineering fundamentals to solve problems encountered by human kind, in collaboration with industry, R&D institutes, institutes of international/national/state importance as deemed fit by the faculty members/concerned supervisor.