B.Tech. (Textile Technology)

2018 Regulations, Curriculum & Syllabi

BANNARI AMMAN INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai

Approved by AICTE - Accredited by NAAC with 'A' Grade)

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BANNARI AMMAN INSTITUTE OF TECHNOLOGY, SATHYAMANGALAM

REGULATIONS 2018

(CHOICE BASED CREDIT SYSTEM)

(Common to all B.E./B.Tech. Degree Programmes)

Regulation 2018 has been prepared in accordance with the guidelines given by the University Grants Commission, All India Council for Technical Education and affiliating University incorporating the features of the Choice Based Credit System (CBCS). The Regulation 2018 is applicable to the candidates admitted to the Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) Degree Programmes of the Institution in the academic year 2018-2019 for Regular admission (Academic year 2019-2020 for Lateral Entry) and subsequently.

The regulations hereunder are subjected to amendments as may be decided by the Academic Council of the Institution from time to time. Any or all such amendments will be effective from such date and to such batches of students (including those already in the middle of the programme) as may be decided by the Academic Council.

1. ADMISSION

Candidate, seeking admission to the B.E./B.Tech. Programme, shall satisfy the conditions of admission prescribed by the Directorate of Technical Education and Anna University, Chennai as given below.

1.1 Regular Admission

Candidates, for admission to the first semester of the eight semesters B.E./B.Tech. Degree Programmes, shall be required to have passed:

- Higher Secondary Examination (10 +2) of curriculum (Regular Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics, and Chemistry as three of the four subjects of the study prescribed under Part-III or any other examinations of any Board or University or authority accepted by the Syndicate of the University / Directorate of Technical Education (DoTE), Chennai as equivalent thereto.

(or)

- Should have passed Higher Secondary Examination of Vocational Stream (Engineering/Technology), prescribed by the Government of Tamil Nadu.

1.2 Lateral Entry Admission

1.2.1 The candidates who possess Diploma in Engineering / Technology awarded by the State Board of Technical Education and Training, Tamil Nadu or its equivalent are eligible to apply for Lateral Entry admission to the third semester of B.E. / B.Tech. Programmes in the branch of study as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time.

(or)

1.2.2 The candidates who possess the Bachelor Degree in Science (B.Sc.) (10+2+3 stream) with Mathematics as a subject in B.Sc. is eligible to apply for Lateral Entry admission to the third semester of B.E./B.Tech. Programmes, as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time. Such candidates shall undergo two additional Engineering subject(s) one each in third and fourth semesters, as bridge courses.

2. PROGRAMMES OFFERED

A candidate may be offered admission to any one of the programmes offered by the Institution for the candidates specified in Clause 1.1 and as per the eligibility criteria of DoTE for the candidates under Clause 1.2 from the list given below:

B. E. Programmes

i. Aeronautical Engineering
ii. Agricultural Engineering
iii. Automobile Engineering
iv. Civil Engineering
v. Computer Science and Engineering
vi. Electronics and Communication Engineering
vii. Electrical and Electronics Engineering
viii. Electronics and Instrumentation Engineering
ix. Mechanical Engineering
x. Mechatronics

B. Tech. Programmes

i. Biotechnology
ii. Fashion Technology
iii. Food Technology
iv. Information Technology
v. Textile Technology

3. STRUCTURE OF THE PROGRAMME

3.1 Every programme shall have a distinct curriculum with syllabi consisting of theory, laboratory, project, soft-skills and personality development courses, as prescribed by the respective Boards of Studies, broadly categorized under:

(i) **Basic Science** courses including Mathematics, Physics, Chemistry and further specialization in these subjects

(ii) **Basic Engineering** courses including Engineering Graphics, Engineering Practices, Basics of Electrical, Electronics, Civil, Mechanical Engineering, Engineering Mechanics and Computer Programming.

(iii) **Humanities and Social Science** courses including Language Courses, Management Courses, Soft Skills and Professional Ethics.

(iv) **Professional Courses** include Discipline Core Courses, Professional Electives, and Open Electives.

(v) **Employability Enhancement Courses (EEC)** includes Project Work and /or Internship, Seminar, Industrial /Practical Training, Value Added and Certificate Courses.

The medium of instruction is English for all the Courses, Examinations, Seminar Presentation, Projects and any other courses that a student registers for.

3.2 Each course is normally assigned a certain number of credits based on the following

Contact period per week	Credits
1 Lecture / 1 Tutorial period	1
2 laboratory Periods (Laboratory / Seminar / Project Work / etc.)	1

3.3 All the B.E. / B.Tech. Students will study Communicative English I during the First Semester. In the Second Semester, they will be divided into two streams based on their English language proficiency assessed in the Continuous Assessment during semester I, in which the upper segment will be provided an option to enroll and study Communicative English II / German / Japanese / French / Chinese / Hindi while the lower segment will study Communicative English II.

3.4 Every student shall be required to opt for **Nine** electives from the list of electives. Students can opt for the electives (Core / Professional) from his / her own discipline courses, during V to VIII Semesters, if he/she satisfies the prerequisite for that particular course.

3.5 However, out of nine electives, every student shall be required to opt for, a minimum of one and subject to a maximum of three courses as open elective from the list of electives of the branch / branches other than his / her branch of specialisation, if he/she satisfies the prerequisite for that particular course.

3.6 Students can also opt for **one-credit courses** of 15 to 20 hour duration, which will be offered by the experts from the industry on specialised topics. Students can opt for such **one-credit courses** during the semesters I to VI as and when these courses are offered. A student will also be permitted to register the **one-credit courses** offered by other Departments, provided the student has fulfilled the necessary pre-requisites or the courses that may not require any pre-requisites. Under no circumstances, the same one credit course shall be repeated in subsequent semesters in any Department / Centre for the same batch of the students and a maximum batch size for a given course shall not exceed 40. In case of disciplines with multiple divisions (intake more than 60) different course(s) shall be offered to other batch(es) of students.

On successful completion of one credit courses, credits will be indicated in the grade sheet as "Additional credits earned", but will not be considered for computing the Semester Grade Point Average (SGPA)/ Cumulative Grade Point Average (CGPA).

3.7 A student can register for Self-Study Elective(s) over and above the electives from any branch of Engineering / Technology at the rate of one per semester starting from V semester onwards provided he/she maintains a Cumulative Grade Point Average (CGPA) of 8.50 or above till the previous semesters with no current arrears. Credits will be indicated for such courses in the grade sheets (additional credits) but will not be considered for computing the CGPA.

3.8 A Student may be permitted to credit only one online course with the approval of the Departmental Consultative Committee constituted by the Head of the Department, subject to a maximum of three credits. The student needs to obtain certification or credit to become eligible for writing the End Semester Examination to be conducted by the CoE. A student can get exemption for a maximum of 3 credits during the entire programme (in lieu of Core elective or Open elective). The Head of the Department may identify a faculty member as coordinator for the course, who is responsible for the evaluation process. The course shall be evaluated through the End Semester Examination only. The evaluation methodology may be decided by the course faculty coordinator.

3.9 **Industrial Training / Internship**

The students may undergo Industrial training / Internship optionally for a period as specified in the table during summer / winter vacation and the credits earned will be indicated in the Mark Sheet. If the student earns three credits in Industrial Training / Internship, the student may drop one Professional Elective. In such cases, Industrial Training / Internship need to be undergone continuously from one organization only. However, if the number of credits earned is 1 or 2, these credits shall not be considered for classification of the degree. The students may also undergo Internship at Research organization / University (after due approval from the Department Consultative Committee) during summer / winter vacation, in lieu of Industrial training.

Duration of Training / Internship	Credits
2 Weeks	1
1 Month	2
2 Months	3

3.10 **Socially Relevant Projects**

A Student may be permitted to carry out a socially relevant project during semester II to semester VI in consultation with the Faculty Guide and submit the project report, in the prescribed format, at the end of the Semester for the valuation.

On successful completion of socially relevant project work, one credit will be indicated in the grade sheet (Additional credits), but these credits will not be considered for computing the CGPA.

4. VALUE ADDED COURSES

A Student can opt for the Value Added Courses offered by the various Department / Centres from Semester II to VII. Head of the Department / Centre shall submit the list of such courses, duly approved / ratified by the Academic Council, to the Controller of Examinations to administer the examination process. A separate Certificate will be issued on successful completion of the course by the Office of the Controller of Examinations.

5. DURATION OF THE PROGRAMME

5.1 A regular student (admitted after 10+2) or equivalent is normally expected to satisfactorily fulfil the requirements for award of the degree B.E. / B.Tech. within four academic years (8 semesters) from the date of admission but in any case not more than 7 years (14 Semesters); lateral entry students shall fulfil such requirements within three academic years (6 semesters) from the date of admission but in any case not more than six years (12 Semesters) leading to the award of Degree of Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) of Anna University, Chennai.

5.2 The total period for completion of the programme from the commencement of the semester, to which the student was admitted, shall not exceed the maximum period (Clause 5.1), regardless to the break-of-study (vide Clause 15) or period of prevention in order.

5.3 Each semester shall consist of minimum 90 working days. Head of the Department shall ensure that every faculty member teaches the subject / course as prescribed in the approved curriculum and syllabi.

5.4 Special Theory / Practical Sessions may be conducted for students who require additional inputs over and above the number of periods normally specified (Remedial Classes), as decided by the Head of the Department, within the specified duration of the Semester / Programme.

6. COURSE ENROLLMENT AND REGISTRATION

6.1 Each student, on admission shall be assigned to a Faculty Advisor (vide Clause 8) who shall advise / counsel the student about the details of the academic programme and the choice of course(s) considering the student's academic background and career objectives.

6.2 Every student shall enroll for the courses of the succeeding semester, in the current semester. However, the student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the semester concerned.

6.3 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

6.3.1 Each student, on admission to the programme, shall register for **all the courses prescribed in the curriculum** in the **first Semester of study (III Semester** for students admitted under **lateral entry stream).**

6.3.2 The enrollment for all the courses of the Semester II will commence 10 working days prior to the last working day of Semester I. The student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the Semester II. In case, if a student fails to register in course(s), he/ she may be permitted to register the same, as specified in the Clause 6.5, in the subsequent semesters or when it is offered.

6.3.3 The enrollment for the courses of the Semesters III to VIII will commence 10 working days prior to the last working day of the preceding semester. The student shall enroll for the courses with the guidance of the student's Faculty Advisor. If a student wishes, the student may drop or add courses (vide Clause 6.4) within **five** working days after the commencement of the

semester concerned and complete the registration process duly authorized by the Faculty Advisor.

6.4 Flexibility to Add or Drop courses

6.4.1 A student has to earn the total number of credits specified in the Curriculum of the respective Programme of study in order to be eligible to obtain the degree. However, if a student wishes, the student is permitted to earn more than the total number of credits prescribed in the curriculum by opting for one- credit courses, self study electives or additional courses.

6.4.2 From the III to VIII semesters (from IV to VIII Semesters in case of lateral entry students), the student has the option of registering for additional courses or dropping existing courses. The total number of credits that a student can add or drop is limited to 8, subject to a maximum of 2 courses in a given Semester. In such cases, the attendance requirement as stated in Clause 7 is mandatory.

6.4.3 The student shall register Project work I in semester VII and Project work II in semester VIII only.

6.5 Reappearance Registration

6.5.1 If a student fails in a theory course, the student shall do reappearance registration (Examination) for that course in the subsequent semesters or when it is offered next.

6.5.2 On registration, a student may attend the classes for the reappearance registration courses, if the student wishes, and the attendance requirement (vide Clause 7) is not compulsory for such courses.

6.5.3 However, if a student wishes to improve his/ her continuous assessment, in the second attempt during reappearance, he/she shall satisfy the Clause 6.5.5 and appear for continuous assessment as given for that particular course.

6.5.4 If the theory course, in which the student has failed, is either a professional elective or an open elective, the student may register for the same or any other professional elective or open elective course, respectively in the subsequent semesters. However, the change of elective courses is permitted only once.

6.5.5 In this case (Clause 6.5.4), the student shall attend the classes, satisfy the attendance requirements (vide Clause 7), earn Continuous Assessment marks and appear for the End Semester Examination.

6.5.6 The student who fails in any continuous assessment courses (Laboratory/ Project work / Seminar or any other HSS/EEC courses) shall register for the same in the subsequent semesters or when offered next, and **repeat** the course as per Clause 6.5.5.

6.5.7 If a student is prevented from writing the end semester examination of a course or several courses due to lack of attendance, the student has to register for that / those course(s) again, when offered next, attend the classes and fulfill the requirements as per Clause 6.5.5 & 6.5.6. If the course, in which the student has 'lack of attendance', is a Core Elective or an Open Elective, the student may register for the same or any other Core Elective or Open Elective course(s) respectively in the subsequent semesters and appear in the examination as per Clause 6.5.5.

6.5.8 If a student fails to secure a pass in any theory courses (including elective) he/she is given a maximum of three arrear attempts to complete the courses. If the student still fails to secure a pass, he/she shall register for the same when offered next and repeat the course.

7. REQUIREMENTS FOR APPEARING FOR THE END SEMESTER EXAMINATION OF A COURSE

A student who has fulfilled the following conditions (vide Clause 7.1 and 7.2) shall be deemed to have satisfied the attendance requirements for appearing for End Semester Examination of a particular course.

7.1 Every student is expected to attend all the periods and earn 100% attendance. However, a student shall secure not less than 80% attendance course wise taking into account the number of periods required for that course as specified in the curriculum.

7.2 If a student, secures attendance between 70% and 79% in any course(s) in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) or participation in Institution/ University/ State/ National/

International level extra and co-curricular activities, with prior permission from the Head of the Department, shall be permitted to appear for the current semester examinations subject to the condition that the student shall submit the medical certificate / participation certificate attested by the Head of the Department (along with Condonation form). Such certificates along with the condonation forms shall be forwarded to the Controller of Examinations for verification and permission to attend the examinations. However during the entire programme of study, a student can avail such Condonation in any two semesters only (regardless the number of courses).

7.3 A student shall normally be permitted to appear for End Semester Examination of the course(s) if the student has satisfied the attendance requirements (vide Clause 7.1 – 7.2) and has registered for examination in those courses of that semester by paying the prescribed fee.

7.4 Students who do not satisfy Clause 7.1 and 7.2 and who secure less than 70% attendance in a course will not be permitted to write the End-Semester Examination of that course. The student has to register and repeat this course in the subsequent semesters or when it is offered next (vide Clause 6.5).

7.5 If a student has shortage of attendance in all the registered courses, he/she would not be permitted to move to the higher semester and has to repeat the current semester in the subsequent year.

7.6 In the case of reappearance (Arrear) registration for a course, the attendance requirement as mentioned in Clauses 7.1 - 7.3 is not applicable. However, the student has to register for examination in that course by paying the prescribed fee.

7.7 A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of grades.

8. FACULTY ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a Faculty member of the Department who shall function as Faculty Advisor

for those students. The Faculty Advisor shall advise and guide the students in registering of courses, reappearance of courses, monitor their attendance and progress and counsel them periodically. The Faculty Advisor also discusses with or informs the parents about the progress / performance of the students concerned.

The responsibilities of the faculty advisor shall be:

- To inform the students about the various facilities and activities available to enhance the student's curricular and co-curricular activities.
- To guide student enrollment and registration of the courses.
- To authorize the final registration of the courses at the beginning of each semester.
- To monitor the academic and general performance of the students including attendance and to counsel them accordingly.

9. COMMITTEES

9.1 Common Course Committee

9.1.1 A theory course handled by more than one faculty including the discipline with multiple divisions (greater than or equal to 2) shall have a "Common Course Committee" comprising of all members of faculty teaching that course with one of the members as the Course Coordinator, nominated by the Head of the Institution (Head of the Department in the case of multiple divisions of a discipline) and student representatives (one per specialization or division) registered for that course in the current semester.

First meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. Two subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all the students.

9.1.2 In addition, Common Course Committee (without the student representatives) shall meet to ensure uniform evaluation through the common question papers during Continuous Assessment and End Semester Examinations.

9.2 Class Committee Meeting

For all the courses taught, prescribed in the curriculum, Class Committee meeting shall be convened thrice in a semester (first meeting within 15 days from the commencement of the semester and other two meetings at equal interval after the first meeting) comprising members of the faculty handling all the courses and two student representatives from the class.

One of the members of the faculty (preferably not handling any courses to that class), nominated by the Head of the Department, shall coordinate the activities of the Committee. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all other students.

10. SYSTEM OF EXAMINATION

10.1 Performance in each course of study shall be evaluated based on (i) Continuous Assessment throughout the semester and (ii) End Semester examination at the end of the semester for the regular courses or as given in the Clause 16. However, the final examination in the case of certificate / value added courses may be conducted, as and when the course is completed, through the office of the Controller of Examinations.

10.2 Each course, both theory and laboratory including project work, shall be evaluated as per the Scheme of Assessment given in Clause 16.

10.3 The End Semester Examinations shall normally be conducted after satisfying the Clause 5.2.

10.4 For the End Semester examinations, both theory and project work, the internal and external examiners (from Academia or Industry) shall be appointed by the Controller of Examinations as per the guidelines given by the Examination cum Evaluation committee of the Institute.

11. PASSING REQUIREMENTS AND PROVISIONS

11.1 The Passing requirement for a student in a course is determined based on the marks obtained both in Continuous Assessment and End Semester Examinations. If the student gets <50% of marks in End Semester Examination, then the student will be awarded only RA (Reappearance) grade.

11.1.1 If a student fails to secure a pass in a particular course, i.e., failing to obtain minimum marks, as stated above, it is mandatory that he/she shall reappear for the examination in that course in the subsequent semester(s) whenever the examinations are conducted for that course, till he / she secures a 'Pass'.

Continuous Assessment (CA) marks obtained by the student in the first appearance shall be retained and considered valid for one subsequent attempt, except Clause 6.5.4, 6.5.5, 6.5.6 and 6.5.7. However, from the third attempt onwards, the student shall be declared to have passed the course if he/she secures a minimum of 6 Grade Points (B Grade) in the course prescribed during the End Semester Examinations.

11.2 If a candidate fails in the seventh semester examinations of Project work I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the End semester examination of Project work II, he/she shall resubmit the Project Report within 60 days from the date of declaration of the results. The resubmission of the project report and the subsequent viva-voce examination will be considered as reappearance with payment of exam fee. In case a student fails in the resubmission of a project report and subsequent viva-voce examination, the student shall register for the course again, when offered next.

11.3 The passing requirement for the courses which are assessed only through continuous assessment (Laboratory and EEC courses except project work), shall be fixed as minimum 50% and the remaining grades are decided as per clause 12.4. If a candidate fails in EEC courses (Except Project work), he/she has to register and repeat the course within 30 days from the date of declaration of the

results. In case a student fails to register within 30 days, he/she shall register for the course again, when offered next.

11.4 The minimum number of total credits to be earned by a student to qualify for the award of Degree in the various branches of study as prescribed by the respective Boards of Studies is given below:

Branch of Study	**Minimum Credits**	
	Regular Admission	**Lateral Entry**
B.E. Programmes		
Aeronautical Engineering	172	135
Agricultural Engineering	172	134
Automobile Engineering	170	133
Civil Engineering	171	133
Computer Science and Engineering	171	133
Electronics and Communication Engineering	172	131
Electrical and Electronics Engineering	170	131
Electronics and Instrumentation Engineering	170	131
Mechanical Engineering	170	131
Mechatronics	170	132
B.Tech. Programmes		
Biotechnology	172	134
Fashion Technology	172	134
Food Technology	170	132
Information Technology	170	132
Textile Technology	171	133

11.5 Student Migration and Credit Transfer: Normalization of the Credits will be carried out in consultation with the Board of Studies of the programme concerned and approved by the Head of Institution, if a student migrates from other Autonomous institutions to Bannari Amman Institution of Technology or rejoins from previous regulation to this regulation.

11.6 A student shall be declared to have qualified for award of B.E/B.Tech. Degree if he/she successfully completes the course requirements (vide Clause 7, 10 and 11) and passed all the prescribed courses of study of the respective programme (listed in Clause 2), within the duration specified in Clause 5.1.

12. ASSESSMENT AND AWARD OF LETTER GRADES

12.1 The assessment shall be based on the performance in the End Semester Examinations and / or Continuous Assessment, carrying marks as specified in Clause 16. Letter Grades (based on Credit Point and Grade Point) are awarded to the students based on the performance in the evaluation process.

12.2 Credit Point is the product of Grade Point and number of credits for a course and Grade Point is a numerical weight allotted to each letter grade on a 10-point scale (as specified in the Clause 12.4), while the Letter Grade is an index of the performance of a student in a said course.

12.3 Condition for Relative Grading

The minimum number of students for applying relative grading system is 30. If the students' strength is less than 30 then absolute grading system will be applied. The relative grading system shall not be applied for laboratory and EEC courses.

12.4 The performance of a student will be reported using Letter Grades in absolute grading, each carrying certain points as detailed below: In relative grading, grades will be decided by the faculty concerned. A student who earns a minimum of 6 grade points in a course is declared to have successfully passed the course.

Range of Total Marks (as specified in Clause 16) / Specific Reason	**Grade Points**	**Letter Grade**
91 to 100	10	O (Outstanding)
81 to 90	9	A + (Excellent)
71 to 80	8	A (Very Good)
61 to 70	7	B + (Good)
50 to 60	6	B (Above average)
0 to 49	0	RA (Reappearance Registration)
Incomplete	0	I
Withdrawal	0	W
Absent	0	AB
Shortage of Attendance	0	SA

'RA' ---Reappearance registration is required for that particular course

'I' --- Continuous evaluation is required for that particular course in the subsequent examinations.

'SA' --- shortage of attendance (Clause 7) and hence prevented from writing end semester examination.

12.5 After completion of the evaluation process, Semester Grade Point Average (SGPA), and the Cumulative Grade Point Average (CGPA) is calculated using the formula:

$$SGPA/CGPA = \frac{\sum_1^n C_i * g_i}{\sum_1^n C_i}$$

Where

C_i : Credit allotted to the course.

g_i : Grade Point secured corresponding to the course.

n : number of courses successfully cleared during the particular semester in the case of SGPA and all the semesters, under consideration, in the case CGPA.

12.6 A student who does not appear for the End Semester Examinations in a course, after registering for the same, shall be deemed to have appeared for that examination for the purpose of classification (Subject to Clause 14 and 15).

12.7 For the non credit courses grades shall be indicated as given in the Clause 16 and shall not be counted for the computation of SGPA/CGPA.

For the Co-curricular activities such as NCC / NSS / NSO / YRC, a satisfactory / not satisfactory grading will appear in the mark sheet. Every student shall put in a minimum of 75% attendance in the training and attend the camp compulsorily. The training and camp shall be completed during the first year of the programme. However, for valid reasons, the Head of the Institution may permit a student to complete this requirement in the second year. A satisfactory grade in the above co-curricular activities is compulsory for the award of degree.

12.8 **Revaluation:** A student, who seeks the re-valuation of the answer script, is directed to apply through proper application to the Controller of Examinations in the prescribed format through the Head of the Department. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses. In the case of theory courses with laboratory component, a student can seek revaluation for the theory component only, following the procedure stated above.

12.9 **Supplementary Examinations**: If a student fails to secure a pass in theory course(s) of VIII semester examination, he/she is eligible to appear for a one time Supplementary Examination which shall be conducted at the end of VIII semester, for the subjects of VIII semester alone within 30 days from the date of declaration of the results.

12.10 **Eligibility for the Award of Degree**

A student shall be declared to be eligible for the award of the B.E. / B.Tech. Degree provided the student has

i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.
ii. Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the courses prescribed in all the 8 semesters within a maximum period of 7 years reckoned from the commencement of the first semester to which the candidate was admitted.
iii. Successfully completed the NCC / NSS / NSO / YRC / Extra-curricular/ Co-curricular requirements.
iv. No disciplinary action is pending against the student.
v. The award of Degree must have been approved by the Syndicate of the University.

13. CLASSIFICATION OF THE DEGREE AWARDED

For the purpose of the 'Award of Degree', the duration of completion of the programme shall be the total duration taken by a student for completing first time registration of all the required courses and satisfying Clause 11, regardless to the period of Break-of-study as per Clause 15 and satisfy any one of the conditions required as given below.

13.1 **First Class with Distinction**: A student who satisfies the following conditions shall be declared to have passed the examination in **First class with Distinction**:

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry students) in the student's First Appearance within five years, which includes authorized break of study of one year. Withdrawal from examination (vide Clause 15) will not be considered as an appearance.
- Should have secured a CGPA of **not less than 8.50**
- Should **NOT** have been prevented from writing end semester examination due to lack of attendance in any of the courses.

13.2 **First Class**: A student who satisfies the following conditions shall be declared to have passed the examination in **First class**:

- Should have passed the examination in all the courses of all eight semesters (six semesters for lateral entry students) within five years, which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of **not less than 7.00**

13.3 **Second Class**: All other students (not covered in clauses 13.1 and 13.2) who qualify for the award of the degree shall be declared to have passed the examination in **Second Class.**

14. WITHDRAWAL FROM THE EXAMINATION

14.1 A student may, for valid reasons, be granted permission by the Head of the Department to withdraw from appearing in the examination in any course(s) only once during the entire duration of the degree programme.

14.2 Withdrawal application shall be valid only, if the student is eligible to write the examination as per Clause 7 and, if it is made within TEN working days before the commencement of the end semester examination in that course or courses and also recommended by the Head of the Department.

14.3 Notwithstanding the requirement of mandatory TEN working days' notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

14.4 If a student withdraws a course or courses from writing end semester examinations, he/she shall register the same in the subsequent semester and write the end semester examination(s).

14.5 Withdrawal shall not be considered as an appearance in the examination for the eligibility of a student for First Class with Distinction or First Class.

14.6 Withdrawal is permitted for the end semester examinations in the final semester, only if the period of study of the student concerned does not exceed 5 years as per clause 13.1 & 13.2.

15. AUTHORIZED BREAK OF STUDY FROM A PROGRAMME

15.1 A student is permitted to go on break of study for a fixed period of one year as a single break in the entire course of study.

15.2 A student is normally not permitted to break the period of study temporarily. However, if a student happens to discontinue the programme temporarily during the middle of programme of study, for reasons such as personal accident or hospitalization due to ill health or in need of health care, he/she shall apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester examination, through the Head of the Department stating the reasons for the break-of-study (for one academic semester or 6 months, whichever is earlier). However, a student detained for want of minimum attendance

requirement as per Clause 7 shall not be considered as permitted 'Break of Study' and Clause 15.3 is not applicable for such case.

15.3 The student is permitted to rejoin the programme after the break / prevention due to lack of attendance, shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new Regulations shall apply to the Dean Academics in the prescribed format through the Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.

15.4 Authorized break of study will be counted towards the duration specified for passing all the courses (vide Clause 5.1 and 5.2) and for the purpose of classification of Degree (vide Clause 13).

15.5 The total period for completion of the programme reckoned from the commencement of the first semester to which the student is admitted shall not exceed the maximum period specified in Clause 5.1, irrespective of the period of break of study in order that he / she may be eligible, for the award of the degree (vide Clause 13).

15.6 In case of valid reasons (as stated in Clause 15.2) extended break-of-study may be granted by the Head of the Institution for a period not more than one year in addition to the earlier authorized break of study.

15.7 If a student does not report back to the Institute, even after the extended Break of Study, the name of the student shall be deleted permanently from the college enrollment. Such students are not entitled to seek readmission under any circumstances.

16. SCHEME OF ASSESSMENT

Courses offered under B.E. / B.Tech. Programmes are assessed as given below:

I	**THEORY COURSES**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Periodical Test I (10)	
	Periodical Test II (10)	
	Innovative Practices (30)	
	End Semester Examination	**50**
	Total Marks	**100**

II	**THEORY COURSES WITH LAB COMPONENT**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Periodical Test I (10)	
	Periodical Test II (10)	
	Innovative Practices (30)	
	(Laboratory Assessment & Report)	
	End Semester Examination (QP pattern as per (I))	**50**
	Total Marks	**100**

III	**LABORATORY COURSES**	**Marks**
	Continuous Assessment	**100**
	Distribution of marks for Continuous Assessment:	
	Conduct of Experiment	
	i. Preparation (20)	
	ii. Experiment and Analysis of Results (20)	
	iii. Record (10)	
	Test – Cycle I (25)	
	Test – Cycle II (25)	
	Total Marks	**100**

IV	**PROJECT WORK I**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Review I	
	Literature Survey (5)	
	Identification of topic and Justification (5)	
	Work plan (10)	
	Review II	
	Approach & Results (15)	
	Conclusion (15)	

	End Semester Examination	**50**
	Report[#] (20)	
	Presentation (20)	
	Viva voce (10)	
	Total Marks	**100**

V	**PROJECT WORK II**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Review I	
	Progress (10)	
	Review II	
	Approach & Results (10)	
	Review III	
	Conclusion & Final Presentation (10)	
	Report (15)	
	Publication of Paper in Conferences / Journals (5)	
	End Semester Examination	
	Presentation (30)	**50**
	Viva voce (20)	
	Total Marks	**100**

VI	**LANGUAGE ELECTIVE**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test 1	
	Listening (5)	
	Speaking (10)	**25**
	Reading (5)	
	Writing (5)	
	Test 2	
	Listening (5)	
	Speaking (10)	**25**
	Reading (5)	
	Writing (5)	
	Oral Exam	**50**
	Total Marks	**100**

VII	**ONE-CREDIT COURSE**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test I	**50**
	Quiz/ Assignment	**50**
	Total Marks	**100**

[#] *Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department*

VIII	**INDUSTRIAL TRAINING/ INTERNSHIP (CONTINUOUS ASSESSMENT ONLY)**	**Marks**
	Assessment by Industry	**30**
	Viva-voce	**20**
	Presentation	**30**
	Case Study / Report	**20**
	Total Marks	**100**
IX	**SOFT SKILLS (CONTINUOUS ASSESSMENT ONLY)**	**Marks**
	Test I	**25**
	Test II	**25**
	Final Examination	**50**
	Total Marks	**100**
	Grades (Excellent / Good / Satisfactory)	
X	**VALUE ADDED / CERTIFICATE COURSES (CONTINUOUS ASSESSMENT ONLY)**	**Marks**
	Test I	**25**
	Test II	**25**
	Final Evaluation / Test	**50**
	Total Marks	**100**
	Grades (Excellent / Good / Satisfactory)	
XI	**ENGINEERING GRAPHICS**	**Marks**
	Continuous Assessment	**100**
	Distribution of marks for Continuous Assessment:	
	Exercise (Minimum 10 Exercises/Modelling)	**60**
	Model Examination	**40**
	Total Marks	**100**

Optional Test: *A student becomes eligible to appear for an optional test conducted after the Periodical Test II, only under the following circumstances: (i) absent for Test I or Test II or both on account of medical reasons (hospitalization / accident / specific illness), or (ii) participation in the College / University / State / National / International level Sports events with prior permission from the Head of the Institution and (iii) on satisfying the conditions (i) or (ii), the student should have registered for the Optional Test, through the concerned member of faculty who handles the course or through the respective Head of the Department, submitted to the Controller of Examinations. Such Optional Tests are not conducted for the courses under the categories III, IV, V, VI, VII, VIII, IX, X and XI listed above.*

17. FIELD / INDUSTRIAL VISIT / INTERNSHIP

In order to provide the experiential learning to the students, Head of the Department shall take efforts to arrange at least two industrial visits / field visits. The students may also undergo in-plant training / internship during summer / winter vacation between III and VII semesters.

18. PERSONALITY AND CHARACTER DEVELOPMENT

Every student shall be required to undergo a minimum of 40 hours of Personality Development Programmes viz, NSS / NCC / YRC / YOGA / Sports and Games / Technical and Non-technical Club activities during the first year. The attendance of the personality and character development courses / events shall be maintained on the regular basis by the concerned First Year Co-ordinators and made available in the Office of the Controller of Examinations before the commencement of Semester examinations of Semester I or Semester II.

19. DISCIPLINE

A student is expected to follow the rules and regulations laid down by the Institute and the affiliating University, as published from time to time. Any violations, if any, shall be treated as per the procedures stated thereof.

If a student indulges in malpractice in any of the End Semester / Continuous Assessments, he / she shall be liable for punitive action as prescribed by the Institution / University from time to time.

20. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The Institution reserves the right to revise/amend/change the Regulations, Curriculum, Syllabi, Scheme of Examinations and date of implementation and to introduce Additional Electives, Open Electives, One Credit Courses and Value Added Courses through the Academic Council.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

On successful completion of four year B. Tech Degree programme a few years after graduation our graduates will

PEO1: Analyse the properties of textile materials to enable the selection of materials for different kinds of textile and apparel manufacturing systems.

PEO2: Compare various technological systems of manufacturing the quality textile materials and apply them for the development of new processes and products.

PEO3: Demonstrate the management responsibilities related to issues namely social, ethical and environmental and personal aspects of textile industry.

PROGRAMME OUTCOMES (POs)

a. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. P r o b l e m **Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. **Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRMME SPECIFIC OUTCOMES (PSOs)

PSO1: Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

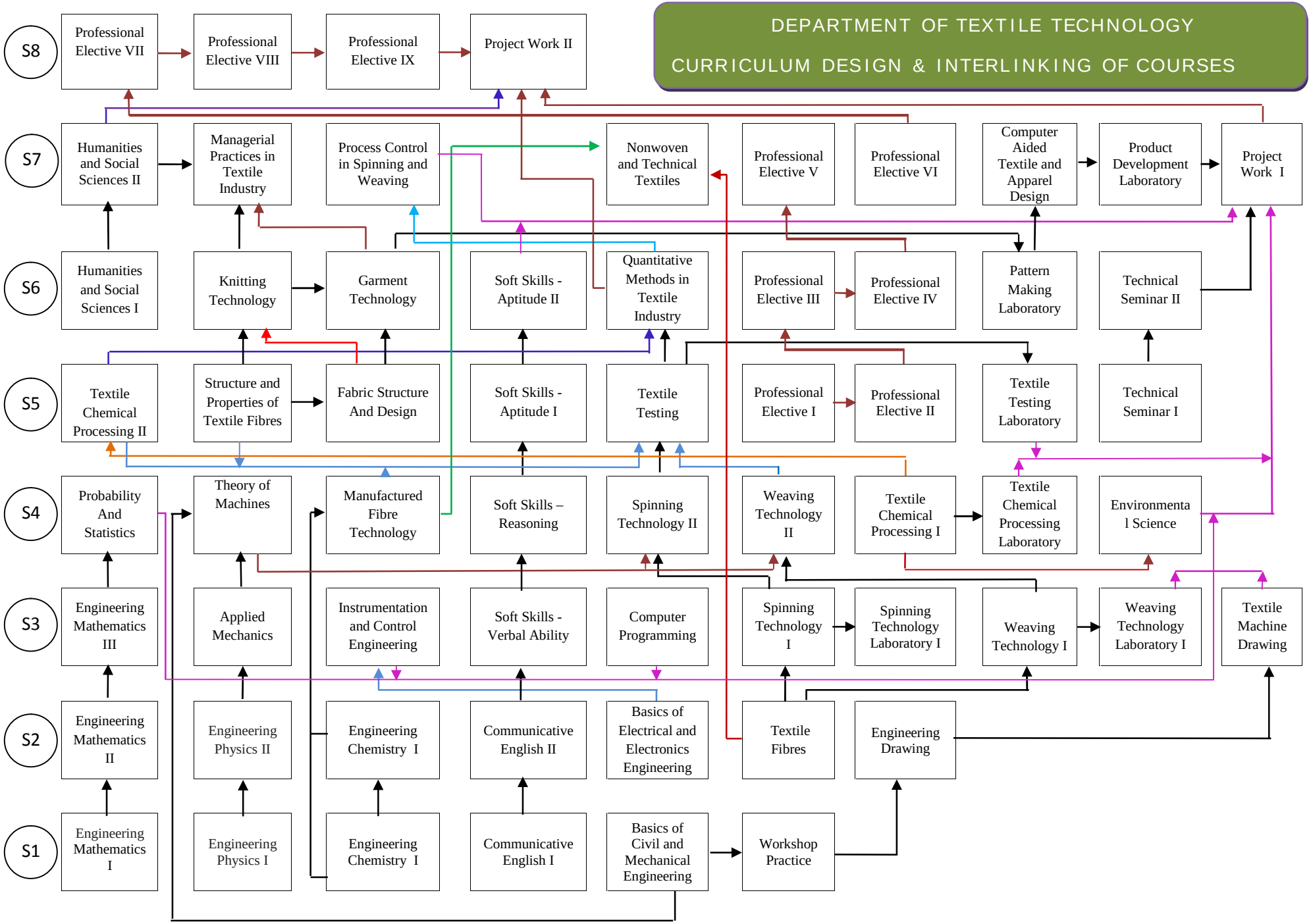
PSO2: Develop new designs (woven / printed / dyed) and products (knitted / woven / non woven) for apparel and technical applications.

MAPPING OF PEOs AND Pos

POs & PSOs	POs												PSOs	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	1	2
PEO 1	X	X		X	X		X		X	X			X	X
PEO 2	X	X	X	X	X	X	X	X	X		X	X	X	X
PEO 3			X	X		X	X	X	X	X	X	X	X	X

DEPARTMENT OF TEXTILE TECHNOLOGY

CURRICULUM DESIGN & INTERLINKING OF COURSES



DEPARTMENT OF TEXTILE TECHNOLOGY

(Minimum Credits to be Earned : 171)

I SEMESTER

Code No.	Course	L	T	P	C	Hours /Week	Maximum Marks			Category
							CA	ES	Total	
18TT101	ENGINEERING MATHEMATICS I	3	1	0	4	4	50	50	100	BS
18TT102	ENGINEERING PHYSICS I	2	0	2	3	4	50	50	100	BS
18TT103	ENGINEERING CHEMISTRY I	2	0	2	3	4	50	50	100	BS
18TT104	BASICS OF CIVIL AND MECHANICAL ENGINEERING	4	0	0	4	4	50	50	100	ES
18HS101	COMMUNICATIVE ENGLISH I	1	0	2	2	3	100	0	100	HSS
18TT106	WORKSHOP PRACTICE	0	0	2	1	2	100	0	100	ES
Total		**12**	**1**	**8**	**17**	**21**	**350**	**250**	**600**	**-**

II SEMESTER

Code No.	Course	L	T	P	C	Hours /Week	Maximum Marks			Category
							CA	ES	Total	
18TT201	ENGINEERING MATHEMATICS II	3	1	0	4	4	50	50	100	BS
18TT202	ENGINEERING PHYSICS II	2	0	2	3	4	50	50	100	BS
18TT203	ENGINEERING CHEMISTRY II	2	0	2	3	4	50	50	100	BS
18TT204	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	2	0	2	3	4	50	50	100	ES
18TT205	TEXTILE FIBRES	2	0	2	3	4	50	50	100	PC
18HS201	COMMUNICATIVE ENGLISH II	1	0	2	2	3	100	0	100	HSS
18TT207	ENGINEERING DRAWING	1	0	4	3	5	100	0	100	ES
Total		**13**	**1**	**14**	**21**	**28**	**400**	**300**	**700**	**-**

III SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18TT301	ENGINEERING MATHEMATICS III	3	1	0	4	4	50	50	100	BS
18TT302	APPLIED MECHANICS	3	0	0	3	4	50	50	100	ES
18TT303	INSTRUMENTATION AND CONTROL ENGINEERING	2	0	2	3	4	50	50	100	ES
18TT304	COMPUTER PROGRAMMING	2	0	2	3	4	50	50	100	ES
18TT305	SPINNING TECHNOLOGY I	3	0	0	3	3	50	50	100	PC
18TT306	WEAVING TECHNOLOGY I	3	0	0	3	3	50	50	100	PC
18TT307	SPINNING TECHNOLOGY LABORATORY I	0	0	4	2	4	100	0	100	PC
18TT308	WEAVING TECHNOLOGY LABORATORY I	0	0	4	2	4	100	0	100	PC
18GE301	SOFT SKILLS - VERBAL ABILITY	0	0	2	-	2	100	0	100	EEC
Total		**15**	**3**	**14**	**23**	**32**	**600**	**300**	**900**	**-**
IV SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18TT401	PROBABILITY AND SATISTICS	3	1	0	4	4	50	50	100	BS
18TT402	THEORY OF MACHINES	3	0	0	3	3	50	50	100	ES
18TT403	STRUCTURE AND PROPERTIES OF TEXTILE FIBRES	3	0	0	3	3	50	50	100	PC
18TT404	SPINNING TECHNOLOGY II	3	0	2	4	5	50	50	100	PC
18TT405	WEAVING TECHNOLOGY II	3	0	2	4	5	50	50	100	PC
18TT406	TEXTILE CHEMICAL PROCESSING I	3	0	0	3	3	50	50	100	PC
18TT407	TEXTILE CHEMICAL PROCESSING LABORATORY	0	0	4	2	4	100	0	100	PC
18TT408	TEXTLE MACHINE DRAWING AND TECHNICAL SEMINAR	0	0	4	2	4	100	0	100	PC
18HS001	ENVIRONMENTAL SCIENCE	2	0	0	-	2	100	0	100	HSS
18GE401	SOFT SKILLS – BUSINESS ENGLISH	0	0	2	-	2	100	0	100	EEC
Total		**19**	**1**	**14**	**25**	**33**	**550**	**350**	**900**	**-**

V SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18TT501	TEXTILE CHEMICAL PROCESSING II	3	0	2	4	5	50	50	100	PC
18TT502	MANUFACTURED FIBRE TECHNOLOGY	3	0	0	3	3	50	50	100	PC
18TT503	FABRIC STRUCTURE AND DESIGN	3	0	0	3	3	50	50	100	PC
18TT504	TEXTILE TESTING	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE I	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE II	3	0	0	3	3	50	50	100	PE
18TT507	FABRIC STRUCTURE AND DESIGN LABORATORY	0	0	2	1	2	100	0	100	PC
18TT508	TEXTLE TESTING LABORATORY	`0	0	4	2	4	100	0	100	PC
18GE501	SOFT SKILLS - APTITUDE I	0	0	2	-	2	100	0	100	EEC
Total		**18**	**0**	**10**	**22**	**28**	**600**	**300**	**900**	**-**

VI SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18HS002	PROFESSIONAL ETHICS IN ENGINEERING	2	0	0	2	2	50	50	100	HSS
18TT602	KNITTING TECHNOLOGY	3	0	2	4	5	50	50	100	PC
18TT603	GARMENT TECHNOLOGY	3	0	0	3	3	50	50	100	PC
18TT604	QUANTITATIVE METHODS IN TEXTILE INDUSTRY	3	1	0	4	5	50	50	100	EEC
	PROFESSIONAL ELECTIVE III	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE IV	3	0	0	3	3	50	50	100	PE
18TT607	PATTERN MAKING LABORATORY	2	0	2	3	4	100	0	100	PC
18GE601	SOFT SKILLS - APTITUDE II	0	0	2	-	2	100	0	100	EEC
Total		**22**	**1**	**6**	**22**	**30**	**600**	**300**	**900**	**-**

VII SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18HS003	PRINCIPLES OF MANAGEMENT	2	0	0	2	2	50	50	100	HSS
18TT702	COSTING AND FINANCIAL MANAGEMENT	3	0	0	3	3	50	50	100	PC
18TT703	NONWOVEN TECHNOLOGY	3	0	0	3	3	50	50	100	PC
18TT704	TECHNICAL TEXTILES	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE V	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE VI	3	0	0	3	3	50	50	100	PE
18TT707	COMPUTER AIDED TEXTILE AND APPAREL DESIGN LABORATORY	0	0	4	2	4	100	0	100	PC
18TT708	PRODUCT DEVELOPMENT LABORATORY	0	0	2	1	2	100	0	100	PC
18TT709	PROJECT WORK I	0	0	6	3	6	50	50	100	EEC
Total		**17**	**0**	**12**	**23**	**29**	**550**	**350**	**900**	**-**

VIII SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
	PROFESSIONAL ELECTIVE VII	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE VIII	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE IX	3	0	0	3	3	50	50	100	PE
18TT804	PROJECT WORK II	0	0	18	9	18	50	50	100	EEC
Total		**9**	**0**	**18**	**18**	**27**	**200**	**200**	**400**	**-**

ELECTIVES

LANGUAGE ELECTIVES

Code No.	Course	L	T	P	C	Hours/ Week	Maximum Marks			Category
							CA	ES	Total	
18HSH01	HINDI	1	0	2	2	3	100	0	100	HSS
18HSG01	GERMAN	1	0	2	2	3	100	0	100	HSS
18HSJ01	JAPANESE	1	0	2	2	3	100	0	100	HSS
18HSC01	CHINESE	1	0	2	2	3	100	0	100	HSS
18HSF01	FRENCH	1	0	2	2	3	100	0	100	HSS
PHYSICS ELECTIVES										
18GE0P1	NANOMATERIALS SCIENCE	3	0	0	3	3	50	50	100	BS
18GE0P2	SEMICONDUCTOR PHYSICS AND DEVICES	3	0	0	3	3	50	50	100	BS
18GE0P3	APPLIED LASER SCIENCE	3	0	0	3	3	50	50	100	BS
CHEMISTRY ELECTIVES										
18GE0C1	CORROSION SCIENCE AND ENGINEERING	3	0	0	3	3	50	50	100	BS
18GE0C2	ENERGY STORING DEVICES	3	0	0	3	3	50	50	100	BS
18GE0C3	POLYMER SCIENCE	3	0	0	3	3	50	50	100	BS
MATHEMATICS ELECTIVES										
18GE0M1	GRAPH THEORY AND COMBINATORICS	3	0	0	3	3	50	50	100	BS
18GE0M2	ALGEBRA AND NUMBER THEORY	3	0	0	3	3	50	50	100	BS
18GE0M3	MATHEMATICAL FINANCE AND QUEUEING THEORY	3	0	0	3	3	50	50	100	BS
DISCIPLINE ELECTIVES										
18TT001	LONG STAPLE SPINNING TECHNOLOGY	3	0	0	3	3	50	50	100	PE
18TT002	TEXTURING TECHNOLOGY	3	0	0	3	3	50	50	100	PE
18TT003	APPAREL PRODUCTION PLANNING AND CONTROL	3	0	0	3	3	50	50	100	PE
18TT004	THEORY OF SPINNING	3	0	0	3	3	50	50	100	PE
18TT005	THEORY OF WEAVING	3	0	0	3	3	50	50	100	PE

18TT006	ADVANCED KNITTING TECHNOLOGY	3	0	0	3	3	50	50	100	PE
18TT007	ADVANCES IN CHEMICAL PROCESSING TECHNOLOGY	3	0	0	3	3	50	50	100	PE
18TT008	TEXTILE EFFLUENT TREATMENT	3	0	0	3	3	50	50	100	PE
18TT009	PROCESS CONTROL IN SPINNING AND WEAVING	3	0	0	3	3	50	50	100	PE
18TT010	PROCESS AND QUALITY CONTROL IN TEXTILE CHEMICAL PROCESSING	3	0	0	3	3	50	50	100	PE
18TT011	COLOUR SCIENCE	3	0	0	3	3	50	50	100	PE
18TT012	PATTERN ENGINEERING	3	0	0	3	3	50	50	100	PE
18TT013	GARMENT PRODUCTION MACHINERY AND EQUIPMENT	3	0	0	3	3	50	50	100	PE
18TT014	MANAGEMENT OF APPAREL UNITS	3	0	0	3	3	50	50	100	PE
18TT015	APPAREL MARKETING AND MERCHANDISING	3	0	0	3	3	50	50	100	PE
18TT016	COATED AND LAMINATED TEXTILES	3	0	0	3	3	50	50	100	PE
18TT017	NANO TEXTILES	3	0	0	3	3	50	50	100	PE
18TT018	HIGH PERFORMANCE FIBRES	3	0	0	3	3	50	50	100	PE
18TT019	TEXTILE COMPOSITES	3	0	0	3	3	50	50	100	PE
18TT020	TOTAL QUALITY MANAGEMENT	3	0	0	3	3	50	50	100	PE
18TT021	MAINTENANCE MANAGEMENT	3	0	0	3	3	50	50	100	PE
18TT022	INDUSTRIAL ENGINEERING	3	0	0	3	3	50	50	100	PE
18TT023	UTILITIES ENGINEERING	3	0	0	3	3	50	50	100	PE
18TT024	HOME TEXTILES	3	0	0	3	3	50	50	100	PE
18TT025	MECHANICS OF TEXTILE MACHINES	3	0	0	3	3	50	50	100	PE
18TT026	SPECIALTY TEXTILES	3	0	0	3	3	50	50	100	PE
18TT027	COMPREHENSION	3	0	0	3	3	50	50	100	PE
18TT028	CLOTHING SCIENCE	3	0	0	3	3	50	50	100	PE
18TT029	MANAGERIAL PRACTICES IN TEXTILE INDUSTRY	3	0	0	3	3	50	50	100	PE

ENTREPRENEURSHIP ELECTIVES										
18GE0E1	ENTREPRENEURSHIP DEVELOPMENT I	3	0	0	3	3	50	50	100	PE
18GE0E2	ENTREPRENEURSHIP DEVELOPMENT II	3	0	0	3	3	50	50	100	PE
OPEN ELECTIVES										
18TT0YA	YARN AND FABRIC MANUFACTURE	3	0	0	3	3	50	50	100	OE
18TT0YB	COLORATION OF TEXTILES	3	0	0	3	3	50	50	100	OE
18TT0YC	TEXTILES IN ENGINEERING APPLICATION	3	0	0	3	3	50	50	100	OE
18TT0YD	GENERAL TEXTILE TECHNOLOGY	3	0	0	3	3	50	50	100	OE
ONE CREDIT COURSES										
18TT0XA	COTTON FIBRES: OPTIONS AND ALTERNATIVES	1	0	0	1	-	100	0	100	EEC
18TT0XB	FANCY YARNS	1	0	0	1	-	100	0	100	EEC
18TT0XC	DENIM FABRICS AND GARMENTS	1	0	0	1	-	100	0	100	EEC
18TT0XD	TESTING OF DYES	1	0	0	1	-	100	0	100	EEC
18TT0XE	TESTING OF AUXILIARIES	1	0	0	1	-	100	0	100	EEC
18TT0XF	ECO PROCESSING	1	0	0	1	-	100	0	100	EEC
18TT0XG	ERECTION AND COMMISSIONING OF TEXTILE MACHINES	1	0	0	1	-	100	0	100	EEC
18TT0XH	WORKLOAD AND WORK ASSIGNMENTS	1	0	0	1	-	100	0	100	EEC
18TT0XI	AIR ENGINEERING IN TEXTILE INDUSTRY	1	0	0	1	-	100	0	100	EEC
18TT0XJ	PRODUCT CERTIFICATION	1	0	0	1	-	100	0	100	EEC
18TT0XK	ENERGY CONSERVATION IN THE TEXTILE INDUSTRY	1	0	0	1	-	100	0	100	EEC
ADDITIONAL ONE CREDIT COURSE										
18GE0XA	ETYMOLOGY	1	0	0	1	-	100	0	100	EEC
18GE0XB	GENERAL PSYCHOLOGY	1	0	0	1	-	100	0	100	EEC

18GE0XC	NEURO BEHAVIORAL SCIENCE	1	0	0	1	-	100	0	100	EEC
18GE0XD	VISUAL MEDIA AND FILM MAKING	1	0	0	1	-	100	0	100	EEC
18GE0XE	YOGA FOR HUMAN EXCELLENCE	1	0	0	1	-	100	0	100	EEC
18GE0XF	VEDIC MATHEMATICS	1	0	0	1	-	100	0	100	EEC
18GE0XG	HEALTH AND FITNESS	1	0	0	1	-	100	0	100	EEC
18GE0XH	CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING	1	0	0	1	-	100	0	100	EEC
18GE0XI	BLOG WRITING	1	0	0	1	-	100	0	100	EEC
18GE0XJ	INTERPERSONAL SKILLS	1	0	0	1	-	100	0	100	EEC
18GE0XK	COMMUNITY SERVICE AND LEADERSHIP DEVELOPMENT	1	0	0	1	-	100	0	100	EEC
18GE0XL	NATIONAL CADET CORPS	1	0	0	1	-	100	0	100	EEC
18GE0XM	NEW AGE INNOVATION AND ENTREPRENEURSHIP	1	0	0	1	-	100	0	100	EEC
18GE0XN	DISRUPTIVE INNOVATION BASED STARTUP ACTIVITIES	1	0	0	1	-	100	0	100	EEC
18GE0XO	SOCIAL PSYCHOLOGY	1	0	0	1	-	100	0	100	EEC

SUMMARY OF CREDIT DISTRIBUTION

S. No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDIT	CREDITS in %	Range of Total Credits	
		I	II	III	IV	V	VI	VII	VIII			Min	Max
1	BS	10	10	4	4	0	0	0	0	28	16	15%	20%
2	ES	5	6	9	3	0	0	0	0	23	14	15%	20%
3	HSS	2	2	0	0	0	2	2	0	8	5	5%	10%
4	PC	0	3	10	17	16	9	12	0	67	39	30%	40%
5	PE	0	0	0	0	6	6	6	9	27	16	10%	15%
6	EEC	0	0	0	0	1	5	3	9	18	10	10%	15%
Total		17	21	23	24	23	22	23	18	171	100.0	-	-

BS - Basic Sciences
ES - Engineering Sciences
HSS - Humanities and Social Sciences
PC - Professional Core
PE - Professional Elective
EEC - Employability Enhancement Course
CA - Continuous Assessment
ES - End Semester Examination

18TT101 ENGINEERING MATHEMATICS I 3 1 0 4

Course Objectives

- Understand the concepts of vectors and Eigenvectors for different matrices to describe the stability of the linear systems in engineering fields.
- Exemplify the concepts of differentiation and integration to identify the area of 2D and 3D surfaces in engineering problems.
- Explain the concepts of analytic functions in complex domain to predict the nature of different engineering systems.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Represent the different forms of coordinate system in complex plane and characteristics of linear systems by Eigenvalues and Eigenvectors.
2. Analyse various types of functions and their differentiation techniques involved in engineering fields.
3. Implement different methods of integration used in engineering problems.
4. Execute the suitable integration technique to calculate the area and volume of different surfaces.
5. Apply the concept of analytic function to estimate the integral in complex plane.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	2	3												
3	2	3												
4	3	3												
5	1	3												

UNIT I **9 Hours**

COMPLEX NUMBERS, VECTORS AND MATRICES

Complex plane, polar coordinates and polar form of complex numbers, powers and roots, fundamental theorem of algebra. Vector algebra in 2-D and 3-D space, dot product and cross product. Matrices : Eigen values and Eigen vectors, Properties of eigen values and eigen vectors.

UNIT II **9 Hours**

CALCULUS

Limits and Continuity of Functions: Limits of functions, types of limits, evaluation of limits, continuity of functions, properties of continuous functions. Derivatives: Derivatives, differentiability, rules and properties, differentiation of transcendental functions, higher order derivatives, implicit differentiation, and differentiation of hyperbolic functions. Integration: Anti-derivatives, Riemann

Sum, indefinite and definite integration, Mean Value Theorem for definite integral, Fundamental Theorem of Calculus.

UNIT III **9 Hours**

INTEGRATION METHODS

Basic integration formulae for algebraic and transcendental functions. Integration by special devices: integration by parts, rationalizing substitution or trigonometric substitution, partial fractions, reduction formulas, improper integrals, convergence tests.

UNIT IV **9 Hours**

APPLICATIONS OF DERIVATIVES AND INTEGRATIONS

Extreme values, points of inflection and curve sketching, Rolles Theorem, Mean Value Theorem, optimization, indeterminate forms, L Hopitals Rule.

Area between curves, volume of a general solid by slicing and cylindrical shell methods, volume of a solid of revolution, length of plane curves, area of a surface of revolution.

UNIT V **9 Hours**

COMPLEX ANALYSIS

Analytic Functions- Properties of Analytic function - Determination of Analytic Function using Milne Thompson method. Cauchys Integral Formula - Classification of Singularities - Cauchys Residue Theorem.

Total: 60 Hours

Reference(s)

1. Finney RL, Weir MD and Giordano FR, Thomas Calculus, 10th edition, Addison-Wesley, 2001.
2. Smith RT and Minton RB, Calculus, 2nd Edition, McGraw Hill, 2002.
3. Kreysgiz E, Advanced Engineering Mathematics, 8th edition, John Wiley & Sons, 1999.
4. Anton H, Calculus with Analytic Geometry, 5th edition, John Wiley & Sons, 1995.
5. Ayres F Jr and Mendelson E, Schaum s Outline of Theory and Problems of Calculus, 4th edition, McGraw Hill, 1999.

18TT102 ENGINEERING PHYSICS I 2 0 2 3

Course Objectives

- Illustrate the Newtons laws of motion and wave motion with applications
- Understand the basic properties of electricity, magnetism and optics
- Differentiate the special theory of relativity and quantum physics from classical physics

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Course Outcomes (COs)

1. Illustrate the Newtons three laws of motion and apply the same to solve the real world problems involving elevator, atwood machine and acceleration of objects
2. Exemplify the physical characteristics of simple harmonic motion, wave motion and find the solutions for wave equations
3. Infer the fundamental laws, properties of electricity and magnetism and apply the same to electric and magnetic elements.
4. Apply the principles of physical and geometrical optics in the mirrors, lenses, microscopes and diffraction gratings
5. Outline the importance of special theory of relativity, quantum physics and analyse the wave and particle nature of matter

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1							2					
2	2								2					
3	2	1												
4	2	1							-					
5	2	1							-					

UNIT I **6 Hours**

MECHANICS

Newtons laws of motion: Concept of force and its nature -Newtons first law and inertial frames - definition of mass - Newtons second law-gravitational force and weight .Newtons third law. Applications of Newtons laws: particle in equilibrium, particle under net force - weighing a mass in an elevator, the atwood machine and acceleration of two objects connected by a cord

UNIT II **6 Hours**

OSCILLATIONS AND WAVES

Fundamentals of simple harmonic motion - energy of simple harmonic oscillator - spring mass system - time period of simple pendulum, compound pendulum and torsional pendulum - Damped oscillations.

Travelling wave motion - sinusoidal waves on strings - speed of a wave - reflection and transmission - rate of energy transfer in wave motion

UNIT III **6 Hours**

ELECTRICITY AND MAGNETISM

Point charges - electric fields - Gausss law and its applications - electric potential - capacitance - energy stored in a capacitor.
Concept and source of magnetic fields - Amperes theorem
- determination of magnetic field due to different current distributions - Faradays law - self-induction and mutual induction - energy stored in an inductor

UNIT IV **6 Hours**

LIGHT AND OPTICS

Nature of light - laws of reflection and refraction - refractive index and Snells law - dispersion of light - total internal reflection - image formation:concave mirrors - convex mirrors - thin lenses - compound microscope - human eye.
Conditions of interference - Youngs double slit experiment - intensity distribution of interference - phase change due to reflection - diffraction-narrow slit diffraction - single slit and two slit - intensity distribution - diffraction grating - applications

UNIT V **6 Hours**

MODERN PHYSICS

Special theory of relativity - simultaneity and time dilation - twin paradox - length contraction - relativistic mass variation - space time graph.
Black body radiation and Planck hypothesis - allowed energy levels - thermal radiation from different objects
- photoelectric and Compton effect. Matter waves - de-Broglie hypothesis - wave nature of particles - Davission-Germer experiment

1 **5 Hours**

EXPERIMENT 1

Determination of resultant of system of concurrent coplanar forces-Parallelogram law of forces

2 **5 Hours**

EXPERIMENT 2

Determination of moment of inertia-Torsional pendulum

3 **5 Hours**

EXPERIMENT 3

Determination of wavelength of mercury spectral lines-spectrometer

4 **4 Hours**

EXPERIMENT 4

Determination of refractive index of solid and liquid-travelling microscope

5 **3 Hours**

EXPERIMENT 5

Determination of wavelength of laser-diffraction grating

6 **4 Hours**

EXPERIMENT 6

Determination of frequency of a tuning fork-Meldes apparatus

7 **4 Hours**

EXPERIMENT 7

Thickness of a thin wire using interference of light-Air wedge method

Total: 60 Hours

Reference(s)

1. R A Serway and J W Jewitt, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2011
2. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011
3. H C Verma, Concepts of Physics (Vol I & II), BharathiBhawan Publishers & Distributors, New Delhi, 2017
4. H D Young and R A Freedman, Sears and Zemanskys University Physics with Modern Physics, Pearson education, 2016
5. R K Gaur and S L Gupta, Engineering Physics, DhanpatRai Publications, 2012

18TT103 ENGINEERING CHEMISTRY I 2 0 2 3

Course Objectives

- Differentiate between ionic, covalent, coordinate bonding and classify the bonding between dye and fabric as ionic or covalent
- Review the basics of polymer chemistry and the mechanism involved to prepare advanced polymers for textile applications
- Understand the concept of electrochemistry for determination of electrode potential, pH and applications as conducting polymers

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Outline the influence of different chemical bonds on the dye fiber interaction
2. Classify polymers and identify the method to determine the molecular weight of selected polymers
3. Identify the mechanism of polymerisation for commercially available natural/synthetic polymers
4. Apply the concepts of electrochemistry to determine the electrode potential and pH of acidic or basic solutions
5. Interpret the importance of conducting polymers in textile research

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	1												
3	2	2												
4	3	2												
5	3	2					1							

UNIT I **6 Hours**

CHEMICAL BONDING

Ionic, covalent and co-ordinate bonds (overview only) -hydrogen bonding and its consequences - Van der Waals forces (dipole-dipole and dipole-induced dipole) - Interaction between fibres/polymers and dyes (basic concept only) - dye substrate affinity (dyes for cellulose fibres and silk)

UNIT II **7 Hours**

INTRODUCTION TO POLYMERS

Monomers - degree of polymerization - homo polymer - hetero polymer - copolymer - tacticity. Classification of polymers based on source (natural and synthetic) and application (plastics, fibres and

elastomers). Polymer molecular weight determination: Number average, weight average and viscosity average method. Functionality of monomer

UNIT III **7 Hours**

MECHANISM OF POLYMERISATION

Types of polymerization: Addition, condensation and copolymerization. Mechanism of addition polymerisation: Free radical, ionic (cationic and anionic) - coordination polymerisation (Ziegler Natta)

UNIT IV **6 Hours**

ELECTROCHEMISTRY IN TEXTILES

Conductivity of electrolytes - electrochemical cell - electrode potential - salt bridge - cell reaction - cell representation. Types of electrodes - calomel electrode - determination of single electrode potential. Influence of pH in textiles - Ion-selective electrode: Glass electrode - measurement of pH using glass electrode

UNIT V **4 Hours**

CONDUCTING POLYMERS

Conducting polymers: Definition - characteristics of conducting polymers - polypyrrole, polyaniline and polythiophene - applications

FURTHER READING

Applications of polymers in day to day life
Fibre composites - Smart clothes using composite fibres
Impact of corrosion in textile and fashion industry

1 **2 Hours**

EXPERIMENT 1

Lab safety rules and guidelines for students

2 **2 Hours**

EXPERIMENT 2

Preparation of N/10 and M/10 oxalic acid and sodium carbonate solutions

3 **4 Hours**

EXPERIMENT 3

Collect and document three natural as well as synthetic fibers and list its properties and uses

4 **4 Hours**

EXPERIMENT 4

Identify thermo from thermosetting plastics and determine the density of the given thermoplastic materials by density test

5 **2 Hours**

EXPERIMENT 5

Determination of molecular weight of a polymer by Ostwald viscometer

6 **4 Hours**

EXPERIMENT 6

Determination of strength of hydrochloric acid in a given solution using pH meter

7 **4 Hours**

EXPERIMENT 7

Conductometric titration of mixture of acids (HCl and CH3COOH)

8 **4 Hours**

EXPERIMENT 8

Application of calomel electrode to determine the redox potential of Fe(II) solution

9 **4 Hours**

EXPERIMENT 9

Conductometric titration of strong acid (HCl) Vs strong base (NaOH)

Total: 60 Hours

Reference(s)

1. J.D. Lee, Concise inorganic chemistry, Blackman Science Ltd, France, Wiley-India, 5th edition(Reprint), 2016
2. V.R. Gowariker, N.V. Viswanathan and Jayader Sreedhar, Polymer Science, New Age International (P) Limited, 2nd edition, 2015
3. B. R. Puri, L. R. Sharma and Madan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., 2010
4. P. C. Jain and M. Jain, Engineering Chemistry, Dhanpat Rai Publications., New Delhi, 2016
5. F.W. Billmeyer, Text book of polymer science, Jr. John Wiley and Sons, 2000
6. www.ch.ic.ac.uk/local/organic/tutorial/steinke/4yrPolyConduct2003.pdf

18TT104 BASICS OF CIVIL AND MECHANICAL ENGINEERING

4 0 0 4

Course Objectives

- To impart basic knowledge in the field of Civil Engineering
- To guide students to select the good building materials
- To create awareness on various types of water supply and transportation systems
- To impart basic knowledge in the various engineering materials and manufacturing Processes.
- To understand the working principles of various Internal Combustion Engines, Refrigeration, Boiler and power plants.
- To understand the working principles of various Boilers and power plants.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Understand the fundamental philosophy of Civil Engineering
2. Identify the nature of building components, functions, construction practices and material qualities
3. Understand the fundamental concepts of water supply and transportation systems
4. Recognize the various engineering materials and manufacturing processes.
5. Understand the working principles and operations Internal Combustion Engines and Refrigeration.
6. Understand the working principles and operations of Boilers and power plants.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1					1	2	1					1	1
2	2					2	2	1					2	2
3	2		2			2	2	1						
4	1	1	1											
5	2	1	1									1	1	1
6	2	1	1									1	2	2

UNIT I **10 Hours**

INTRODUCTION TO CIVIL ENGINEERING

History, development and scope of Civil Engineering Functions of Civil Engineers. Construction Materials Characteristics of good building materials:Stones - Bricks -Cement - Aggregates and concrete. Surveying: Definition and purpose Classification Basic principles Measurement of length by chains and tapes. 10hours

UNIT II **10 Hours**

GENERAL FEATURES RELATING TO BUILDINGS

Selection of site Basic functions of buildings Major components of buildings. Types of foundation Bearing capacity of soils General Principles of Brick masonry Stone masonry Introduction to Green Building and Interior Design 10hours

UNIT III **10 Hours**

WATER SUPPLY AND TRANSPORTATION SYSTEMS

Sources of water Supply Methods of Rain Water Harvesting Flow Diagram of Water treatment Process Modes of Transportation Systems. Classification of Highways-Components of roads Bituminous and cement concrete roads. Importance of railways - Gauges Components of permanent way Types of bridges. 10hours

UNIT IV **10 Hours**

ENGINEERING MATERIALS AND MANUFACTURING PROCESSES

Materials classification, mechanical properties of cast iron, steel and high speed steel Casting process-Introduction to green sand moulding, pattern, melting furnace electric furnace Introduction to metal forming process and types Introduction to arc and gas welding Centre lathe, Drilling and Milling machines principal parts, operations. 10hours

UNIT V **10 Hours**

INTERNAL COMBUSTION ENGINES AND REFRIGERATION

Internal Combustion (IC) Classification, main components, working principle of a two and four stroke petrol and diesel engines, differences Refrigeration working principle of vapour compression and absorption system Introduction to Air conditioning. 10hours

UNIT VI **10 Hours**

ENERGY, BOILERS, TURBINE AND POWER PLANTS

Energy-Solar, Wind, Tidal, Geothermal, Biomass and Ocean Thermal Energy Conversion (OTEC)Boilers classification, Babcock and Wilcox and La-Mont Boilers, differences between fire tube and water tube boiler Steam turbines- working principle of single stage impulse and reaction turbines Power plant classification, Steam, Hydel, Diesel, and Nuclear power plants. 10hours

Total: 60 Hours

Reference(s)

1. N. Arunachalam, Bascis of Civil Engineering, Pratheeba Publishers, 2000
2. M. S. Palanichamy, Basic Civil Engineering, TMH, 2009
3. G. Shanmugamand M. S. Palanichamy, Basic Civil and Mechanical Engineering,Tata McGraw Hill Publishing Co., New Delhi, 2009
4. Pravin Kumar, Basic Mechanical Engineering, Pearson Education India, Pearson,2013.
5. G. Shanmugam and S. Ravindran, Basic Mechanical Engineering, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2013.
6. S. R. J. Shantha Kumar, Basic Mechanical Engineering, Hi-tech Publications, Mayiladuthurai, 2015

18HS101 COMMUNICATIVE ENGLISH I 1 0 2 2

Course Objectives

- Read and understand the main points on familiar matters regularly encountered in work, school, or leisure
- Listen and respond in most common situations where English is spoken
- Write simple connected texts on topics which are familiar or of personal interest
- Describe experiences and events, hopes and ambitions and briefly give reasons and explanations for opinions and plans

Programme Outcomes (POs)

i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Use appropriate grammar & vocabulary that is expected at the BEC Preliminary exam level
2. Understand the general meaning of non-routine letters within own work area, and short reports of a predictable nature
3. Write straightforward, routine letters of a factual nature, and make notes on routine matters, such as taking/placing orders
4. Follow simple presentations/demonstrations
5. Deal with predictable requests from a visitor, state routine requirements, and offer advice within own job area on simple matters

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1									1					
2									2					
3									3					
4										1				
5										2				

UNIT I **9 Hours**

GRAMMAR

Tenses Future continuous, Past continuous, Past perfect, Past simple, Past tense responses, Present perfect continuous, Present perfect/past simple Reported speech Adverbs intensifiers Comparatives and superlatives Conditionals 2nd and 3rd Connecting words expressing cause and effect, contrast Phrasal verbs Prepositions of place Simple passive - Wh-questions in the past Question tags Will and going to, for prediction.

UNIT II **9 Hours**

READING

Understanding short real-world notices, messages Detailed comprehension of factual material; skimming and scanning skills - Interpreting visual information Reading for detailed factual

information Reading for gist and specific information - Grammatical accuracy and understanding of text structure - Reading and information transfer.

UNIT III **9 Hours**

WRITING

Internal communication including note, message, memo or email - arranging / rearranging appointments, asking for permission, giving instructions - Business correspondence including letter, fax, email apologising and offering compensation, making or altering reservations, dealing with requests, giving information about a product.

UNIT IV **9 Hours**

LISTENING

Listening for specific information Listening for numbers and letters Note completion Listening for gist listening to monologues (presentations, lectures, announcements and briefings) listening to interacting speakers (telephone conversations, face-to-face conversations, interviews and discussions).

UNIT V **9 Hours**

SPEAKING

Exchanging personal and factual information expressing and finding out about attitudes and opinions organise a larger unit of discourse Turn-taking, negotiating, collaborating, exchanging information, expressing and justifying opinions, agreeing and/or disagreeing, suggesting, speculating, comparing and contrasting, and decision-making.

1.Goodbye party for Miss Pushpa T S - Nissim Ezekiel
2.Our Casuarina Tree - Toru Dutt
3.Palanquin Bearers - Sarojini Naidu
4.The Tyger - William Blake
5.Ode on a Grecian Urn - John Keats

Total: 45 Hours

Reference(s)

1. Alexander Garrett, Cambridge BEC Preliminary Students Book with Answers, Cambridge University Press, 2016.
2. Lan Wood, Anne Williams and Anna Cowper. Pass Cambridge BEC Preliminary, Second Edition, New Delhi, 2014.
3. Norman Whitby. Cambridge Business Benchmark. Pre-Intermediate to Intermediate, Students Book. South Asian Edition, 2018.

18TT106 WORKSHOP PRACTICE **0 0 2 1**

Course Objectives

- To provide hands on training for fabrication of components using carpentry, sheet metal, fitting and welding equipment/tools.
- To develop the skills for preparing the green sand mould using foundry tools and to make simple electrical & household pipe line connections using suitable tools
- To develop the skill to make / operate/utilize the simple engineering components.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Fabricate simple components using carpentry, sheet metal, fitting & welding equipment/tools.
2. Prepare green sand mould and make simple electrical & household pipe line connections using suitable tools.
3. Make / operate / utilize the simple engineering components

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	3		2									
2	1	-	3		2									
3	1	-	2		3									

1 **3 Hours**

EXPERIMENT 1

Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box) (or) making simple object using Metal Spinning Machine. (Example: Aluminum Cup).

2 **3 Hours**

EXPERIMENT 2

Prepare V (or) Half round (or) Square (or) Dovetail joint from the given mild Steel flat.

3 **3 Hours**

EXPERIMENT 3

Fabrication of a simple component using thin and thick plates. (Example: Book rack)

4 **3 Hours**

EXPERIMENT 4

Making a simple component using carpentry power tools. (Example: Electrical switch Box/Tool box/ Letter box].

5 **3 Hours**

EXPERIMENT 5

Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union, bend, Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes, bend, gate valve, flanges and foot valve.

6 **3 Hours**

EXPERIMENT 6

Prepare a green sand mould using solid pattern/split pattern.

7 **3 Hours**

EXPERIMENT 7

Construct a domestic electrical wire connections using indicator, one way switch with calling bell, two way switch with lamp, one way switch with fan regulator and one way switch with socket.

8 **3 Hours**

EXPERIMENT 8

Alignment and leveling of textile machines.

9 **3 Hours**

EXPERIMENT 9

Extraction of bearing, gears and pulleys from textile machines

10 **3 Hours**

EXPERIMENT 10

Usage of gauges in textile machinery for setting

Total: 30 Hours

18TT201 ENGINEERING MATHEMATICS II 3 1 0 4

Course Objectives

- Understand the concepts of partial derivatives and multiple integrals to define the area, volume and extreme values of various surfaces in engineering fields.
- Classify the sequences and series in linear systems is convergent or divergent.
- Formulate the real time engineering problem into mathematical model using ordinary differential equation and solve it by appropriate method.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Illustrate the various parameters in partial differentiation and characterize the maxima and minima functions for signals and systems.
2. Apply multiple integral concepts to calculate the area and volume by appropriate vector integral theorems.
3. Analyse the convergence and divergence of sequences and series by various tests.
4. Construct first order differential equations from real time phenomena and solve it by suitable method.
5. Execute the appropriate method to solve the second order differential equations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3												
2	2	3												
3	2	3												
4	1	3												
5	1	3												

UNIT I **9 Hours**

PARTIAL DIFFERENTIATION

Functions of several variables, plotting of 2-variable functions, introduction to cylindrical and spherical coordinates, chain rule, total differential, gradient, directional derivatives, normal lines and tangent planes, extreme of functions of two variables, applications.

UNIT II **9 Hours**

MULTIPLE INTEGRALS

Double integrals, regions of integrations, triple integrals, applications (Cartesian coordinates only- Greens theorem and Gauss Divergence theorem).

UNIT III **9 Hours**

SEQUENCES AND SERIES

Sequences and series, convergence and divergence of series, absolute convergence, conditional convergence, test for convergence and divergence. Power series for functions, interval of convergence, Taylor and Maclaurin series, Taylors Theorem with remainder.

UNIT IV **9 Hours**

FIRST ORDER DIFFERENTIAL EQUATIONS

Separable differential equations, homogeneous differential equations, exact differential equations, integrating factor, Bernoullis equation, applications.

UNIT V **9 Hours**

SECOND ORDER DIFFERENTIAL EQUATIONS

Second order homogeneous and non-homogeneous equations with constant coefficients, variation of parameters, method of undetermined coefficients, series solutions of differential equations, applications.

FOR FURTHER READING

Application of transformations in design theory.

Total: 60 Hours

Reference(s)

1. Finney RL, Weir MD and Giordano FR, Thomas Calculus, 10th edition, Addison-Wesley, 2001.
2. Smith RT and Minton RB, Calculus, 2nd Edition, McGraw Hill, 2002.Kreysgiz E, Advanced Engineering Mathematics, 8th edition, John Wiley & Sons, 1999.
3. Ray Wylie and C Louis Barrett, Advanced Engineering Mathematics, Sixth Edition, Tata McGraw-Hill Publishing Company Ltd, 2003.
4. Peter V. O Neil , Advanced Engineering Mathematics, Seventh Edition , Cengage Learning India Private Limited, 2012.
5. Glyn James, Advanced Engineering Mathematics, Third Edition,Wiley India, 2014.

18TT202 ENGINEERING PHYSICS II 2 0 2 3

Course Objectives

- understand the elastic and surface properties of materials for their relevant applications to various streams of engineering and technology
- realize the importance of static and dynamic friction in textile materials
- apply the concepts involved in thermodynamics for solving the real world problems

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Course Outcomes (COs)

1. understand the elastic properties of materials in terms of the three modulii of elasticity and surface properties of liquids
2. exemplify the wave properties, generation of ultrasonic's and their applications in the field of non-destructive testing methods
3. illustrate the crystal structure, crystal planes and unit cell characteristics of cubic crystal systems
4. assess the differences between static and dynamic friction and effect of wear and abrasions in textile machinery parts
5. apply the knowledge of thermodynamics in calculating the heat requirement for fabric process and analyze kinetics of dyeing

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1							2					
2	2	1							2					
3	2	1							2					
4	2	1							2					
5	2	1							2					

UNIT I **6 Hours**

ELASTICITY AND SURFACE PROPERTIES

Elasticity: elastic and plastic behavior of materials - stress - strain diagram - Hookes law - types of elastic modulii: Youngs modulus - bulk modulus - rigidity modulus - Poissons ratio - factors affecting elasticity. Surface properties: cohesive force - adhesive force - factors affecting surface tension - interfacial tension - emulsions - detergency - foaming - wettability - coefficient of viscosity - Stokes law - Poiseuilles law - coefficient of viscosity of various liquids.

UNIT II **6 Hours**

ULTRASONICS

Properties of ultrasonic waves - generation: magnetostriction and piezoelectric methods - detection of ultrasonic waves - velocity of ultrasonic waves using acoustic grating. Nondestructive testing: pulse echo method - merits and demerits - applications: drilling - cutting .SONAR

UNIT III **6 Hours**

SOLID STATE PHYSICS

Crystalline and noncrystalline materials - lattice points - space lattice - crystal structure -unit cells - Bravais lattice and crystal systems - Miller indices - procedure for finding Miller indices-relation between interplanar distance and interatomic distance - unit cell characteristics of SC, BCC, FCC and HCP structures

UNIT IV **6 Hours**

FRICTION

Friction: basic laws - static and dynamic friction - adhesion - sheering theory - surface roughness - deformation - ploughing - normal adhesion - effects of speed on friction - wear and abrasion - frictional behaviour of elastomers - rolling friction

UNIT V **6 Hours**

THERMODYNAMICS

Heat - equilibrium and quasistatic process - path functions - comparison between heat and work - internal energy - laws of thermodynamics - isothermal and adiabatic process - work done - reversible and irreversible process - entropy diffusion- model for diffusion - diffusion coefficient - rate of dyeing, equilibrium, exhaustion, migration, adsorption and absorption of dyes - kinetics of dyeing with disperse dyes

1 **4 Hours**

EXPERIMENT 1

Find the elevation of the given wooden beam at the midpoint by loading at the ends and hence calculate the Youngs modulus of the material.

2 **4 Hours**

EXPERIMENT 2

Find the depression at the midpoint of the given wooden beam for 50g, 100 g, 150 g, 200 g and 250 g subjected to non-uniform bending and determine the Youngs modulus of the material of the beam.

3 **4 Hours**

EXPERIMENT 3

Determine the moment of inertia of the disc and calculate the rigidity modulus of a given wire using torsion pendulum (symmetrical masses method).

4 **4 Hours**

EXPERIMENT 4

Determine the coefficient of viscosity of a given liquid by Poiseuille's method.

5 **4 Hours**

EXPERIMENT 5

Determine the

(i) wavelength of ultrasonics in a liquid medium,

(ii) velocity of ultrasonic waves in the given liquid
(iii) compressibility of the given liquid using ultrasonic interferometer.

6 **5 Hours**

EXPERIMENT 6

Determine the coefficient of thermal conductivity of a bad conductor by disc method.

7 **5 Hours**

EXPERIMENT 7

Form the interference fringes from the air wedge setup and calculate the thickness of the given material (yarn)

Total: 60 Hours

Reference(s)

1. A. Serway and John W. Jewett, JR. Physics for Scientists and Engineers with Modern Physics, Ninth Edition Raymond, 2016.
2. Bhattacharya, D.K. & Poonam, T. Engineering Physics. Oxford University Press, 2015
3. Gaur, R.K. & Gupta, S.L. Engineering Physics. Dhanpat Rai Publishers, 2012
4. Pandey, B.K. & Chaturvedi, S. Engineering Physics. Cengage Learning India, 2012.
5. B.S. Gupta, Friction in textile materials, Wood Cut Publishing Pvt Ltd. 2008

18TT203 ENGINEERING CHEMISTRY II 2 0 2 3

Course Objectives

- Explain the significance of electromagnetic spectrum on colour theory based on complementary colours of light, chromophore, auxo chrome, intensity shifts and illustrate photo processes based on Jablonski diagram.
- Classify dyes based on chromo phore and outline the structure, properties and applications of selected natural and synthetic dyes
- Summarize the effect of dyes on human health , environment and analyze the textile effluents in water by chemical methods to treat by adsorption and membrane technology

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Summarize different regions in an electromagnetic spectrum and exemplify chromophores based on intensity shifts
2. Explain the influence of electromagnetic radiation in photochemical process of dyes
3. Classify dyes based on chromophore and understand the properties and uses of dyes in textile applications
4. Outline the effect of dyes on human health, environment and analyze the effluents in water by chemical methods
5. Apply suitable method to remove textile effluents from waste water by adsorption and membrane technology

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	1												
3	2	2												
4	3	2												
5	2	2												

UNIT I **7 Hours**

COLOUR CHEMISTRY

Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational transitions. Regions of electromagnetic spectrum - complementary colours - chromophores, auxochromes, hyperchromic shift, hypochromic shift, hypsochromic shift and bathochromic shift - conjugated chromophores.

UNIT II **5 Hours**

PHOTOCHEMISTRY OF DYES

Laws of photochemistry. Lambert-Beer Law and its limitations. Photoprocesses - Jablonski diagram (Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence) - Chemiluminesence

and Photo-sensitization. Principle, instrumentation (Block diagram), applications- colorimetric analysis (estimation of prussian blue dye).

UNIT III **6 Hours**

DYES FOR TEXTILES

Classification of dyes - important chemical chromophores of dye classes (azo, anthraquinone and indigoid). Structure, properties and applications of azo dye (congo red), triaryl methane dye (Malachite green), anthraquinone dye (Alizarin-1,2 dihydroxy anthraquinone) and indigoid dye (Indigo).

UNIT IV **5 Hours**

CHEMICAL METHODS OF ANALYSIS

Effect of textile effluents on environment and human health. Water quality parameters: BOD, COD, DO content (determination of DO content in water by Winklers method) - neutralization titration (Estimation of alkalinity in water) - complexometric titration (Role of EDTA in textile industry) - redox titration (Iodometry).

UNIT V **7 Hours**

TEXTILE EFFLUENT TREATMENT

Wastewater treatment - treatment with activated carbon. Adsorption: Types (physisorption and chemisorption) - applications of adsorption - adsorption of solutes from solutions - adsorption isotherm: Types (I-V). Membrane Technology : Reverse osmosis - electrodialysis.

FURTHER READING

Finger print region in infra red spectroscopy
Dye effluent from textile and its treatment

1 **2 Hours**

EXPERIMENT 1

Interpretation of extended chromophore present in organic compound by UV-Visible spectrum

2 **4 Hours**

EXPERIMENT 2

To introduce the Lambert - Beer s Law by analyzing the influence of the light path length through the absorption medium on transmittance, the influence of the increased concentration of solution on transmittance and the impact of different substances/species on transmittance

3 **2 Hours**

EXPERIMENT 3

Estimation of Prussian blue dye by colorimetric analysis

4 **4 Hours**

EXPERIMENT 4

Preparation of natural/ synthetic dye for textile applications

5 **2 Hours**

EXPERIMENT 5

Estimation of alkalinity in water sample by volumetric analysis

6 **4 Hours**

EXPERIMENT 6

Estimation of hardness in the given water sample(s) by EDTA method

7 **4 Hours**

EXPERIMENT 7

Estimation of dissolved oxygen content in water sample(s) by Winkler s method

8 **4 Hours**

EXPERIMENT 8

Estimation of chloride present in the given water sample by argentometric method

9 **4 Hours**

EXPERIMENT 9

Treatment of water containing dye effluents by activated charcoal method

Total: 60 Hours

Reference(s)

1. J.D. Lee, Concise inorganic chemistry, Blackman Science Ltd, France, Wiley-India, 5th edition(Reprint), 2016
2. P. C. Jain and M. Jain, Engineering Chemistry, Dhanpat Rai Publications., New Delhi, 2016
3. Sashi Chawla, Text Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi, 2003
4. B. R. Puri, L. R. Sharma and Madan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., 2010
5. J. C. Kuriacose and J. Rajaram, Chemistry in Engineering & Technology, Vol. 1&2, TMH, 2009

18TT204 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

2 0 2 3

Course Objectives

- Explain electrical properties of fibres and nano-materials and their measurement using digital meters.
- Exemplify the operation of electrical drives used in textile industry.
- Explain the electronics used in textile industry.
- Interpret the sensors used in textile industry.
- Attribute the different types of earthing and electrical Safety.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Explain electrical properties of fibers and nano-materials and their measurement using digital meters.
2. Exemplify the operation of electrical drives used in textile industry.
3. Explain the electronics used in textile industry.
4. Interpret the sensors used in textile industry.
5. Attribute the different types of earthing and electrical Safety.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3	3	2									
2	3	2	-	2	3								3	
3	3	2	-	3	2	3	2							2
4	3	2	-	3	3		2						2	
5	3	2	1	3	2	3								

UNIT I **5 Hours**

PROPERTIES OF MATERIALS AND MEASUREMENT

Properties of Materials and Measurement, Electrical properties such as Conductivity, Resistivity, Capacitance of Nano Materials and Fibre, Measurement of Voltage, Current, Power and Power factor using Digital meter - LCRQ meter.

UNIT II **8 Hours**

ELECTRICAL MACHINES AND DRIVES

Construction and Operation of DC motors, Three phase Induction Motor, Servo Motor, DC Generator, speed control of DC motor, speed control of AC motor- VFD.

UNIT III **5 Hours**

FUNDAMENTALS OF ELECTRONICS

Characteristics of PN Junction diode, Timers - Display system, Interfacing DC motor with electronic control system.

UNIT IV **6 Hours**

SENSORS AND PLC

Principles of transducers, strain gauge, photocell, Proximity Sensors, Inductive Sensor, Hall Sensors, Programmable Logic Controller in textile industry.

UNIT V **6 Hours**

EARTHING, SAFETY AND ACCESSORIES

Earthing: Necessity- Types of Earthing, Measurement of Earth Resistance - Types of fuses, MCB, ELCB ,Necessity of Insulation - Types of Switches, Sockets and Plugs.

1 **6 Hours**

EXPERIMENT 1

Measurement of conductivity, resistivity of fibers and conducting polymers.

2 **6 Hours**

EXPERIMENT 2

Develop a prototype driving mechanism using VFD.

3 **6 Hours**

EXPERIMENT 3

Develop an electronic speed control system for DC motor.

4 **6 Hours**

EXPERIMENT 4

Measurement of temperature using thermistors.

5 **6 Hours**

EXPERIMENT 5

Fuse replacement and earthing methods.

Total: 60 Hours

Reference(s)

1. A.L.Anwari, Basic of electrical engineering, Dhanpat Rai,2016.
2. Alan.s.moris, Reza Langari,Measurement and instrumentation , Elsevier,2011.
3. R. S. Sedha, A Textbook of Applied Electronics, S.Chand & Company Ltd, 2013.
4. T.k.Nagsarkar and M.S.Sukhija ,Basic of Electrical Engineering, oxford university,2011.
5. Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall,2010.

18TT205 TEXTILE FIBRES 2 0 2 3

Course Objectives

- To teach the fundamentals of natural and manmade fibres and their properties.
- To impart knowledge on the identification of various natural and manmade fibres.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Understand the origin and production of textile fibres
2. Understand production of natural fibres and their physical and chemical properties
3. Understand the production of regenerated fibres and their properties
4. Understand the production of PA and PET fibres and their properties
5. Understand the production of special fibres and their properties and Identification of fibres

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3									1	2	-	2	
2	3									1	2	-	2	
3	3									1	2	-	2	
4	3									1	2	-	2	
5	3									1	2	-	2	

UNIT I **6 Hours**

INTRODUCTION AND NATURAL FIBRES

Fibre - Staple fibre - Filament - Yarn -Thread - Fabric and Clothing. Characteristics of Textile Fibre - Classification of Textile Fibres.
Cotton: Evolution of cotton varieties - Genetically modified Cotton - Organic Cotton & Coloured Cotton - Cultivation and harvesting - Chemical composition - Chemical structure - Physical properties - Chemical properties and End uses

UNIT II **6 Hours**

NATURAL FIBRES (CONT.)

Bast Fibres: Varieties and uses - Flax, Ramie, Hemp, Kenaf, Banana. Jute: Cultivation- Retting -Fibre Extraction - Properties. Wool: Types - Rearing - Shearing - Chemical Composition and structure - Physical and Chemical properties - uses.

Silk: Types - Reeling - Throwing - Chemical Composition and Structure - Physical and Chemical properties - uses.
Leaf fibres: Sisal - Pine apple - Abaca - Physical properties - Chemical properties and uses. Fruit fibres: Coir - Physical properties - Chemical properties and End uses

UNIT III **6 Hours**

REGENERATED CELLULOSIC FIBRES AND REGENERATED PROTEIN FIBRES

Introduction to fibre forming processes. Viscose rayon: Principle of manufacture - Physical properties - Chemical properties &End uses. Modification of viscose rayon - Tencel - Modal .Alternative to viscose process.
Principle of manufacture: Casein fibre- Vicara fibre - Ardil fibre - properties.

UNIT IV **6 Hours**

POLYAMIDE FIBRES AND POLYESTER FIBRE

Classification of Nylon fibres - Manufacture of Nylon 6 - Nylon 66 - Chemical structure and properties - End uses of polyamides -properties and application
Manufacture of polyester - Chemical structure - Physical and chemical properties - End uses.

UNIT V **6 Hours**

SPECIALITY FIBRES AND IDENTIFICATION OF FIBRES

Classification of Speciality fibres - Aromatic polyamides - Glass Fibre - HDPE fibre -HMPE -PBI - Properties and end uses.

Feeling Test - Burning test - Microscopic test -Staining Test -Chemical test - Density measurement.

FOR FURTHER READING

Details of major Cotton producing countries, Major wool and silk producing countries, Comparison of regenerated cellulose fibres with cotton and regenerated protein fibres with wool, silk, Comparison of Nylon 6 and Nylon 66, Solubility Parameters.

1 **2 Hours**

EXPERIMENT 1

Fibre identification techniques: Assessment of physical characteristics by feel, appearance and other subjective techniques

2 **2 Hours**

EXPERIMENT 2

Fibre identification techniques: Burning test

3 **4 Hours**

EXPERIMENT 3

Fibre identification techniques: Microscopic assessment

4 **6 Hours**

EXPERIMENT 4

Fibre identification techniques: Solubility test

5 **4 Hours**

EXPERIMENT 5

Fibre identification techniques: Measurement of fibre density

6 **4 Hours**

EXPERIMENT 6

Identification of the given fibres (cellulosic fibres - 2)

7 **4 Hours**

EXPERIMENT 7

Identification of the given fibres (Protein fibres - 2)

8 **4 Hours**

EXPERIMENT 8

Identification of the given fibres (manufactured fibres - 2)

Total: 60 Hours

Reference(s)

1. H. V. Sreenivasa Murthy, Introduction to Textile Fibres, TAI Publications, Mumbai, 1987.
2. S. P. Mishra, A Textbook of Fibre Science and Technology, New Age publication, 2000
3. Natural Fibres Hand Book with Cultivation and Uses, NIIR board of Consultants and Engineers, 2007.
4. J. Gordon Cook, Handbook of Textile Fibres: Natural Fibres: Volume 1, Woodhead Textiles Series No. 4, Woodhead Publishing Limited, UK, 2001.
5. J. Gordon Cook, Handbook of Textile Fibres: Manmade Fibre: Volume 2, Woodhead Textiles Series No. 4, Woodhead Publishing Limited, UK, 1999.

18HS201 COMMUNICATIVE ENGLISH II 1 0 2 2

Course Objectives

- Read and understand ideas of complex text on both concrete and abstract topics
- Listen and understand technical discussions in his/her field of specialisation
- Produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options
- Interact with a degree of fluency and spontaneity that makes regular interaction without strain

Programme Outcomes (POs)

i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Use appropriate grammar & vocabulary that is expected at the BEC Vantage exam level.
2. Understand the general meaning of non-routine letters, and of a report of predictable / unpredictable topic
3. Write simple reports of factual nature and factual non-routine letters
4. Ask for factual information and understand the answer; and take/pass on workplace messages
5. Express opinions and present arguments to a limited extent; and give simple, prepared presentations on familiar topics

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1									1					
2									2					
3									3					
4										1				
5										2				

UNIT I **9 Hours**

GRAMMAR3

Tenses - Future continuous, Future perfect, Future perfect continuous, Past perfect, Past perfect continuous - Adjectives and adverbs - Mixed conditionals - Modals - can't have, needn't have - Modals of deduction and speculation - Narrative tenses - Passives - Phrasal verbs, extended - Relative clauses - Reported speech - Will and going to, for prediction - Wish - Would expressing habits, in the past.

UNIT II **9 Hours**

READING

Scanning and reading for gist - Understanding text structure - Reading for gist and specific information - Vocabulary and structure - Understanding sentence structure and error identification

UNIT III **9 Hours**

WRITING

A message, memo or email, Giving instructions, explaining a development, asking for comments, requesting information, agreeing to requests - Business correspondence: explaining, apologising, reassuring, complaining, short report: describing, summarising - proposal: describing, summarising, recommending, persuading.

UNIT IV **9 Hours**

LISTENING

Listening for and noting specific information - Listening to identify topic, context, Function - Following the main points and retrieving specific information from the text.

UNIT V **9 Hours**

SPEAKING

Giving personal information: Talking about present circumstances, past experiences and future plans, expressing opinions, speculating - Organising a larger unit of discourse: Giving information and expressing and justifying opinions - Turn-taking: negotiating, collaborating, exchanging information, expressing and justifying opinions, agreeing/disagreeing, suggesting, speculating, comparing and contrasting, and decision-making.

1.A Horse and Two Goats - R K Narayan
2.My Lord the Baby - Rabindranath Tagore
3.Twist in the Tale - Jeffery Archer
4.The Third and Final Continent - Jhumpa Lahiri
5.The Gift of the Magi - O Henry

Total: 45 Hours

Reference(s)

1. Guy Brook-Hart, "BEC Vantage: Business Benchmark Upper-Intermediate- Student's Books" 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Ian Wood, Paul Sanderson, Anne Williams with Marjorie Rosenberg, "Pass Cambridge BEC Vantage- Student's Book" 2nd Edition, Cengage Learning, New Delhi, 2014
3. Michael Handford, Martin Lisboa, Almut Koester, Angela Pitt, "Business Advantage - Student's Book Upper-Intermediate" Cambridge University Press, New Delhi, 2014.
4. Cambridge Examinations Publishing, "Cambridge BEC VANTAGE - Self-study Edition", Cambridge University Press, UK, 2005.

18TT207 ENGINEERING DRAWING 1 0 4 3

Course Objectives

- Create an engineering drawing concept as per industrial standards.
- Construct orthographic projections of points and lines.
- Construct projection of planes and simple solids.
- Develop section of solids and development of surfaces.
- Demonstrate the orthographic projection from isometric view and vice versa

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Create an engineering drawing concept as per industrial standards
2. Construct orthographic projections of points and lines.
3. Construct projection of planes and simple solids.
4. Develop section of solids and development of surfaces.
5. Demonstrate the orthographic projection from isometric view and vice versa

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2								2	1			1	
2	2								2	1			1	
3	1								2	1			1	
4	1								2	1			1	
5	1								2	1			1	

UNIT I **15 Hours**

FUNDAMENTALS OF ENGINEERING DRAWINGS

Definition, standards, drawing tools, drawing sheets, scales, line and its types. Practices on lettering, numbering, dimensioning of drawings. Construction of conic sections-ellipse, parabola and hyperbola using eccentricity method.

UNIT II **15 Hours**

PROJECTION OF POINTS

Principles of projection, Projection of points in four quadrants, first angle projection of straight lines - perpendicular to one plane, parallel and inclined to both planes.

UNIT III **15 Hours**

PROJECTION OF PLANES AND SOLIDS

Projection of simple planes and projection of simple solids .parallel, perpendicular and inclined to one plane using change of position method.

UNIT IV **15 Hours**

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Section of Solids-Simple position with cutting plane parallel, perpendicular and inclined to one plane. Development of surfaces - simple and truncated solids.

UNIT V **15Hours**

ORTHOGRAPHIC AND ISOMETRIC PROJECTION

Orthographic and isometric projection of components used in engineering applications.

Total: 75 Hours

Reference(s)

1. K. Venugpoal, Engineering Drawing and Graphics, Sixth edition, New Age International, 2011.
2. Basant Agrawal, Mechanical drawing, Tata McGraw-Hill Education, 2008.
3. Engineering Drawing Practice for Schools & Colleges, Bureau of Indian Standards-Sp46, 2008.
4. K.V. Natarajan, A Text Book of Engineering Graphics, Dhanalakshmi Publishers, 2013.

18TT301 ENGINEERING MATHEMATICS III 3 1 0 4

Course Objectives

- Understand the concepts of Fourier series, Fourier and Laplace transforms which will enable them to model and analyze the physical phenomena
- Implement the Fourier analysis, an elegant method in the study of heat flow, fluid mechanics and electromagnetic fields.
- Apply the numerical techniques to offer an approximate solution for the differential equations in a real world situation.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Apply the Fourier analysis for the periodicity of combination of sine and cosine functions.
2. Infer different techniques of Fourier transforms for non- periodicity functions
3. Classify partial differential equation and able to solve various equations
4. Interpret the solution of system of linear equations by various numerical techniques
5. Execute the numerical solution of initial and boundary value problems of differential equations by different methods

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	2												
3	1	2												
4	1	2	-											
5	1	2	-											

UNIT I **9 Hours**

FOURIERSERIES

Dirichlets conditions - General Fourier series - Odd and even functions - Half range cosine and sine series - Root mean square value.

UNIT II **9 Hours**

FOURIER TRANSFORM

Fourier Integral Theorem- Fourier Transform and Inverse Fourier Transform- Sine and Cosine Transforms - Properties - Transforms of Simple Functions - Convolution Theorem - Parsevals Identity

UNIT III **9 Hours**

PARTIAL DIFFERENTIAL EQUATION

Introduction to partial differential equations - One-dimensional wave equation - Method of separation of variables - D-Alemberts solution of the wave equation. Heat equation.Laplaces equation

UNIT IV **9 Hours**

NUMERICAL SOLUTION OF SYSTEM OF LINEAR EQUATIONS

Solution of algebraic and transcendental equations: Fixed point iteration method - Newton- Raphson method - Solution of system of linear equations: Gauss elimination method - Inverse of a matrix: Gauss-Jordan method- Eigen values of a matrix by Power method.

UNIT V **9 Hours**

NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS

Solution of first order ordinary differential equations: Eulers method - Fourth order Runge- Kutta method -Milnes predictor and corrector method - Solution of partial differential equations: Parabolic equations by Crank Nicholson method- Hyperbolic equations by explicit finite difference method

Total: 60 Hours

Reference(s)

1. KreyszigErwin, Advanced Engineering Mathematics, 7th Edition, John Wiley, 1993
2. Johnson Richard A. and BhaltacharyyaGouri K., Statistics, Principles and Methods, 3rd Edition, John Wiley, 1996
3. ONeil Peter V., Advanced Engineering Mathematics, 4th Edition, PWS-Kent, 1995
4. James Glyn, Advanced Modern Engineering Mathematics, Addison-Wesley, 1993.
5. Grewal B. S, Numerical Methods in Engineering and Science with Programms in C & C++, Ninth Edition, Khanna Publications, 2010.
6. SankaraRao. K, Numerical Methods for Scientists and Engineers, Third Edition, PHI Learning Private Limited, New Delhi, 2009

18TT302 APPLIED MECHANICS 3 0 0 3

Course Objectives

- To understand the static behaviour of particles and structures
- To analyse the behaviour of rigid bodies in equilibrium

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Compute the resultant force for various systems using laws of mechanics
2. Compute the frictional forces using free body diagram of particles and rigid bodies
3. Evaluate the sectional properties of surfaces and solids
4. Compute the simple stress and strain for one and two dimensional elements
5. Determine the shear force and bending moment and analyze the flexural member

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-			2									
2	3	1			1									
3	1	2		2	2									
4	3	1		2	2									
5	1	2			1									

UNIT I **9 Hours**

STATICS OF PARTICLES

Concurrent forces in plane and space - problems involving the equilibrium of a particle.

UNIT II **9 Hours**

STATICS OF RIGID BODIES IN TWO DIMENSIONS

Rigid bodies -two dimensional structure - Moment of force - Moment of a couple. Equivalent systems of coplanar forces. Rigid body in equilibrium, problems involving equilibrium of rigid body. Friction: Laws of friction - co-efficient of friction - problems involving dry friction - ladder friction.

UNIT III **9 Hours**

CENTROIDS, CENTRE OF GRAVITY AND MOMENT OF INERTIA

Centroids of areas, determination of moment of inertia of plane figures. Polar moments of inertia, radius of gyration. Kinetics of Particles: Introduction - equation of motion. Work energy method - potential energy.

UNIT IV **9 Hours**

SIMPLE STRESS AND STRAIN

Axial and shear stresses and strain - Elasticity - Hook"s law - Factor of safely - Lateral strain - Poisson"s ratio - Volumetric strain. Stresses in composite bars due to axial loading.

UNIT V **9 Hours**

SHEAR FORCE AND BENDING MOMENTS

Relationship between loading - Shear force and bending moment - shear force and bending moment diagrams for cantilever, simple supported and overhanging beams subjected to concentrated load and u.d.l. maximum bending moment and point of contra flexure. Theory of bending: Theory of simple bending and assumptions - derivation of formula M/I=f/y=E/R and its application to engineering problems.

Total: 45 Hours

Reference(s)

1. R.K.Bansal, Engineering Mechanics, Laxmi Publications, New Delhi 1992
2. S.Rajasekaran & S.Sankarasubramaniyan, Basics of Engineering Mechanics - Structures - Statics & Dynamics, Vikas Publications. New Delhi, 2002.
3. B.C.Punmia, A.K.Jain, Strength of Materials and Theory of Structures - Vol.3, Lakshmi Publications, New Delhi 2007.
4. R.K.Rajput, Strength of Materials, S.Chand & Company Ltd., New Delhi 2011

18TT303 INSTRUMENTATION AND CONTROL ENGINEERING 2 0 2 3

Course Objectives

- To understand the calibration, characteristics and applications of transducers
- To impart necessary knowledge in the construction and working of recording and indicating instruments
- To provide knowledge about transfer function, time and frequency response of systems

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Summarize the functional elements, static and dynamic characteristic of measurement systems
2. Interpret the construction and operation of resistive, capacitive, inductive and active type of transducers
3. Illustrate the construction and working of indicating, recording instruments and data logger
4. Determine the transfer function of electrical and mechanical systems using first principle method and block diagram reduction techniques
5. Determine the time domain and frequency domain specifications for the given transfer function

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	-											
2	2	1	-											
3	2	1	-											
4	2	2	-	2	3						-	-	-	-
5	2	2	-	2	3						-	-	-	-

UNIT I **6 Hours**

BASICS OF MEASUREMENT

Definitions of instrument, instrumentation, control, controllers functional elements of measurement system standards static calibration classification of errors Static characteristics of instruments: accuracy, precision, bias, sensitivity, linearity, resolution, threshold and hysteresis dynamic characteristics of zero and first order system.

UNIT II **6 Hours**

TRANSDUCERS

Principle of operation, construction details and applications of resistance potentiometers strain gauges thermistor thermocouple LVDT capacitive transducers piezo electric transducers photoelectric transducer.

UNIT III **6 Hours**

INSTRUMENTATION

Indicating and recording devices: construction and working of PMMC instrument, successive approximation and dual slope type digital instruments cathode ray oscilloscope inkjet and laser printers and xy plotter magnetic disc storage data loggers.

UNIT IV **6 Hours**

SYSTEMS REPRESENTATION

Basic elements in control systems open and closed loop systems transfer function of basic electrical and mechanical systems block diagram reduction techniques

UNIT V **6 Hours**

TIME AND FREQUENCY RESPONSE

Time response time domain specifications standard test inputs first and second order system response to standard test signals steady state error static error constants frequency response bode plots

FOR FURTHER READING

IC temperature sensor Yarn break sensor Applications of capacitive and optical sensors in textile industries Inkjet textile printers Frequency response of systems Polar plot Concepts of stability Characteristic equation Routh Hurwitz criterion Root Locus technique

1 **3 Hours**

EXPERIMENT 1

Measurement of linear displacement using inductive transducer

2 **4 Hours**

EXPERIMENT 2

Light intensity measurement using photo electric transducer

3 **6 Hours**

EXPERIMENT 3

Measurement of force using strain gauge and load cell

4 **4 Hours**

EXPERIMENT 4

Measurement of temperature using Thermocouple

5 **4 Hours**

EXPERIMENT 5

Temperature measurement using Thermistor

6 **3 Hours**

EXPERIMENT 6

Measurement of voltage, current, frequency and phase angle using CRO

7 **3 Hours**

EXPERIMENT 7

Determination of Transfer Function for AC Servomotor

8 **3 Hours**

EXPERIMENT 8

Step response of first order system

Total: 60 Hours

Reference(s)

1. A.K. Sawhney, Puneet Sawhney, A course in Electrical and Electronic Measurements and Instrumentation, Nineteenth edition, Dhanpat Rai & Co (P) Ltd, 2012
2. H.S.Kalsi, Electronic Instrumentation, Third Edition, Tata McGraw Hill Education Private Limited, 2012.
3. E.O.Doeblin, Measurement Systems: Applications and Design , 6th Edition, Tata McGraw-Hill Book Co., 2012
4. I.J.Nagrath, M.Gopal, Control Systems Engineering, Fifth Edition, New Age International Publishers, New Delhi, 2012
5. Katsuhiko Ogata, Modern Control Engineering, Third Edition, Prentice Hall of India Ltd., New Delhi, 2011.
6. D. Patranabis, Sensors and Transducers, 2nd Edition, Prentice Hall India Pvt. Ltd, 2009

18TT304 COMPUTER PROGRAMMING 2 0 2 3

Course Objectives

- To understand the basics of computer organisation
- To understand the basics of C primitives, operators and expressions
- To understand the different primitive and user defined data types

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Develop solutions using problem solving techniques and number system conversions
2. Write the programs using operators, type conversion and input-output functions
3. Apply decision making and looping statements in writing C programs
4. Apply the concepts of arrays and strings in C programs
5. Design applications using structures and functions in C

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1			1									
2	1	1			1									
3	1	3			1									
4	2	1			2									
5	2	1			2									

UNIT I **6 Hours**

INTRODUCTION TO COMPUTERS

Introduction to computers - Characteristics of Computers - Evolution of Computers - Computer Generations - Basic Computer Organization - Number System - Problem Solving Techniques - Features of a Good Programming Language.

UNIT II **6 Hours**

INTRODUCTION TO C PROGRAMMING

Overview of C-Structure of C program-Keywords-Constants- Variables-Data types-Type conversion Operators and Expressions: Arithmetic-Relational-Logical-Assignment- Increment and Decrement-Conditional-Bitwise -Precedence of operators-Managing I/O operations-Formatted I/O-Unformatted I/O.

UNIT III **6 Hours**

CONTROL STATEMENTS

Decision Making and Branching: simple if statement-if else statement-nesting of if else Statement-Switch Statement. Decision Making and Looping: while statement-do while statement-for statement-Nested for statement Jump Statements: goto-break-continue-return statement

UNIT IV **6 Hours**

ARRAYS AND STRINGS

Arrays: Introduction, one dimensional array, declaration - Initialization of one dimensional array, two-dimensional arrays, initializing two dimensional arrays, multi dimensional arrays. Strings: Declaring and initializing string variables- Reading strings from terminal - writing string to screen - String handling functions.

UNIT V **6 Hours**

STRUCTURES AND FUNCTIONS

Structures and Unions: Introduction-defining a structure- declaring structure variables-accessing structure members-structure initialization-Unions-Enumerated data type , User Defined Functions: Elements of user defined functions -Definition of functions-return values and their types- function calls-function declaration-categories of function -call by value and call by reference-recursion-Preprocessor directives and macros

FOR FURTHER READING

Creating and manipulating document using word - Mail merge - Creating spread sheet with charts and formula using excel - developing power point presentation with Animations - C graphics using built in functions

1 **3 Hours**

EXPERIMENT 1

Write a C program to perform arithmetic operations on integers and floating point numbers.

2 **3 Hours**

EXPERIMENT 2

Write a C program to implement ternary operator and relational operators.

3 **2 Hours**

EXPERIMENT 3

Write a C program to find the greatest of three numbers using if-else statement.

4 **4 Hours**

EXPERIMENT 4

Write a C program to display the roots of a quadratic equation with their types using switch case.

5 **2 Hours**

EXPERIMENT 5

Write a C program to generate pyramid of numbers using for loop.

6 **4 Hours**

EXPERIMENT 6

Write a C program to perform Matrix Multiplication

7 **2 Hours**

EXPERIMENT 7

Write a C program to check whether the given string is Palindrome or not.

8 **4 Hours**

EXPERIMENT 8

Write a C program to find the factorial of given number.

9 **6 Hours**

EXPERIMENT 9

Design a structure to hold the following details of a student. Read the details of a student and display them in the following format Student

details: rollno, name, branch, year, section, cgpa.

****

NAME:

ROLL NO:

BRANCH:

YEAR:

SECTION:

CGPA:

Total: 60 Hours

Reference(s)

1. Pradeep K. Sinha, Priti Sinha, Computer Fundamentals, BPB publications, 2008
2. Ashok. N. Kamthane, Computer Programming, Second Edition, Pearson Education, 2012
3. E.Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 2012
4. Herbert Schildt, C -The complete Reference, Tata McGraw-Hill, 2013
5. Byron Gottfried, Programming with C, Schaum"s Outlines, Tata McGraw-Hill, 2013

18TT305 SPINNING TECHNOLOGY I 3 0 0 3

Course Objectives

- To teach the design, constructional features and working principles of spinning preparation machines.
- To educate on the processing of different types of fibres and their blends.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Perform count calculations; select ginning machines and produce quality lint; select blow room machinery and use for the production of quality card feed material
2. Assess techniques of producing quality card sliver; select process parameters in carding
3. Outline the techniques of producing quality draw frame sliver; apply 'friction field' theory for control of fibres
4. Examine the techniques of producing quality combed sliver; choose process parameters; apply Gegauf's Noil theory for quality combed material
5. Outline the techniques of producing quality roving with optimum package build.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2		3					1	1	1	3	1
2	2		2		3					1	1	1	3	1
3	2		2		3					1	1	1	3	1
4	2		2		3					1	1	1	3	1
5	2		2		3					1	1	1	3	1

UNIT I **9 Hours**

GINNING AND BLOWROOM

Count systems - Direct and indirect - application in textiles -Ginning: Principles of ginning process. Roller gin and Saw gin. Pre- and post- ginning operations. Developments in ginning. Blowroom: Objectives of blowroom - Design, constructional features, classification and working principles of feeding and opening / coarse cleaning machines. .

UNIT II **9 Hours**

BLOWROOM

Design, constructional features and working principles of fine cleaning, blending and card feeding machines. Principles of opening and cleaning. Processing of cotton, manmade fibers and blends. Material transport system - waste and dust collection systems - contamination sorters - waste recycling machines -Technological developments.

UNIT III **9 Hours**

CARDING

Objectives of carding process - Design, Constructional Features and working principles of a modern card and card feeding systems. Processing of cotton, manmade fibres and blends. Mechanism of carding: wire point disposition - fibre configuration, blending, leveling, fibre breakage, hook formation - web formation- fibre transfer efficiency and factors affecting fibre transfer. Card settings. Card clothing. Card wire grinding. Principles of auto levelers. Technological developments

UNIT IV **9 Hours**

DRAWFRAME AND COMBER

Objectives of drawframes Roller arrangements in draw frames and fibre control devices. Top and bottom roller characteristics and maintenance - Principles of doubling and drafting - theory of friction field - drafting waves and control of fibres. Technological developments. COMBER

Comber preparatory processes: Methods of lap preparation - Lap forming machines. Comber: Objectives - Combing cycle - Design, constructional features and working principles of comber machine; Process parameters. Charles Gegauf Noil Theory. Technological developments.

UNIT V **9 Hours**

SPEED FRAME

Objectives - Design, constructional features and working principles of speed frame: Creel - drafting system - top and bottom rollers - top arm drafting system - roller settings - roller weighting systems - types of flyers - false twister- spindle - bobbin rail and spindle rail - drive to the machine - flyer lead and bobbin lead - bobbin builder motion. Processing of cotton, manmade fibres and blends. Automatic doffing. Technological developments.

Total: 45 Hours

Reference(s)

1. W. Klein, Rieter Manual of Spinning Volume 1&3, Rieter, 2010.
2. Peter R. Lord, Handbook of Yarn Production, Technology, Science and Economics, CRC Press publication, New York, 2002.
3. Carl A. Lawrence, Fundamentals of Spun Yarn Technology, CRC Press publication, New York, 2002.
4. R. Chattopadhyay, Technology of Carding, NCUTE, IIT Delhi, 2003.
5. R. Chattopadhyay and R. S. Rengasamy, Spinning, Drawing, Combing & Roving, NCUTE Pilot Programme, Indian Institute of Technology, New Delhi, 2003.
6. R. Chattopadhyay, Advances in Technology of Yarn Production, NCUTE, IIT Delhi, 2002.

18TT306 WEAVING TECHNOLOGY I 3 0 0 3

Course Objectives

- To teach the different preparatory processes in weaving
- To impart thorough knowledge of the concepts involved in these processes
- To educate on the features of machines required for the different processes

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Compare and contrast the different types of warp and weft winding processes in terms of working principles as well as various important settings.
2. Illustrate the two different types of warping processes in terms of working principles and applications.
3. Suggest the sizing recipes for various fabric constructions and analyze the sizing performance.
4. Explain the primary, secondary and auxiliary motions of weaving.
5. Explain the working principles of shedding (tappet, dobby, Jacquard and drop box mechanisms), picking and beat-up, let-off and take-up mechanisms

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3				2						2	1	3	2
2	3				2						2	1	3	2
3	3				2						2	1	3	2
4	3				2						2	1	3	2
5	3				2						2	1	3	2

UNIT I **10 Hours**

WINDING

Objectives - Classification of winders - Characteristics of parallel winding, cross winding and precision winding - Traversing techniques - Types and working principles of yarn clearers - Types of tensioners - guides- knotters and splicers. Stop motions. Automatic cheese and cone winders - creel - tension control - stop motion - length measuring device - auto doff. Winding of cotton, synthetic and blended yarns.

WEFT WINDING-Objectives - Working principle of automatic pirn winding machine - functional elements. Processing of cotton, synthetic and blended yarns.

UNIT II **6 Hours**

WARPING AND SIZING

Warping

Objectives - Beam warping machine - sectional warping machine.Working principles and applications.

Sizing

Objectives - Types and selection of ingredients for sizing - Size preparation: Size add-on - Procedures and Cooking Parameters. Sizing of cotton and blended yarns.

UNIT III **10 Hours**

SIZING AND DRAWING-IN

SIZING (CONT.)

Sizing machines: Multi-cylinder: Types of creel - Size box - Drying Cylinders - Headstock. Control systems in sizing machines: temperature control - size level control - moisture control - stretch control.

Beam pressing devices: mechanical - pneumatic - hydraulic. Single end sizing process. Drawing-in

Working principles of manual, semiautomatic and automatic drawing-in machines - warp tying-knotting, pinning machines.

UNIT IV **10 Hours**

LOOM PRIMARY MOTIONS

Classification of weaving machines - Basic motions: Primary - Secondary - Auxiliary; Loom timing. Heald wires - heald frames. Types of sheds - Tappet shedding - Dobby shedding: Climax - Cam - paper - Rotary -Electronic. Jacquard shedding - Single lift - Double lift - Cross-border - Vincenzi - Verdol - electronic jacquard.

UNIT V **9 Hours**

LOOM PRIMARY AND SECONDARY MOTIONS

LOOM PRIMARY MOTIONS (CONT.)

Picking: Shuttles - Cone over pick - Under pick: side lever and side shaft - Checking devices. Beating: Reed types- Temples - Sley eccentricity.

Loom Secondary Motions

Take up motion: Negative - positive - continuous. Let-off motions: Negative - Positive - Electronic. Types of Back rest. Loom drives.

Drop Box Motions

Box motions: 1x2 - 1x4; working principle

Total: 45 Hours

Reference(s)

1. D. B. Ajgaonkar, M. K Talukdar and Wedekar, Sizing: Material Methods and Machineries, Mahajan Publications Ahmedabad, 1999.
2. P. K. Sriramalu, D. B. Ajgaonkar and M. K. Talukdar, Weaving Machines Mechanisms, Management Mahajan publishers, Ahmedabad 1998.
3. M. K. Talukdar, An Introduction to winding and Warping Testing Trade Press, Mumbai, 1982.
4. Anon., Woven Fabric Production I, NCUTE Publication, IIT, New Delhi, 2002.
5. Anon., Woven Fabric Production II, NCUTE Publication, IIT, New Delhi, 2002.
6. P. Marks and A. T. C. Robinson Principles of Weaving, The Textile Institute, 1989

18TT307 SPINNING TECHNOLOGY LABORATORY I 0 0 4 2

Course Objectives

- To impart hands-on practical knowledge about the concepts learnt in the Course, Spinning Technology.
- To enable the students to make necessary changes in the machinery settings to achieve the desired results in spinning preparatory machinery.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Identify the change points in the spinning machinery (machine settings, change gears, pulleys etc)
2. Change machine settings, process parameters and conduct experiments to obtain improved quality, reduced wastes and increased productivity
3. Interpret the results for process control.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	1	1					1		1	3	1
2	3	2	1	2	1					1		1	3	1
3	3	2	1	2	1					1		1	3	1

1 **4 Hours**

EXPERIMENT 1

Measurement and Calculation of Speeds of Ginning Machine, calculation of ginning out turn.

2 **4 Hours**

EXPERIMENT 2

Measurement of speeds of beaters and openers; adjustments in grid bar settings.

3 **4 Hours**

EXPERIMENT 3

Settings and Production calculations in Blowroom line. Cleaning efficiency of a beater

4 **4 Hours**

EXPERIMENT 4

Card - Draft and Production calculations.

5 **4 Hours**

EXPERIMENT 5

Card - Card Waste study (Zone wise) Cleaning Efficiency Calculation.

6 **4 Hours**

EXPERIMENT 6

Card - Card Settings for a given cotton mix (at least 4 major settings).

7 **4 Hours**

EXPERIMENT 7

Drawframe - Draft calculation and Production calculations.

8 **4 Hours**

EXPERIMENT 8

Drawframe - Sliver hank adjustment by changing draft change gear wheel

9 **4 Hours**

EXPERIMENT 9

Drawframe - Effect of roller setting change on draw frame sliver unevenness.

10 **4 Hours**

EXPERIMENT 10

Comber - Speed, Draft calculations.

11 **4 Hours**

EXPERIMENT 11

Comber - Estimation and alteration of Comber noil percentage - Head to head variation and total noil percentage.

12 **4 Hours**

EXPERIMENT 12

Draft, Twist and Production calculations in speed frame.

13 **4 Hours**

EXPERIMENT 13

Change roving hank and roving twist in speed frame

14 **4 Hours**

EXPERIMENT 14

Estimation of Roving stretch percentage.

15 **4 Hours**

EXPERIMENT 15

Design Experiment, Application Oriented Experiment
Mini Project.

Total: 60 Hours

18TT308 WEAVING TECHNOLOGY LABORATORY I 0 0 4 2

Course Objectives

- To provide hands-on knowledge on the mechanisms and settings in preparatory machines and looms.
- To conduct application oriented experiments.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Set various preparatory processes for weaving operation
2. Operate weaving preparatory machines, plain looms and loom attachments.
3. Dismantle, assemble and set loom mechanisms and motions.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		2	3	2				2			1	3	2
2	3		2	3	2				2			1	3	2
3	3		2	3	2				2			1	3	2

1 **4 Hours**

EXPERIMENT 1

Analysis of yarn faults during winding

2 **4 Hours**

EXPERIMENT 2

Determination of yarn quality after sizing

3 **4 Hours**

EXPERIMENT 3

Production and Efficiency calculation in Semi Automatic Pirn Winder

4 **4 Hours**

EXPERIMENT 4

Production and Efficiency calculation in Automatic Pirn Winder

5 **6 Hours**

EXPERIMENT 5

Create a section in sectional warping machine for a given design

6 **6 Hours**

EXPERIMENT 6

Alter traverse and study the effect on section warping producing two small sections

7 **6 Hours**

EXPERIMENT 7

Analysis of Cone and Pirn characteristics and Pirn Building Mechanism.

8 **6 Hours**

EXPERIMENT 8

Dismantling, assembling and setting of Tappet Shedding Motion

9 **6 Hours**

EXPERIMENT 9

Dismantling, assembling and setting of Over Pick Mechanism

10 **4 Hours**

EXPERIMENT 10

Dismantling, assembling and setting of Under Pick Mechanism

11 **4 Hours**

EXPERIMENT 11

Dismantling, assembling and setting of Take-up Mechanism

12 **6 Hours**

EXPERIMENT 13

Application Oriented Experiment

Total: 60 Hours

18GE301 SOFT SKILLS - VERBAL ABILITY 0 0 2 0

Course Objectives

- To help students gain adequate proficiency in vocabulary
- To read and understand unabridged text
- To help students become proficient in basic writing skills related to work place communication

Programme Outcomes (POs)

i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Take up verbal ability part of the placement tests with confidence
2. Write with confidence in professional and workplace communication
3. Distinguish fact from opinion by reading passages from a text

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										1				
2											2			
3									2					

UNIT I **15 Hours**

INTRODUCTION

Synonyms - Antonyms - Word Groups - Verbal Analogies - Etymology - Critical Reasoning - Cloze Test - One Word Substitution - Idioms and Phrases - Text & Paragraph Completion.

UNIT II **15 Hours**

BASICS OF VERBAL APTITUDE

Sentence Formation - Paragraph Formation - Change of Voice - Change of Speech - Reading Comprehension - Sentence Equivalence - Jumbled Sentences - Spotting Errors -Homophones Homonyms - Commonly Mispronounced/Misspelt Words.

Total: 30 Hours

Reference(s)

1. Murphy, Raymond. English Grammar in Use A Self-Study Reference and Practice Book for Intermediate Learners of English. IV Edition. United Kingdom: Cambridge University Press. 2012.
2. Lewis, Norman. Word Power Made Easy. New York: Pocket Books. 1991.
3. Baron"s The Official Guide for New GMAT Review, New Jersey: John Wiley & Sons, Inc. 2015.

18TT401 PROBABILITY AND SATISTICS 3 1 0 4

Course Objectives

- Understand the basic concepts of probability and the distributions with characteristics and also two dimensional random variables.
- Apply different statistical inference techniques in testing of hypothesis in a real time fashion industry.
- Analyse the design in identifying the suitable product by comparing the characteristics of the material in industries.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Course Outcomes (COs)

1. Demonstrate the basic probability axioms and concepts, Probability distributions of the random variables in designing process.
2. Identify the relationship and properties of two dimensional random variables using Correlation techniques in textile manufacturing.
3. Implement basic statistical inference techniques, including confidence intervals and hypothesis testing to science/engineering problems.
4. Design an experiment using ANOVA technique.
5. Compare statistical data using control chart in quality control.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2							2					
2	2	2												
3	3	2												
4	3	2	-											
5	3	2		-										

UNIT I **9 Hours**

PROBABILITY THEORY

Axioms of probability - Conditional probability - Bayes theorem - Random variable: Probability mass function - Probability density function- Moment Generating function-Binomial, Poisson and Normal distributions.

UNIT II **9 Hours**

TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Regression analysis in Textile Manufacturing.

UNIT III **9 Hours**

TESTING OF HYPOTHESIS

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means -Small sample tests: t-test for mean-F-test - Chi-square test for Goodness of fit and Independence of attributes.

UNIT IV **9 Hours**

DESIGN OF EXPERIMENTS

One way and Two way classifications - Completely randomized design - Randomized block design - Latin square design.

UNIT V **9 Hours**

STATISTICAL QUALITY CONTROL

Control charts for measurements (X and R charts) - Control charts for attributes (p, c and np charts) - Tolerance limits - Acceptance sampling.

Total: 60 Hours

Reference(s)

1. Milton J. S. and Arnold Jesse C., Introduction to Probability and Statistics: Principles and Applications for Engineering and The Computing Sciences, McGraw Hill Inc, 3rd Edition, 1995.
2. S.C. Gupta, Fundamentals of Statistics, 7th Edition, Himalaya Publishing House Pvt. Ltd. 2018.
3. Johnson Richard A. and Bhaltacharyya Gouri K., Statistics, Principles and Methods, 3rd Edition, John Wiley, 1996.
4. James Glyn, Advanced Modern Engineering Mathematics, Addison-Wesley, 1993.
5. Kreyszig Erwin, Advanced Engineering Mathematics, 7th Edition, John Wiley, 1993.

18TT402 THEORY OF MACHINES 3 0 0 3

Course Objectives

- To understand the concepts of various machine parts and its mechanisms
- To understand the benefits of different cams and follower motions scheme and to construct cam profiles graphically
- To know the kinematic properties of gears, clutches, flywheel and design of belt and chain drives

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Recognize the concept of mechanisms in the machine parts and determine velocity and acceleration involved in simple mechanisms.
2. Design and construct the cam profile graphically based on follower motions.
3. Design Friction drives like flat and V-belts for power transmission.
4. Classify the gears and gear trains based on the design aspects.
5. Construct and Analyze turning moment diagrams of an engine and summarize the importance of balancing of masses

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	2												
3	1	1												
4	1	2												
5	3	2												

UNIT I **9 Hours**

BASICS OF MECHANICS

Basic concepts of link, pair, chain, mechanism - Machines and structures- Degree of freedom - Gruebler"s criteria -Kutzback Criterion, Grashoff"s Law. Inversions of Mechanism - Four bar and single slider crank. Determination of velocity and acceleration - Relative velocity method: Four bar and single slider mechanism.

UNIT II **9 Hours**

CAM AND FOLLOWER MECHANISMS

Types of cams and followers - Types of motion - Uniform velocity, simple harmonic motion, uniform acceleration and retardation motion and cycloidal motion. Design of cam profile - Knife edged, roller and oscillating roller follower. Pressure angle and undercutting

UNIT III **9 Hours**

BELT DRIVES AND CLUTCHES

BELT DRIVES AND CLUTCHES

Belt Drives: Types-Velocity Ratio -Slip of belt - Creep of belt. Tensions for flat belt drive - Determination of angle of contact -Initial, centrifugal and maximum tension in the belts - Condition for maximum power. V Belt drive

Friction Clutches - Single Plate and Multiplate Clutches.

UNIT IV **9 Hours**

GEARS AND GEAR TRAINS

Gears - Types - classifications-Nomenclature of spur and helical gears - Law of gearing. Gear trains - Types (Concepts only).

UNIT V **9 Hours**

TURNING MOVEMENT DIAGRAM, FLY WHEEL AND BALANCING

Introduction - Turning moment diagram for a single cylinder four stroke Internal Combustion Engines - Fluctuation of Energy. Introduction to Flywheel (Basics only). Balancing of rotating and reciprocating masses (Basics only).

Total: 45 Hours

Reference(s)

1. S. S. Rattan, Theory of Machines, Tata McGraw-Hill, 2002.
2. K. Slater Textile Mechanics, Vol-I, The Textile Institute, Manchester, UK, 1997.
3. J. E. Shigley and J. J. Uicker, Theory of Machines and Mechanisms, McGraw-Hill Book, New York, 1995
4. Syad and R L Singal, Kinematics of Machinery, Tech Mac Publishers, 2007
5. R. S. Rengasamy, Mechanics of Spinning Machines, NCUTE Publication, IIT Delhi, 2002
6. R. S. Khurmi, Theory of Machines, S Chand & Company Ltd, New Delhi, 2008

18TT403 STRUCTURE AND PROPERTIES OF TEXTILE FIBRES

3 0 0 3

Course Objectives

- To understand the fundamentals of fibre structure and physical characterization methods.
- To relate the fibre properties such as moisture, mechanical, optical, frictional, electrical and thermal properties in terms of structure of the fibres.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Suggest a suitable technique for characterization of a given polymer
2. Describe a fibre in terms of physical and chemical structure in relation to their properties.
3. Analyse the fibres in terms of physical properties (moisture, mechanical, electrical and thermal)
4. Compare different fibres in terms of physical properties.
5. Suggest suitable fibre(s) for a given end use / requirement.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-				3					2	3	3	
2	2	-				3					2	3	3	
3	2	-				3					1	3	3	
4	2	-				1					2	3	3	
5	2	-				3					2	3	3	

UNIT I **9 Hours**

PHYSICAL STRUCTURE OF FIBRES

Requirements for fibre forming polymers. Fine and morphological structure of Cotton - Flax - Jute- Silk -Wool - Viscose - Polyester - Polyamide - Polyacrylonitrile - Polyolefins. Structural models and their limitations. Investigation methods of fibre structure- Microscopic methods: SEM, TEM, AFM. X-ray diffraction methods, Spectroscopic methods: FTIR. Density measurements.

UNIT II **9 Hours**

MOISTURE ABSORPTION PROPERTIES OF FIBRES

Moisture content and regain - hysteresis - Regain curves. Theories of moisture sorption. Measurement methods of regain and their limitations. Equilibrium absorption of moisture by fibres. Factors influencing moisture regain. Differential and integral heat of sorption - Diffusion equations and their limitations - Diffusion coefficient - Conditioning of fibres - Mechanism of conditioning - Swelling of fibres.

UNIT III **12 Hours**

MECHANICAL PROPERTIES OF FIBRES

Definitions: breaking strength, breaking extension, tensile stress, tensile strain, mass specific stress, yield point, initial modulus, secant modulus, work of rupture and work factor. Stress-strain curves for textile fibres and their explanation. Factors influencing tensile properties of fibres. Elastic properties. Methods of tensile testing - CRL / CRT/ CRE methods and their limitations. Mechanical conditioning of fibres. Visco-elastic properties: Time effects - Dynamic mechanical analysis of fibres. Torsional and flexural rigidity - Measurement techniques.

UNIT IV **9 Hours**

OPTICAL AND FRICTIONAL PROPERTIES

Refractive index of fibres - Measurement and factors influencing the results. Birefringence and optical orientation factor. Reflection of light, Luster index, factors influencing luster. Absorption of light - dichroism, dichroic ratio. Fibre friction. Theories of friction - Amonton"s law, Bowden"s adhesion shearing mechanism, Lincoln"s law. Measurement of friction and factors influencing fibre friction. Friction in wool - theory of directional frictional effect.

UNIT V **6 Hours**

ELECTRICAL AND THERMAL PROPERTIES

Conduction, dissociation of ion pairs. Measurement of electrical resistance of fibres. Dielectric properties. Static electricity - Thermal properties - Structural changes in fibres on heating. Thermal transitions. Heat setting. Thermal decomposition of fibres.

Total: 45 Hours

Reference(s)

1. W. E. Morton, and J. W. S. Hearle, Physical Properties of Textile Fibres, Woodhead Publishing Limited, Cambridge, UK, 2008.
2. V. B. Gupta and V. K. Kothari, Textile Fibres: Developments and Innovations, Vol. 2, Progress in Textiles: Science & Technology, IAFL Publications, 2000.
3. Woodings, Regenerated Cellulose Fibres, Woodhead publishing Limited, Cambridge, UK, 2001.
4. B. P. Saville, Physical Testing of Textiles, Woodhead Publishing Limited, Cambridge, England 2000.
5. James F. Shackelford and William Alexander, Materials Science and Engineering, CRC Press LLC, New York, 2001.

3 0 2 4

18TT404 SPINNING TECHNOLOGY II

Course Objectives

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

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Explain construction and working principles of ring, rotor and jet spinning machines.
2. Compare and contrast ring spinning with open-end spinning processes.
3. Compare the structural features of yarns produced in ring, rotor and jet spinning processes.
4. Compare SIRO, SOLO and Core and wrap spinning technologies and applications.
5. Explain design and working of different types friction spinning systems and post spinning.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1										2	
2	3	1	1										2	
3	3	1	1										2	
4	3	1	1										2	
5	3	1	1										2	

UNIT I **9 Hours**

RING SPINNING

Objectives - Design constructional features and working principles of ring frame. Processing of cotton, manmade fibres and blends. Compact spinning - Principle of compacting drafted fibre strand - spinning geometry- different methods of compact yarn manufacture - compact yarn properties. Automation: Bobbin transport systems, Automatic doffing, Linkconer. Ring Data systems.

UNIT II **9 Hours**

ROTOR SPINNING

Principles of twist insertion - real and false twist - principle of break/open spinning. Design and constructional features of rotor spinning machine - Rotor drive - Fibre flux density - back doubling -

wrapper fibre formation - rotor yarn structure and properties - rotor yarn properties. Automation in Rotor spinning.

UNIT III **9 Hours**

TOW TO TOP, BULK YARN PRODUCTION AND AIR-JET SPINNING

Tow to sliver stretch breaking - Tow to sliver cutting methods - machines. Acrylic Bulk yarn production machines and methods.

Basic principle - Methods of fasciated yarn manufacture (MJS system) - Developments - Raw material requirements Classification of fasciated yarn structure - Yarn properties - Yarn quality- Process parameters: Air pressure -draft - delivery rate - ribbon width - feed ratio. Advancements in air-jet spinning: Plyfil spinning - Vortex spinning (Murata MVS and Rieter) .Yarn quality, process parameters and applications.

UNIT IV **9 Hours**

CORE YARN SPINNING, SIRO AND SOLO SPINNING, WRAP SPINNING

Principle - Requirements for core yarn spinning -Methods of core yarn production: Core yarn: Ring - rotor - friction -air-jet spinning. Raw materials. Principle - Yarn manufacture - Yarn characteristics - End uses. Principle - Raw materials - Yarn structure -Properties - Spinning limits and applications. Self Twisting Principle - Repco Spinning.

UNIT V **9 Hours**

FRICTION SPINNING, ADHESIVE SPINNING AND POST SPINNING PROCESS

Types - Principles of yarn formation - Fibre feed - Fibre assembly - Twist insertion - Yarn withdrawal. Yarn structure - Raw material requirements - Influence of process parameters. Adhesive spinning systems: Twilo and Bobtex processes.

Yarn conditioning - Doubling - ring doubling - Two for one twister. Process parameters. Reeling: plain reeling and cross reeling. Bundling and Baling.

1 **3 Hours**

EXPERIMENT 1

Speeds, draft, twist and production calculations in Ring frame

2 **3 Hours**

EXPERIMENT 2

Effect of Ring frame builder motion parameters on package characteristics.

3 **4 Hours**

EXPERIMENT 3

Effect of Roller Pressure on Yarn Quality

4 **4 Hours**

EXPERIMENT 4

Setting modifications and end breakage studies in ring frame

5 **4 Hours**

EXPERIMENT 5

Effect of Process Parameters in Rotor Spinning

6 **4 Hours**

EXPERIMENT 6

Production and twist calculation of Two-For-One twister (TFO)

7 **4 Hours**

EXPERIMENT 7

Effect of process variables of TFO on two-fold yarn quality

8 **4 Hours**

EXPERIMENT 8

Producing 3 different counts in rotor spinning after changing process parameters

Total: 75 Hours

Reference(s)

1. W. Klein, Rieter Manual of Spinning Volume 4-6 , Rieter, 2010
2. W. Klein, A Practical Guide to Ring Spinning, Vols. 4 - 5, The Textile Institute, Manchester,1987.
3. W. Klein, New Spinning Systems, The Textile Institute, Manchester, U.K., 1993.
4. Carl A. Lawrence, Fundamentals of Spun Yarn Technology, CRC Press publication, New York, 2002.
5. R. V. M. Gowda, New Spinning Systems, NCUTE Publication, New Delhi, 2005
6. Peter R. Lord, Handbook of Yarn Production, Technology, Science and Economics, CRC Press publication, New York, 2002.

18TT405 WEAVING TECHNOLOGY II 3 0 2 4

Course Objectives

- To import knowledge and advantages of using shuttleless loom
- study on various shuttleless machine operations and its working principles.
- Give a input on selvedges and storage devices functions.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select loom parameters of shuttle looms and projectile looms for the fabric production.
2. Choose type of rapier looms and loom parameters for fabric production.
3. Analyse air quality and quantity requirements in air jet weaving; choose air-jet loom parameters for fabric production.
4. Analyse water quality and quantity requirements for water jet weaving; choose water jet loom and multi-phase loom parameters for fabric production.
5. Select the appropriate storage and selvedge devices for shuttle less weaving machines.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	2	3	2				2			2	3	2
2	3	-	2	3	2				2			2	3	2
3	3	-	2	3	2				2			2	3	2
4	3	-	2	3	2				2			2	3	2
5	-	-	2	3	2				2			2	3	2

UNIT I **9 Hours**

SHUTTLE AUTO AND PROJECTILE WEAVING MACHINE

Automatic Loom - Different types - Pirn changing mechanism - Temple and eye cutters - Loom drives.

Projectile Weaving Machine: Yarn quality requirements for shuttle less looms - Gripper projectile machines - Working elements and weft insertion cycle in projectile machine - Torsion bar picking mechanism.

UNIT II **9 Hours**

RAPIER WEAVING MACHINE

Classification: Rigid and flexible, Single and double rapiers. Principle of tip and loop transfer Weft insertion cycles. Rapier drives - salient features. Timing diagrams.

UNIT III **9 Hours**

AIR JET WEAVING MACHINE

Requirements for sley drive in shuttle less weaving - Air-jet machines - Principle of weft insertion - Weft insertion cycle. Air quality and quantity requirements.

UNIT IV **9 Hours**

WATER JET WEAVING MACHINE AND MULTIPHASE WEAVING

Water-jet machines - Principle of weft insertion - Weft insertion cycle - Water quality and quantity requirements. Working principle - Shedding and beat-up mechanisms. Circular multiphase weaving machine.

UNIT V **9 Hours**

STORAGE DEVICES AND SELVEDGES

Weft selection, measuring and storage devices and their working principles. Selvedges: Half cross leno - Full cross leno - Twisted - Tuck-in - Bonded and fused.

1 **4 Hours**

EXPERIMENT 1

Dismantling, assembling and setting of let-off motions (Positive and Negative)

2 **4 Hours**

EXPERIMENT 2

Dismantling, assembling and setting of weft fork motions (side and centre) and fast reed motion

3 **4 Hours**

EXPERIMENT 3

Dismantling, assembling and setting of negative dobbies

4 **4 Hours**

EXPERIMENT 4

Dismantling, assembling and setting of loom brakes motion and altering back rest attachments.

5 **4 Hours**

EXPERIMENT 5

Study of Jacquard mechanism and 4 x 1 drop box mechanism.

6 **2 Hours**

EXPERIMENT 6

Study of automatic pirn changing mechanism and warp stop motions.

7 **2 Hours**

EXPERIMENT 7

Study of passage of warp sheet, air connections, design of main and relay nozzles in air jet loom

8 **2 Hours**

EXPERIMENT 8

Weft accumulator settings and adjustment

9 **4 Hours**

EXPERIMENT 9

Application Oriented Design based Experiment

Total: 75 Hours

Reference(s)

1. P. K. Sriramulu, D. B. Ajgaonkar and M. K. Talukdar, Weaving Machines, Mechanisms and Management, Mahajan Publishers, Ahmedabad 1998.
2. Sabit Adanur, Handbook of Weaving, CRC press, Washington 2001
3. R. Marks and A. T. C. Robinson, Principles of Weaving, The Textile Institute, Manchester 1989
4. J. J. Vincent, Shuttleless Loom, The Textile Institute 1980.

18TT406 TEXTILE CHEMICAL PROCESSING I 3 0 0 3

Course Objectives

- To understand the preparation of fibre, yarn and fabrics dyeing with machinery required.
- To understand the concept of colour measurement and processes involved in the colouration of textile materials.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Suggest process parameters for singeing, desizing and scouring.
2. Suggest suitable bleaching and mercerizing method
3. Appraise the concepts of colour science and methods of measurement of colour parameters
4. Explain the principles of dyeing and dyeing machines
5. Develop dye recipe, choose dyeing parameters and evaluate fastness properties

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1											3
2	3	2	1											2
3	3	-	1											3
4	2	1	1											3
5	3	2	1											3

UNIT I **9 Hours**

PREPARATORY IN WET PROCESSING

Wet process sequences for cotton (knitted & woven), wool, silk and blended fabrics. Singeing: Desizing:. Scouring: Saponification - emulsification - detergency - Scouring of cotton. Wool: scouring, Crabbing, Milling and carbonization - Silk: Degumming. Scouring of synthetic materials and blends. Features and working principles of - kier. Physical and chemical methods of assessing scoured fabrics - Measurement of residual impurities.

UNIT II **9 Hours**

BLEACHING AND MERCERIZING

Bleaching: Reactions of hypochlorite - hydrogen peroxide - sodium chlorite. Continuous scouring and bleaching process. Combined scouring and Bleaching. Bleaching of blends - Physical and chemical evaluation of bleached materials.Mercerization: Principles and methods - effects of process conditions

on structure and properties. Mercerization of cotton / viscose blends. Mercerizing machines - Assessment of mercerized samples. Liquid ammonia treatment

UNIT III **9 Hours**

COLOUR AND MEASUREMENT

Theory, Concepts and communication of colour. Beer-Lambert Law - Colour Primaries and Colourmixing - Eye and Brain system on colour perception - colour vision tests. C.I.E Method of determining the Tristimulus values - Colour difference equation and measurement - Metamerism - Dichroism. Application of C.C.M. in textile industry. Whiteness and Yellowness Index.

UNIT IV **9 Hours**

DYEING

Dyes - properties - Auxochrome, chromophore and common dye structure - dye-fibre interactions - Substantivity - Affinity - Adsorption isotherms. Rate of dyeing and half dyeing time.Classification of dyes (Application and chemical structure) - Properties, Mechanism and Application: Direct, Reactive, Acid, Basic, Vat, Disperse, Sulphur, Azoic and Metal complex dyes.

UNIT V **9 Hours**

DYEING OF SYNTHETIC AND OTHER FIBRES

Dyeing of PET, Nylon, Acrylic, Triacetate and protein fibres. Dyeing of blends.

FASTNESS ASSESSMENT

Assessment of dyed materials: light - washing - rubbing (wet and dry) - perspiration - sublimation fastness.

WET PROCESSING MACHINES

Construction (schematic diagram) and working of loose stock, hank and package processing machines - J-box - jigger - winch - jet and soft-over-flow machines - continuous dyeing ranges.

Total: 45 Hours

Reference(s)

1. S. R. Karmakar, Chemical Technology in the Pre-Treatment Processes of Textiles, Elsevier, 1999
2. E.R.Trotman., Dyeing and Chemical Technology of Textile Fibers, B.I.Publishing pvt ltd, New Delhi 1994.
3. C. V. Kaushik, Chemical Processing of Textiles, NCUTE, 2004.
4. V. A. Shenai, Technology of Bleaching and Mercerisation, Sevak Publication, Bombay, 1996.
5. A. D. Sule., Computer Colour Analysis, New age international publishers, 1997.
6. V. A. Shenai, Evaluation of Textile Chemicals, Sevak publications, Mumbai, 1995.

18TT407 TEXTILE CHEMICAL PROCESSING LABORATORY

0 0 4 2

Course Objectives

- To acquire the skills in preparation for textile materials. To evaluate the properties of pre-treated materials and the strength of chemicals used in the pre-treatment.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select process parameters for desizing, scouring and carry out in laboratory scale
2. Choose process parameters and carry out bleaching and mercerization of given samples
3. Develop dye recipes and new print patterns

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3		1				3			2		2
2	2	2	3		1				3			2		2
3	2	2	3		1				3			2		2

1 **4 Hours**

EXPERIMENT 1

Hydrolytic desizing, scouring of grey cotton and assessment of the desized and scoured samples.

2 **4 Hours**

EXPERIMENT 2

Comparison of BAN and Tensile strength of Mercerized Cotton Yarn.

3 **4 Hours**

EXPERIMENT 3

Comparison of hydrogen peroxide and sodium hypochlorite bleached samples for whiteness

4 **2 Hours**

EXPERIMENT 4

Dyeing of cotton using direct dye.

5 **4 Hours**

EXPERIMENT 5

Dyeing of cotton using reactive dyes (hot and cold brand dyes)

6 **4 Hours**

EXPERIMENT 6

Dyeing of wool/silk with acid and basic dyes

7 **4 Hours**

EXPERIMENT 7

Dyeing of polyester with disperse dyes (HTHP)

8 **4 Hours**

EXPERIMENT 8

Dyeing of cotton with vat and sulphur dyes.

9 **4 Hours**

EXPERIMENT 9

Assessment of rubbing and perspiration fastness of fabrics dyed with reactive and direct dyes.

10 **4 Hours**

EXPERIMENT 10

Assessment of ISO light fastness, sublimation fastness of fabrics dyed with direct and disperses dyes.

11 **4 Hours**

EXPERIMENT 11

Compare ISO Wash fastness and test (at least two methods) and assess the colour difference of the samples

12 **18 Hours**

EXPERIMENT 12

Mini-project and Discussions

Total: 60 Hours

18TT408 TEXTILE MACHINE DRAWING AND TECHNICAL SEMINAR

0 0 4 2

Course Objectives

- To Provide the Practice to draw the two and three dimensional views of various parts of textile machines using CAD software.
- To train to create layout drawing for textile machine installation in spinning and weaving laboratories

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Create two and three dimensional part drawings of textile machines using of modeling software.
2. Read, understand and draw machine components in spinning according to established engineering practices
3. Read, understand and draw machine components in weaving and wet processing machines according to established engineering practices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	-	3	2									
2	3	2	-	3	2									
3	3	2	-	3	1									

1 **10 Hours**

EXPERIMENT 1

Introduction to CAD (commands like point, line, circle etc.) and Drawing

2 **10 Hours**

EXPERIMENT 2

Exercise on two dimensional models (Eg. Square, circle, Rectangle)

3 **10 Hours**

EXPERIMENT 3

Exercise on three dimensional models (Eg. Cube, Polygon, Cone, Prism)

4 **10 Hours**

EXPERIMENT 4

Draw two dimensional drawings for the following textile spinning components (a) Bottom roller shaft. (b) Spindle blade (Top Part)
c. Ring (Ring frame)
d. Sprocket wheel
e. Rotor (Rotor spinning Machine)
f. Bolster (Bottom Part of Spindle)
g. Grid bar
h. Stepped pulley

5 **10 Hours**

EXPERIMENT 5

Sketch the two dimensional drawing for the following Weaving components a. Dobby hook
b. Weft fork
c. Shuttle
d. Warper beam flange
e. Pirn
f. Cone holder

6 **10 Hours**

EXPERIMENT 6

Draw proportionate sketches for the following components
a. Padding mangles machine parts
b. Beaker in dyeing machine

Total: 60 Hours

18HS001 ENVIRONMENTAL SCIENCE 2 0 0 2

Course Objectives

- Realize the interdisciplinary and holistic nature of the environment
- Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development
- Recognize the socio-economic, political and ethical issues in environmental science

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Course Outcomes (COs)

1. Assess the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources.
2. Analyze the different types of ecosystems and biodiversity, its values and also role of professionals in protecting the environment from degradation.
3. Identify the existing environmental challenges related to pollution and its management.
4. Select suitable strategies for sustainable management of components of environmental.
5. Correlate the impacts of population and human activities on environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	2				-				-			
2	-	2					-					-		
3	-	-	3			3	1					-		
4	-	-	2			1	3					-		
5	-	-	2			2	2					-		

UNIT I **6 Hours**

NATURAL RESOURCES

Forest resources: Use - over exploitation - deforestation - case studies. Water resources: Use - over utilization of surface and ground water - conflicts over water. Mineral resources: Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: Effects of modern agriculture - fertilizer-pesticide problems (eutrophication, blue baby syndrome, biomagnification) - water logging - salinity - case studies. Energy resources: renewable(solar, wind, tidal, geothermal and hydroelectric power) - non renewable energy sources

UNIT II **6 Hours**

ECOSYSTEMS AND BIODIVERSITY

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - food chains - food webs and ecological pyramids - Types of ecosystem: Introduction - characteristic features: forest ecosystem - desert ecosystem - ecological succession. Biodiversity - value of biodiversity - threats to biodiversity - endangered and endemic species - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity - field study

UNIT III **6 Hours**

ENVIRONMENTAL POLLUTION

Pollution: Definition - causes - effects - control measures of air pollution - water pollution: (Sewage water treatment by activated sludge and trickling filter) - marine pollution - thermal pollution - noise pollution. Disaster management: causes - effects - control measures of floods - earthquake - cyclone - landslides

UNIT IV **7 Hours**

SOCIAL ISSUES AND ENVIRONMENT

Sustainable development: Definition - Unsustainable to sustainable development - urban problems related to energy. Environmental ethics - issues and possible solutions - solid waste management - causes - effects - 3R Principles (landfills, incineration, composting). Water conservation - rain water harvesting - watershed management. Climate change - global warming - acid rain - ozone layer depletion. Environment Protection Act: Air (Prevention and control of pollution) Act - Wildlife Protection act

UNIT V **5 Hours**

HUMAN POPULATION AND ENVIRONMENT

Human population: Population growth - characteristics - variation among nations - population explosion - women and child welfare programmes - value education - HIV / AIDS. Role of information technology in environment and human health - occupational safety and health administration (OSHA)

Total: 30 Hours

Reference(s)

1. Anubha Kaushik, C.P. Kaushik, Environmental Science and Engineering , 4th Multi Colour Edtion, New Age International Publishers, New Delhi, 2014
2. A. Ravi krishnan, Environmental Science and Engineering, 5th revised Edition, Sri Krishna Hitech Publishing company (P) Ltd, Chennai, 2010
3. T. G. Jr. Miller, S. Spool man, New Environmental Science, 14th Edition, Wadsworth Publishing Co, New Delhi, 2014
4. E. Bharucha, Textbook of Environmental studies, second Edition, Universities Press Pvt. Ltd., New Delhi, 2013

18TT501 TEXTILE CHEMICAL PROCESSING II 3 0 2 4

Course Objectives

- To understand printing and finishing of textile materials.
- To analyse the design, constructional and operational features of textile Printing and Finishing machinery.
- To acquire the skills related to printing and finishing of textile materials.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select methods, styles of printing and printing ingredients to carry out printing of textile materials
2. Choose class of dyes according to the type of textile materials
3. Evaluate finishing operations on textiles
4. Assess functional finishes on textiles
5. Appraise an effluent treatment plant.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1					1	2					3
2	1	2	2					1	2					3
3	2	3	1					1	2					3
4	2	3	1					1	2					3
5	1	1	2					1	2					3

UNIT I **9 Hours**

PRINTING METHODS

Hand, block, screen, roller, rotary, inkjet, digital, Transfer, garment printing. Drawback and advantages. Photoelectric method of screen preparation. Styles of Printing: Direct, Discharge and Resist Styles. Printing Ingredients: Printing paste- properties and requirements. After Treatment: Steamers - Agers - Curing process.

UNIT II **9 Hours**

PRINTING

Printing of Cellulose Fabrics: Direct, Reactive, Vat, Azoic and Sulphur Dyes and Pigments Printing of Wool/Silk Fabrics: Acid, Basic and Reactive Dyes.Printing of Synthetics: Disperse Dyes, Acid Dyes and Pigments

UNIT III **9 Hours**

FINISHING

Mechanical and Chemical Finishing - Durable and non-durable finishes - Softening treatment: mechanism - anionic, cationic, non-ionic, amphoteric, reactive softeners, silicone softeners, PE emulsions - Evaluation and testing methods.Heat setting (stenter) - Calendaring - Sanforising.Application of chemical finishes: padding- low wet pick up methods (foaming, spraying)- coating and laminating. Drying (cylinder, loop, tumble).

UNIT IV **9 Hours**

FUNCTIONAL FINISHES

Flame retardant finish: Mechanism - Assessment methods of FR finish. Water repellent and water proof finishes: Wetting- Contact angle - assessment methods. Soil release finish: mechanism - Evaluation of soil release. Wash and wear finish: mechanism - cross linking agents (formaldehyde and non-formaldehyde)- assessment methods. Mechanism and chemistry: Antistatic finish - UV Protection finish -Antimicrobial finish - Anti odour finish - enzymatic treatment (biopolishing).

UNIT V **9 Hours**

EFFLUENT TREATMENT

Textile Effluent: Characteristics, BOD, COD, TDS and pH. Textile Effluent Treatment: Primary, Secondary Tertiary Membrane technology. Zero Discharge. Effluent (discharge) standards: BIS

1 **4 Hours**

EXPERIMENT 1

Direct style of printing on cotton fabric using direct dyes and reactive dyes.

2 **2 Hours**

EXPERIMENT 2

Printing of white and colour khadi paste/Pigment.

3 **4 Hours**

EXPERIMENT 3

Tie and Dye

4 **2 Hours**

EXPERIMENT 4

White and vat colour discharge print on reactive dyed cotton fabric.

5 **2 Hours**

EXPERIMENT 5

Finishing of cotton fabrics with softener and stiffener and the assessment of bending rigidity of the treated fabrics.

6 **2 Hours**

EXPERIMENT 6

Assessment of flame retardancy of fabric finished with flame retardant.

7 **4 Hours**

EXPERIMENT 7

Assessment of weight loss, abrasion resistance and pilling performance of biopolished fabric

8 **10 Hours**

EXPERIMENT 8

Mini-project and discussions

Total: 75 Hours

Reference(s)

1. W. D. Schindler and P. J. Hauser, Chemical Finishing of Textiles, Woodhead Publishing Limited, 2004.
2. V. A. Shenai, Technology of Printing, Vol. IV, Sevak Publication, Bombay, 1996.
3. P. Vankar, Textile Effluent, NCUTE Publication, New Delhi, 2002
4. W. C. Leslie Miles, Textile Printing, Society of Dyers and Colourists, 2003.
5. R. S. Bhagwat, Hand book of Textile Processing Machinery, 2003.

18TT502 MANUFACTURED FIBRE TECHNOLOGY 3 0 0 3

Course Objectives

- To understand the processes involved in manufacturing of manmade fibres
- To understand the post spinning operations of manmade fibres

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. List the fundamental requirements of fibre forming polymers.
2. Illustrate the principles of synthetic fibre formation and their production techniques.
3. List different morphological and fine structures observed in manufactured fibres (melt and solution spun fibres).
4. Outline the need and importance of post spinning processes and their effects on the properties of manufactured fibres.
5. Demonstrate the need, importance of specialty fibres, properties and specific industry application.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	1			-					3	-	
2	3	2		1	2		-					3	-	
3	2	2	1	1			-					3	-	
4	3	2	1	1			-					3	-	
5	2	2	3	1	2		-					3	2	3

UNIT I **9 Hours**

SPINNING OF MAN MADE FIBRES

Fibre forming processes. Melt Solution (Wet- Dry) - Dry-jet wet and Gel Spinning of polymeric fibres. Melt spinning line: Features of screw extruder, static and dynamic mixer - pre-filter - melt manifold - spin-pack - quenching systems. Solution spinning Line: Dope - candle filter - godets - coagulation bath.

UNIT II **9 Hours**

STRUCTURE FORMATION DURING SPINNING

Structure-property relationships in polymers-tacticity - polymer morphology-crystallinity- phase transitions (first and second order)- factors affecting first order and second order transitions. Structure formation: Melt -Solution spun fibres- crystallinity and orientation. Process variables and their influences - Structural changes during high speed spinning process.

UNIT III **9 Hours**

POST SPINNING OPERATIONS

Spin finishes: Need and composition of spin finish - spin finish application techniques - spin finish for filament - staple fibre production. Drawing: Need for Drawing - Drawing Unit - Spin-draw process- Draw warping. Heat Setting: Need for heat setting - Structural changes during heat setting - Evaluation methods.

UNIT IV **9 Hours**

MASS COLOURATION, TEXTURING AND TOW TO TOP CONVERSION

Mass colouration in solution and melt spinning system: Methods - selection of colouring materials. Effect of additives in structure and properties of fibres. Texturing: Need -Methods - Detailed study of Draw texturing, friction texturing and air jet texturing, Textured yarn characteristics. Tow-to-top conversion methods.

UNIT V **9 Hours**

SPECIALITY FIBRES

Speciality Fibres: Properties and end-uses. Differentially dyeable polyester and nylon. PLA fibre production. Alternative to viscose fibre process. Bi-component and bi-constituent fibres. Non-circular cross sections and hollow fibres.

Total: 45 Hours

Reference(s)

1. V. B. Gupta and V. K. Kothari, Manufactured Fibre Technology, Chapman & Hall, 1997
2. S. P. Mishra, Science and Technology of Manmade fibres, Suraj Publications, 2007
3. D. Saravanan, Natural Fibres and Man Made Fibres, Proceedings of AICTE Staff Development Programme, New Delhi, 2006.
4. V. A. Usenko, Fibre chemistry, The Processing of Manmade Fibres, Springer New York Publications, 2004
5. S. P. Mishra, Fibre Science and Technology, New Age International Publication, 2000

18TT503 FABRIC STRUCTURE AND DESIGN 3 0 0 3

Course Objectives

- Import knowledge on different types of fabric structure
- To give a input on fabric structure analyzing skill
- To understand the design concepts of fabric structures

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Construct the Design, Draft and Lifting Plans of basic weaves of woven fabrics.
2. Explain construction, properties and applications of different types of specialty weaves.
3. Apply different types of Jacquards and weaving mechanisms to produce ornamental structures.
4. Suggest the design of different types of pile fabrics and stitching methods of double cloth.
5. Relate the colour and pigment theories to create different colour and weave effects in fabrics.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2											3	
2	2												3	
3	1								3	3		3		3
4	2	2											3	
5	1									3		3		3

UNIT I **9 Hours**

BASIC WEAVES

Elements of fabric design: Design, draft , peg plan, repeat. Plain, Twill, Satin, Sateen. Plain Weave Derivatives - Warp rib, Weft rib and Matt weave - Regular and Irregular. Twill weave derivatives - Pointed twill, herringbone twill, broken twill, transposed twill. Types of twill weave

UNIT II **9 Hours**

WEAVES FOR SPECIAL PURPOSE

Ordinary and Brighton honeycomb, Huck-a-back and modification, Mock leno, Distorted mock leno, Crepe weaves. Gauze and Leno weaves: Russian Cord - Net Leno, Madras Muslin structures.

UNIT III **9 Hours**

SPECIAL WEAVES

Bedford cords - Plain and twill faced, Wadded welts and piques, Wadded piques, Loose and fast back welts and piques , Extra warp and Extra weft figuring. Backed fabrics: Warp and weft backed, Reversible and Non-reversible.

UNIT IV **9 Hours**

PILE AND DOUBLE CLOTH

Pile fabrics: Warp pile, Fast wire pile, Terry weaves, Terry stripes and checks, Weft Pile, Plain back and Twill back velveteen, Lashed Pile Corduroy, Weft plush.
Double cloth: Classification, types of stitches, wadded double cloth, warp and weft wadded double cloth, centre warp and weft stitched double cloth.

UNIT V **9 Hours**

COLOUR THEORY AND DROP DESIGNS

Colour theory: Light and Pigment theory, Modification of colour, Applications of colour, Colour and weave effects, Spot figuring, Arrangement of figures, Drop design Half drop bases Sateen system of distribution.

Total: 45 Hours

Reference(s)

1. Z. J. Grosicki, Watson, Textile Design and Colour: Elementary Weaves and Figured Fabrics, Butterworths, London, 2004.
2. Z. J. Grosicki, Watson, Advanced Textile Design: Compound Woven Structures, Butterworths London, 2004.
3. D. Goerner, Woven Structure and Design, Part I, WIRA, 1986.
4. D. Goerner, Woven Structure and Design, Part II, BTTG, 1989.

18TT504 TEXTILE TESTING 3 0 0 3

Course Objectives

- Select suitable sampling technique for fibres, yarns and fabrics; choose instruments and testing methods for fibres and interpret the results.
- Choose instruments and testing methods for yarns, fabrics and interpret the results.
- Demonstrate knowledge of primary and total hand values; interpret the results of KES modules.
- Choose instruments and testing methods for tensile testing of textile materials and interpret the results.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Suggest suitable sampling techniques for fibres, yarn and fabrics.
2. Select appropriate method and test the given fibre, yarn and fabric samples for physical parameters / characteristics.
3. Select appropriate method and test the given fibre, yarn and fabric samples for physical properties.
4. Analyse the given test results and infer the conclusions suitable for implementation
5. Illustrate the principles involved in testing instruments / equipment used in textile industry and factors influencing the test results.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1			-	3	1		2		-	-	1	3	1
2	1			-	3			2		-	-	1	3	1
3	1			-	3	1		2		-	-	1	3	3
4	1			3	3	1		2		-	-	1	3	3
5	1			-	3	1		2		-	-	1	3	3

UNIT I **9 Hours**

SAMPLING AND FIBRE TESTING

Sampling: Sampling techniques. Precautions in sampling; Sampling offibres, yarns and fabrics. Sampling errors. Standard test atmosphere, measurement of relative humidity. Moisture content and regain of textile materials: Measurement methods, Drying methods, Limitations. Fibre Length Measurement; Fibre Fineness Measurement. Measurement of cotton fibre maturity, trash and micro dust. High Volume instruments, Advanced fibre information system.

UNIT II **9 Hours**

YARN TESTING

Yarn count systems, measuring instruments; Yarn Twist: Single, Ply, Cord, Measurement, Contraction. Crimp rigidity. Unevenness: U%, CV% - Imperfections, mass (variation)diagrams, spectrogram, VL curve. Seldom occurring faults: Classification, Measurement, Analysis. Hairiness: Measurement principles, Interpretation.

UNIT III **9 Hours**

FABRIC

Fabric thickness, Areal density, Crimp, Cover factor and fabric sett. Permeability, Air, Water vapour, Breathability, Thermal Insulation. Hand: Stiffness, Flexural rigidity, Drape. Crease recovery and resistance, Abrasion, Pilling, Flex.

UNIT IV **9 Hours**

FABRIC (CONTD…)

Primary and total hand value. KES and FAST modules. Fabric scanning systems. Measurement of Dimensional stability.Friction: Measurement methods for fibre, yarn and fabrics.

UNIT V **9 Hours**

TENSILE TESTING

TensileTesting, Strength Measurement: Factors influencing tenacity and elongation. Principles, Methods of measuring Tensile characteristics of Fibre, Yarn and Fabric. Tear and Bursting Strength: Dynamic tensile testing. Measurement, Applications. Constant tension transport testing. General

Calibration of instruments and equipment. Example Standard testing procedures (from AATCC, ASTM, BIS, BS, DIN, ISO). Labelling standards and methods.

Total: 45 Hours

Text Book(s)

1. J. E. Booth, Principles of Textile Testing, CBS Publishers & Distributors, New Delhi, 1996
2. B. P. Saville, Physical Testing of Textiles, Woodhead Publishing Ltd., England, 1999

Reference(s)

1. V. K. Kothari, Testing and Quality Management, Vol.1, IAFL Publications, New Delhi, 1999.
2. P. J. Morris, J. H. Merkin and R. W. Renal, Modelling of Yarn Properties from Fibre Properties, Journal of Textile Institute, PP, 322, 335, 1999.

18TT507 FABRIC STRUCTURE AND DESIGN LABORATORY

0 0 2 1

Course Objectives

- Import knowledge on different types of fabric structure
- To give a input on fabric structure analyzing skill
- To understand the design concepts of fabric structures

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Construct the Design, Draft and Lifting Plans of basic weaves of woven fabrics.
2. Explain construction, properties and applications of different types of specialty weaves.
3. Apply different types of Jacquards and weaving mechanisms to produce ornamental structures.
4. Suggest the design of different types of pile fabrics and stitching methods of double cloth.
5. Relate the colour and pigment theories to create different colour and weave effects in fabrics.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-							3	3			3	-
2	2	-							3	3			3	-
3	2	-							3	3			3	-
4	2	-							3	3		3	3	-
5	2	-							3	3		3	3	-

1 **4 Hours**

EXPERIMENT 1

Design, Draft and Peg plan of Plain Weave

2 **2 Hours**

EXPERIMENT 2

Design, Draft and Peg plan of Twill Weaves

3 **2 Hours**

EXPERIMENT 3

Design, Draft and Peg plan of Satin or Sateen Weave

4 **2 Hours**

EXPERIMENT 4

Design, Draft and Peg plan of Honey comb weave

5 **2 Hours**

EXPERIMENT 5

Design, Draft and Peg plan of Huck-a-Back weave

6 **4 Hours**

EXPERIMENT 6

Design, Draft and Peg plan of Extra Warp or Extra Weft

7 **4 Hours**

EXPERIMENT 7

Design, Draft and Peg plan of Pile Fabrics (Warp or weft)

8 **4 Hours**

EXPERIMENT 8

Design, Draft and Peg plan of Analysis of Backed Fabric

9 **2 Hours**

EXPERIMENT 9

Design, Draft and Peg plan of Bedford cords

10 **4 Hours**

EXPERIMENT 10

Design, Draft and Peg plan of Analysis of Double Cloth

Total: 30 Hours

Reference(s)

1. Z. J. Grosicki, Watson, Textile Design and Colour: Elementary Weaves and Figured Fabrics, Butterworths, London, 2004.
2. Z. J. Grosicki, Watson, Advanced Textile Design: Compound Woven Structures, Butterworths London, 2004.
3. D. Goerner, Woven Structure and Design, Part I, WIRA, 1986.
4. D. Goerner, Woven Structure and Design, Part II, BTTG, 1989.

18TT508 TEXTILE TESTING LABORATORY 0 0 4 2

Course Objectives

- Draw representative samples, perform testing of fibres, yarns and fabrics
- Interpret the results obtained for process control and product certification
- Perform experiments to improvise on applications; design or modify simple instruments; make use of advanced statistical techniques

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Draw representative samples, perform testing of fibres, yarns and fabrics
2. Interpret the results obtained for process control and product certification
3. Perform experiments to improvise on applications; design or modify simple instruments; make use of advanced statistical techniques

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1			-	3	1		2				1	3	1
2	1			-	3	1		2				1	3	1
3	1			3	3	1		2				1	3	3

1 **4 Hours**

EXPERIMENT 1

Measurement of Fibre length by Baer Sorter and Digital Fibro graph

2 **2 Hours**

EXPERIMENT 2

Measurement of Fibre fineness and bundle strength testing by Stelo meter

3 **4 Hours**

EXPERIMENT 3

Measurement of linear density of sliver, roving, and yarn and moisture regain of fibre sample.

4 **4 Hours**

EXPERIMENT 4

Single and ply yarn twist measurement

5 **4 Hours**

EXPERIMENT 5

Measurement of Single Thread Strength, Lea Strength and Impact strength of yarn and fabric

6 **4 Hours**

EXPERIMENT 6

Measurement of Yarn evenness and imperfections and assessment using yarn appearance board

7 **4 Hours**

EXPERIMENT 7

Measurement of Drape Coefficient of fabrics with different areal densities

8 **4 Hours**

EXPERIMENT 8

Measurement of Fabric thickness, stiffness and crease recovery

9 **4 Hours**

EXPERIMENT 9

Fabric tensile strength (Strip test and Grab test) and tear strength

10 **4 Hours**

EXPERIMENT 10

Assessment of Fabric abrasion resistance and fabric pilling

11 **4 Hours**

EXPERIMENT 11

Measurement of Fabric Air Permeability and bursting strength

12 **18 Hours**

EXPERIMENT 12

Design / Application oriented experiment

Total: 60 Hours

Reference(s)

1. Department Laboratory manual

18TT602 KNITTING TECHNOLOGY 3 0 2 4

Course Objectives

- To educate the students on the basics of knit structures and machines
- To educate the students on single jersey and double jersey knit structure and its derivatives
- To educate the students on warp knit structure and its derivatives

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Outline the basic operations of knitting machines.
2. Prioritize and suggest knitting machinery for a given end use.
3. Elaborate pattern mechanisms in flat knitting.
4. Differentiate between warp and weft knitting processes.
5. Characterize warp knitting structural models.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1												3	2	2
2	2					1						3	3	2
3			3			1						3	3	2
4			3			1						3	3	2
5	2					1						3	2	2

UNIT I **9 Hours**

KNITTING FUNDAMENTALS

Comparison of weaving and knitting. Weft knitting classifications - Circular-flat-V-bed. Mechanical elements of knitting: Needles types - Sinkers - Cams - Cylinder - Feeder - Take-up. Knitting cycle and yarn path - Structural Elements of Weft Knitting. Single knit and double knit structures.

UNIT II **9 Hours**

WEFT KNITTING

Basic weft knitting machines, needle operation, fabrics and their characteristics: Single jersey - Rib - Purl - Interlock and derivatives. Notations and needle gaiting. Intelligent yarn

delivery systems - open width fabric production - computerized knitting machines - CONTRA knitting techniques. Quality control

UNIT III **9 Hours**

FLAT KNITTING

Basic principles - Elements - Manual - Mechanical - Derivatives structures. Jacquard knitting - Pattern wheel, Pattern drum, Tape patterning devices, Electronic jacquard knitting.

UNIT IV **9 Hours**

WARP KNITTING

Comparison of Warp knitting and weft knitting. Basic structural elements of warp knitting. Over lap, under lap closed and open lap stitches. Machine classification - Knitting elements: Tricot - Raschel - Simplex - Multibar machines - Pattern Control Mechanisms - Pattern wheels - Chain links

UNIT V **9 Hours**

WARP KNITTED STRUCTURES

Basics - Two bar structures - Full tricot - Locknit - Reverse locknit - Satin - Raised loop - Queen's cord - Shark skin - Double atlas. Fabric geometry: Dimensional parameters. An energy model of plain knitted fabrics - Dynamics of yarn tension on Knitting machines.

1 **3 Hours**

EXPERIMENT 1

Single Jersey fabric structure analysis

2 **3 Hours**

EXPERIMENT 2

Single Jersey fabric derivatives structure analysis

3 **4 Hours**

EXPERIMENT 3

Rib fabric structure analysis

4 **4 Hours**

EXPERIMENT 4

Rib fabric derivatives structure analysis

5 **4 Hours**

EXPERIMENT 5

Interlock fabric structure analysis

6 **4 Hours**

EXPERIMENT 6

Interlock fabric derivative structure analysis

7 **4 Hours**

EXPERIMENT 7

Warp knit Tricot structure analysis

8 **4 Hours**

EXPERIMENT 8

Warp knit Raschel structure analysis

Total: 75 Hours

Reference(s)

1. David J Spencer, Knitting Technology, 3rd Edition, Wood head Publishing, 2001
2. N. Anbumani, Knitting Fundamentals, Machines, Structures and Development, New Age International Pvt. Ltd., 2007
3. Henry Johnson, Introduction to Knitting Technology, Abhishek Publications, Chandigarh, 2006.
4. Samuel Raz, Flat Knitting Technology, C. F. Rees GmbH, Druck-Repro-Verlag, Heidenheim, Germany, 1993
5. Chandrasekhar Iyer, Bernd Mammal and Wolfgang Schach., Circular Kintting, Meisenbach GmbH, Bamberg, 1995
6. D. B. Ajgaonkar, Knitting Technology, Universal Publication Corporation, Mumbai, 1998

18TT603 GARMENT TECHNOLOGY 3 0 0 3

Course Objectives

- To teach principles and practice of apparel manufacturing.
- To impart knowledge on the effect of equipment on product quality and performance

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select the appropriate fabrics and trims for a garment.
2. Demonstrate the concepts of pattern making and grading to cut the fabrics as per the specifications.
3. Evaluate sewing machines and sewing threads and give suitable suggestion for making a given garment.
4. Suggest appropriate the apparel production systems for making various garments.
5. Appraise pressing and packing techniques in the production of apparels.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2											2
2	2		3											2
3	2	3											2	
4	2		3										2	
5	2		3										2	

UNIT I **9 Hours**

OVERVIEW

Introduction to Apparel manufacturing process. Functional divisions of an apparel industry. Material Evaluation of Fabric, Trims and Accessories: Receiving and inspecting materials. Types of defects. Common fabric problems for apparel manufacturers.

UNIT II **9 Hours**

CUTTING

Basics of Pattern making and grading. Marker planning: requirements - Efficiency Marker making - Cut order planning. Features of a digitizer. Plotters- flat bed plotter, drum plotter. Spreading: Requirements - Methods - Nature of fabric package - Machines. Cutting: requirements - Hand shears -

Straight knife - Round knife - Band knife - Computer control - Die - Laser - Plasma torch - Water jet - Quality control in cutting - defects and troubleshooting.

UNIT III **9 Hours**

SEWING

Stitches - properties - Classes. Seams - Properties - Classes. Sewing machine fundamentals - Classification - Stitch forming mechanism - Sewing machine feed mechanisms-Industrial sewing machine working principle. Types of Sewing machine beds. Sewing threads - Types - Characteristics - Thread size - Ticket number. Types of needles - Sewing problems - Quality control in sewing - defects and troubleshooting.

UNIT IV **9 Hours**

APPAREL PRODUCTION SYSTEMS

Basic concepts - Plant layout - Product oriented layout - Process oriented layout - Progressing bundle System (PBS) - Unit Production System (UPS) - Modular Production System (MPS) - Flexible Manufacturing - work flow - Balancing - Buffer.

UNIT V **9 Hours**

PRESSING AND PACKING

Fusing equipments - working principles, types, and its functions. Pressing - purpose of pressing - categories of pressing - pressing equipment and methods-pleating-permanent press - the state of pressing.Packing types of packing-styles of packing. Final inspection. Support materials: Linings - interlinings - waddings - other materials. Closures: Buttons - zippers - hook-and-loop tapes. Trims: labels - threads - laces - embroidery - tapes.

Total: 45 Hours

Reference(s)

1. David J. Tyler, Carr and Latham, Technology of Clothing Manufacture, Blackwell Publishing, 2008.
2. Grace I. Kunz and Ruth E. Glock, Apparel Manufacturing: Sewn Product Analysis, Prentice Hall, 2004.
3. Gerry Cooklin, Introduction to Clothing Manufacture, Blackwell Science Ltd., 2007.
4. H. Peggal, Introduction to Dress Making, Marshal Caverdish, London, 2001.
5. Solinger Jacob, Apparel Manufacturing Analysis, Columbia Boblin Media, 2000.

18TT604 QUANTITATIVE METHODS IN TEXTILE INDUSTRY

3 1 0 4

Course Objectives

- Compute the production rates of spinning machines and parameters of limit irregularity, yarn twist and moisture of fibres, intermediate products and yarns.
- Prepare yarn realization, spin plan and productivity reports in spinning department.
- Compute the production parameters in weaving preparatory processes.
- Estimate yarn requirements, productivity, yarn-fabric reconciliation in weaving and knitting.
- Compute liquor ratios in textile chemical processing and consumption of utilities; assess degradation due to chemical processing; evaluate whiteness.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Calculate production rates of spinning and weaving machines.
2. Calculate parameters of limit irregularity, yarn twist and moisture of fibres, intermediate products and yarns.
3. Prepare yarn realisation, spin plan and productivity reports in spinning department.
4. Estimate yarn requirements and prepare reports related to weaving productivity, yarn-fabric reconciliation and knitting.
5. Calculate liquor ratios in textile chemical processing and consumption of utilities and evaluation of fabrics for quality.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2							2	-		1	3	
2	3	2							2	3	2	1	3	
3	3	2							2	-	2	1	3	
4	3	2							2	3		1	3	
5	3	2							2	-		1	3	

UNIT I **9 Hours**

SPINNING

Linear density (count): Tex, English, Denier, Metric, Woollen, Worsted, count conversions, count control (wrapping). Yarn diameter. Index of irregularity. Moisture calculations: Invoice weight. Production, time, speeds and efficiency for all the machines in short-staple spinning including post-spinning operations, Material content (length and mass) in all spinning containers and packages.

UNIT II **9 Hours**

SPINNING (CONTD)

Twist and twist multipliers in Tex, Ne and Metric systems, Yarn twist contraction. Cleaning efficiency and wastes; Yarn realization, Wastes: soft, hard, invisible loss/gain; Raw material requirements for a given product mix, raw material-yarn production reconciliation; Spin plan: production balancing in spinning. Productivity calculations: Production per spindle, HOK, Conversion to 40s, productivity in winding, worker complement in spinning

UNIT III **9 Hours**

FABRIC FORMATION

Beam count, Production, time, speeds and efficiency for all the machines in weaving processes, Material content (length and mass) in weaving processes, Sectional warping: number of sections, cone angle. Size recipe, size pick-up. Fabric parameters: constructional details, crimp and contraction, Reed count, width in reed, denting. Cover factor: warp, weft, and cloth. Take-up (loom), pick wheels.

UNIT IV **9 Hours**

FABRIC FORMATION (CONTD…)

Hard waste: theoretical and actual, Areal density (GSM), Yarn requirements for a given product mix,yarn-fabric reconciliation. Weave plan: production balancing, Weaving productivity measures, labour complement in weaving. Weaving snap study. Optimization of package sizes: warpers and weavers beams. Knitting production: circular, flat bed and warp, loop length, tightness factor, stitch density, yarn requirements.

UNIT V **9 Hours**

TEXTILE CHEMICAL PROCESSING

Expression of volumes of liquids: w/w, w/v and v/v. Density of salt / chemical solution, o° Be to ° Tw to g/cc, Normality, Molarity - Molality. Lab-to-shop floor calculations for preparation, colouration and finishing. Estimation of degradation in Preparatory Processes: Calculation of Copper Number, carboxyl group content. Dye exhaustion to the fabric in padding process. Colour difference, shade sorting, CIE Whiteness Index, ASTM Yellowness Index. Utilities consumption.

Total: 60 Hours

Reference(s)

1. J. E. Booth, Textile Mathematics, Volume 1, 2 & 3, The Textile Institute, 2000.
2. R. Sen Gupta, Weaving Calculations, Mc Graw Hill, 1996.
3. Edward S Olson, Textile Wet Processes, Vol. 1 Preparation of Fibres and Fabrics, Mahajan Publishers Private Limited, India, 1997.
4. Jose Cegarra, Publio Puente, Jose Valldeperas, The Dyeing of Textile Materials, Eurotex Publication, Italy, 1992.
5. Gulrajani M L, Sanjay Gupta, Energy Conservation in Textile Wet Processing, Omega Scientific Publishers, New Delhi, 1992
6. Sule A D, Computer Colour Analysis, New Age International Publishers, New Delhi, 2002.

18TT607 PATTERN MAKING LABORATORY 2 0 2 3

Course Objectives

- To acquire hands-on experience on pattern drafting
- To understand the types of seams and stitches, sewing threads and their quality.
- To understand various garment parts and their grading methods
- To acquire the knowledge on use of accessories for garments.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Analyse the human anthropometrics and sizing systems
2. Draft the pattern for given measurements.
3. Apply different embroidery stitches on apparels.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1										1	-
2	3	2	1										1	-
3	3	2	1											2

UNIT I **5 Hours**

HUMAN ANTHROPOMETRICS AND SIZING SYSTEMS

Measurements and its importance, land mark terms, sequence of taking body measurements .vertical measurements and horizontal measurements. Sizing system: size categories in menÃƒÂ¢??s wear, womenÃƒÂ¢??s wear and childrenÃƒÂ¢??s wear, international sizing, Proportion and disproportion of human figure.

UNIT II **5 Hours**

PATTERN MAKING

Pattern making tools, pattern making terms, basic blocks, pattern details, dart, notches, grain line, drill hole marks, ease allowance, seam allowance, style lines, types of pattern, techniques of pattern making - drafting, draping and flat pattern, blending and trueing.

UNIT III **5 Hours**

DRAFTING

Principles of pattern drafting, Drafting patterns for basic bodice, sleeve, skirt, types of sleeves, collars, yokes, cuffs. shirt and trouser.

UNIT IV **5 Hours**

FLAT PATTERN TECHNIQUES

Dart manipulation methods - pivot, slash & spread and measurement method. Single and double dart series, conversion of dart into style lines, yokes, gathers and multiple darts.

UNIT V **5Hours**

PATTERN GRADING

3D body scanning, principles, operations and advantages of body scanning technologies. Principles of pattern grading, types - draft grading and track grading, two dimensional and three dimensional grading.

1 **3 Hours**

EXPERIMENT 1

Development of patterns for Baby Frock

2 **3 Hours**

EXPERIMENT 2

Development of patterns for Salwar Kameez

3 **3 Hours**

EXPERIMENT 3

Development of patterns for T-shirt

4 **3 Hours**

EXPERIMENT 4

Development of patterns for Shirt

5 **3 Hours**

EXPERIMENT 5

Development of patterns for men's trousers

6 **3 Hours**

EXPERIMENT 6

Development of patterns for Ladies' blouse

7 **3 Hours**

EXPERIMENT 7

Development of graded patterns any two styles

8 **3 Hours**

EXPERIMENT 8

Preparing an embroidery design using computerised embroidery machine

9 **3 Hours**

EXPERIMENT 9

Preparing samples for seams and seam finishes

10 **3 Hours**

EXPERIMENT 10

Mini Project - Design and develop any Kid's wear

Total: 60 Hours

Reference(s)

1. Helen Joseph Armstrong, Pattern Making for Fashion Designers 4th Edition, Prentice-Hall, New Jersy, 2006.
2. Le Pechoux B and Ghosh T K , Apparel Sizing and Fit, Textile Progress, Volume 32, The Textile Institute, Manchester, 2002.
3. Ashdow S P, Sizing in clothing - Developing effective sizing systems for ready to wear clothing, CRC press, Textile Institute & Wood Head publishers, England, 2007.
4. Connie Amaden Crawford, The Art of Fashion Draping, Fairchild Publications, New York, 2005.
5. Harold Carr and Barbara Lathom, The Technology of Clothing Manufacture, Blackwell Sciences, Oxford, 1996.

18TT702 COSTING AND FINANCIAL MANAGEMENT

3 0 0 3

Course Objectives

- To offer the students a broad overview of costing of textile products and teach principles of financial management

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Perform arithmetical operations with complex numbers
2. Explain the meanings of a relation defined on a set, an equivalent relation and a partition of a set
3. Calculate percentages in real life contexts , find any percentage of a given whole using their knowledge of fraction multiplication and increase / decrease a given whole by a percentage
4. Demonstrate the situations like motion in as straight line, Boats and Streams, Trains, Races and clocks
5. Demonstrate the situations like motion in as straight line, Boats and Streams, Trains, Races and clocks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3			3			2	-	2	-		2	
2	2	3			3			2	-	2	-		2	
3	2	3			3			2	-	2	-		2	
4	2	3			3			2	-	2	-		2	
5	2	3			3			2	-	2	-		2	

UNIT I **8 Hours**

BASICS OF COSTING AND FINANCIAL MANAGEMENT

Introduction to cost accounting-Cost ledgers: Reconciliation between cost and financial accounting - Costing methods -Product Costing, Job, order, Batch and Contract costing- Cost Sheet. Introduction Financial Management: Functions, Goals, Organization of Finance Function, Time Value of Money, Future Value and Present Value of Money. Real and Nominal Interest Rate

UNIT II **8 Hours**

PROCESS COSTING AND ACCOUNTING

Process costing-operation costing -operating costing -unit costing, multiple costing -Marginal costing -Throughput accounting -ABC -integration of standard costing with marginal cost -Transfer pricing-Treatment of special expenses -Accounting and control of waste, scrap, spoilage, defective etc.

UNIT III **10 Hours**

PRINCIPLES OF CAPITAL BUDGETING

Principles and Nature of Capital Budgeting, Evaluation Techniques: Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index. Project selection under Capital Rationing

UNIT IV **10 Hours**

CAPITAL BUDGETING

Cost of Capital and Capital Structure Concept of Cost of Capital, Measurement of Specific Costs and Overall Cost of Capital, Factors Determining Capital Structure, Operating and Financial Leverage.

UNIT V **9 Hours**

WORKING CAPITAL MANAGEMENT

Principles of Working Capital, Principles and Determinants of Working Capital, Operating Cycle, Estimation of Working Capital, Policies for Financing Current Assets, GWC vs. NWC.

Total: 45 Hours

Reference(s)

1. M.N.Arora, Cost Accounting: Principles and practice, New Delhi: Vikas publishing Pvt. Ltd., 2011.
2. Horngreen, Foster &Datar,Cost Accounting-A Managerial Emphasis, New Delhi: Prentice Hall India, 2010.
3. Dr. Ashish K. Bhattacharyya,Principles and Pracitice of Cost AccountingÃƒ?Ã‚¢, NewDelhi: Prentice Hall (PHI), 2012
4. I.M.Pandey,Financial Management, New Delhi: Vikas Publishing House Pvt. Ltd.,2012.
5. Brigham and Houston, Fundamentals of Financial Management, New Delhi: Thomson Learning,.
6. Prasanna Chandra, Financial Management-Theory and Practice, New Delhi: Tata McGraw-Hill Publishing Company Ltd, 2012.

18TT703 NONWOVEN TECHNOLOGY 3 0 0 3

Course Objectives

- To understand the fundamentals of various production processes in the manufacture of nonwovens
- To acquire knowledge on the different methods of finishing nonwoven products
- To understand the various applications of nonwovens

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Explain the nonwoven manufacturing processes using natural and chemical fibres
2. Differentiate different bonding methods used in nonwoven manufacturing process
3. Suggest suitable finishing methods of nonwoven meant for different applications.
4. Evaluate the nonwovens in terms of physical properties
5. Outline the applications of nonwovens for hygiene and household products.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	3	-									3	3	3
2	2	3	-									3	3	3
3	2	3	-			3						3	3	3
4	2	3	-			3						3	3	3
5	-	3	-			3						1	3	3

UNIT I **9 Hours**

WEB FORMATION

Definition of Nonwoven - nonwoven manufacturing processes - nonwoven properties and applications including environmental considerations. Raw materials for the production of nonwoven: natural fibers -animal fibres -chemical fibres. Web forming - Lay process - spun laying. Spun bonding web formation

UNIT II **12 Hours**

BONDING

Needling: principle - needle characteristics - process variables- fabric properties. Loop formation processes: types - Process variables -fabric properties. Hydro-entanglement process: principle - process variables -Fabric properties. Bonding: Hot air - Heat setting - Thermal calendar-Ultrasound - Chemical - saturation - print. Foam and spray bonding

UNIT III **9 Hours**

FINISHING

Mechanical finishing: splitting and winding - perforating -drying - compressive finishes, Surface finishes: singeing - shearing - flocking - raising - polishing -softening, Wet finishes: washing - colouration -printing - Application of chemical finishes :types - antistatic agents - antimicrobial or biocidal finishes -flameproof finishes - waterproof finishes - softeners- stiffeners. UV stabilisers

UNIT IV **8 Hours**

TESTING

Sampling and statistics - Testing conditions -Standards and specifications. Testing of raw materials - finished fabrics. Testing process related to end use: hygiene and medical products - household textiles. Protective clothing and filter fabrics

UNIT V **7 Hours**

APPLICATIONS

Hygiene - medical-safety -cleaning - household products - home textiles - apparels - technical. Re-utilization of nonwovens - recycling of nonwovens. Techno economic in nonwovens

Total: 45 Hours

Reference(s)

1. Wilhelm Albrecht, Nonwoven Fabrics, WILEY-VCH Verlag Gmbh & Company, Germany, 2003.
2. S. Russell, Handbook of Nonwovens, The Textile Institute Publication, 2007.
3. O. Irsak, Nonwoven Textiles, Textile Institute, Manchester, 1999
4. R. Krcma, Manual of Nonwovens, Textile Trade Press, Manchester, 1993.

18TT704 TECHNICAL TEXTILES 3 0 0 3

Course Objectives

- To provide an overview on the application of technical textiles.
- To teach the manufacturing processes of a few important technical textiles.
- To educate on the physical and chemical properties of technical textiles.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Characterize the different sectors of textile industry and their role in the economy
2. Assess contribution of various sectors of textile industry to nation's economy
3. Critique the efforts taken by the Government of India for the growth of Indian Textile Industry
4. Plan for the utilities in the various sectors of textile Industry.
5. Use personnel management principles in textile industry

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	1	-		1		2			3	2	
2	3	2	3	1	-		2		1	2		3	2	
3	3	2	3	1	-		1		2			3	2	
4	3	2	3	1	-		2		2			3	2	
5	2	2	3	1	-		2		2	1		3	2	3

UNIT I **12 Hours**

TECHNICAL FIBRES AND COMPOSITES

High strength and modulus organic fibres High chemical and thermal resistance organic fibres. High performance inorganic fibres Ultra fine and Novelty fibres .Classification and major applications of technical textiles and market potential. Reinforcement fibres matrix materials Classification of textile reinforcement structure Composite manufacturing techniques: hand lay-up compression moulding applications of structural composites. Healthcare and hygienic products

UNIT II **6 Hours**

MEDICAL TEXTILES

Classification and fibres used requirements. Detailed study and application of textiles in: implantable non-implantable extracorporeal devices.

UNIT III **6 Hours**

PROTECTIVE TEXTILES

Waterproof fabrics breathable fabrics Fire protection Heat and cold protection Ballistic protective clothing Camouflage textiles NBC protection.Nuclear protective fabrics

UNIT IV **12 Hours**

FILTRATION TEXTILES

Principles of filtration Filtration requirements: fibres and fabrics Filters in air conditioning Textiles in liquid filtration Designing Testing.
Materials Geotextiles functions. Geotextiles applications

UNIT V **9 Hours**

COATED TEXTILES

Fibres and fabrics for coated textiles polymers and additives in coating coating methods: Calendaring Heat setting Chemical processes.
Tyre cord design Manufacturing techniques. Airbags: materials and properties Manufacturing techniques Seat belts and fabrics liner fabrics. Textiles for aircrafts

Total: 45 Hours

Text Book(s)

1. Sabit Adanur and Wellington Sears, Handbook of Industrial Textiles, Technomic Publishing company Inc., USA, 1995.

2. A. R. Horrocks and S. C. Anand, Handbook of Technical Textiles, Woodhead Publishing Limited and The Textile Institute, 2000.

Reference(s)

1. Alagirusamy and A. Das, Technical Textile Yarns, CRC press, 2010.
2. P. W. Harrison, The Design of Textiles for Industrial Applications, Textile Institute, Manchester, 1998.
3. Pushpa Bajaj and A. K. Sengupta, Industrial Applications of Textiles for Filtration and Coated Fabrics, Textile Progress Vol.14, 1992.
4. Jarmila Svedova, Industrial Textiles, Elsevier Science Publishing Co Inc. New York, 1990.

18TT707 COMPUTER AIDED TEXTILE AND APPAREL DESIGN LABORATORY

0 0 4 2

Course Objectives

- To acquire skills in analyzing the fabric structure, woven design and garment design
- To acquire skills in making patterns of garments and grading
- To select appropriate software tools for designing and grading activities

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select CATD software tools to simulate different types woven fabrics with multiple colours.
2. Apply CATD software tools to simulate different types of garments.
3. Compute marker efficiency for a given garment pattern.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2		3								2	2
2	1		2		3								2	2
3	1		2		3								2	2

1 **6 Hours**

EXPERIMENT 1

Development of dobby designs(part I) based on interactiveness of weave, peg plan, draft colour order and yam type

2 **6 Hours**

EXPERIMENT 2

Development of dobby designs (part II) colour and weave effect deigns, stripe and check effect designs based on colour order and yam type

3 **6 Hours**

EXPERIMENT 3

Development of jacquard designs (part I)
a) Colouring and weave selection concepts.shade and feature weave and thread balance
b) Spot figuring
c) Half drop and all over designs

4 **6 Hours**

EXPERIMENT 4

Development of jacquard designs (part II)
Repeat design, weave, and number of repeats on fabric width.
Resizing: fabric sett

5 **6 Hours**

EXPERIMENT 5

Multilayer design extra warp and extra weft design concepts

6 **4 Hours**

EXPERIMENT 6

Double cloth, Two-in-One cloth design concept and stitching concepts

7 **4 Hours**

EXPERIMENT 7

Draft the pattern and grade using spec sheets for knitted and woven garments

8 **6 Hours**

EXPERIMENT 8

Lay planning and marker efficiency calculations for woven and knitted garments

9 **16 Hours**

EXPERIMENT 9

Mini-project on development of textile designs, pattern drafting and grading

Total: 60 Hours

18TT708 PRODUCT DEVELOPMENT LABORATORY 0 0 2 1

Course Objectives

- To select appropriate process parameters and set the machines
- To operate the textile machines and equipment available in the laboratories
- To produce standard textile products using machines available in the laboratories of textile department

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select the appropriate process parameters to produce a textile product.
2. Select the suitable sequence of operations to produce a particular end product.
3. Create a product as per the plan.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		1		2								2	2
2	1		1		2								2	2
3	1		1		2								2	2

Total: 30 Hours

18TT709 PROJECT WORK I **0 0 6 3**

Course Objectives

- Identify a problem in the field of textiles or related discipline.
- Survey or carry out activities leading to generation of new knowledge.
- Prepare a report and make a presentation

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Identify and formulate a real world problem related to textiles
2. Identify the requirement and develop the design solutions.
3. Identify technical ideas, strategies and methodologies.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	3	2			2	2	2	1		2	3
2	3	3	2	3	2			2	2	2	1	-	2	3
3	3	3	2	3	2			2	2	2	1		2	3

18TT804 PROJECT WORK II **0 0 18 9**

Course Objectives

- Identify a problem in the field of textiles or related discipline.
- Survey or carry out activities leading to generation of new knowledge.
- Prepare a report and make a presentation

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Identify, formulate a real world problem and break-down the complex problems into various concepts and principles based on the literature search
2. Identify the activities required and methods to fulfill them and prepare a work-plan to execute the activities
3. Create and / or select appropriate processes / tools for modeling or preparation of work plan(materials and methods)
4. Develop a product or process with systematic approach involving problem analysis, designing solutions (considering health, safety, legal and cultural issues)

5. Prepare the reports and presentations in the specified format.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	3	2		-	2	2	2	1	2	2	3
2	3	3	2	3	2		-	2	2	2	1	2	2	3
3	3	3	2	3	2		-	2	2	2	1	2	2	3
4	3	3	2	3	2		-	2	2	2	1	2	2	3
5	3	3	2	3	2		-	2	2	2	1	2	2	3
6	3	3	2	3	2		-	2	2	2	1	2	2	2

18HSH01 HINDI **1 0 2 2**

Course Objectives

- To help students acquire the ability to understand a simple technical text in Hindi
- To teach them how to converse in Hindi on simple day-to-day situations
- To help students acquire the ability to understand a simple technical text in Hindi

Programme Outcomes (POs)

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Construct simple sentences and use vocabulary required for day-to-day conversation.
2. Distinguish and understand the basic sounds of Hindi language.
3. Appear for Hindi examinations conducted by Dakshin Bharat Hindi Prachar Sabha.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				

UNIT I **9 Hours**

Hindi Alphabet: Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - Vowel Signs - Chandra Bindu & Visarg -Table of Alphabet -Vocabulary.

UNIT II **9 Hours**

Nouns: Genders (Masculine & Feminine Nouns long vowels and short vowels - -Masculine & Feminine - Reading Exercises.

UNIT III **9 Hours**

Pronouns and Tenses: Categories of Pronouns - Personal Pronouns - Second person (you & honorific) - Definite & Indefinite pronouns - Relative pronouns - Present tense - Past tense - Future tense - Assertive & Negative Sentences - Interrogative Sentences.

UNIT IV **9 Hours**

Classified Vocabulary: Parts of body - Relatives - Spices - Eatables - Fruit & Vegetables - Clothes - Directions - Seasons - Professions.

UNIT V **9 Hours**

Speaking: Model Sentences and Rhymes - Speaking practice for various occasions.

Total: 45 Hours

Reference(s)

1. Hindi Prachar Vahini-1 by Dakshin Bharat Hindi Prachar Sabha Chennai
2. B.R. Kishore, Self Hindi Teacher for Non-Hindi Speaking People,Vee Kumar Publications(P)Ltd., New Delhi,2009
3. Videos, Stories, Rhymes and Songs

1 0 2 2

18HSG01 GERMAN

Course Objectives

- To help students appear for the A1 level Examination
- To teach them how to converse fluently in German in day-to-day scenarios

Programme Outcomes (POs)

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. listen and identify individual sounds of German
2. use basic sounds and words while speaking
3. read and understand short passages on familiar topics
4. use basic sentence structures while writing
5. understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

Introduction to German language: Alphabet - Numbers - Greetings - Days and Seasons- Working with Dictionary.

UNIT II **9 Hours**

Nouns - articles - Speaking about one self - Listening to CD supplied with the books, paying special attention to pronunciation

UNIT III **9 Hours**

Regular & Irregular verbs - Personal pronouns - family - Introduction to types of sentences

UNIT IV **9 Hours**

Question words-Types of Questions - Nominative case- Verb Conjugation - country - nationalities

UNIT V **9 Hours**

Verbs - to be & to have - conjugation - Hobbys - Framing basic Questions and answers

Total: 45 Hours

Reference(s)

1. Kursbuch and Arbeitsbuch, NETZWERK A1 DEUTSCH ALS FREMDSPRACHE, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2015
2. Langenscheidt Eurodictionary - German - English / English - German, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2009
3. Grundkurs, DEUTSCH Lehrbuch Hueber Munichen, 2007.

18HSJ01 JAPANESE **1 0 2 2**

Course Objectives

- To train students for N5 Level Examination
- To teach them use basic Japanese sentences in day-to-day conversation
- To make students familiar with the Japanese cultural facets and social etiquettes

Programme Outcomes (POs)

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Recognise and write Japanese alphabet
2. Speak using basic sounds of the Japanese language
3. Apply appropriate vocabulary needed for simple conversation in Japanese language
4. Apply appropriate grammar to write and speak in Japanese language
5. Comprehend the conversation and give correct meaning

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

Introduction to Japanese - Japanese script- Pronunciation of Japanese(Hiragana)- (Katakana) Long vowels - Pronunciation of in,tsu,ga - Letters combined with ya,yu,yo - Daily Greetings and Expressions - Numerals. N1 wa N2 desu - N1 wa N2 ja arimasen - S ka N1 mo - N1 no N2 - san - Kore - Sore - Are - Kono N - Sono N - Ano N - Sou desu - Sou ja Arimasen - S1 ka - S2 ka - N1 no N2 - Sou desu ka - Koko - Soko - Asoko - Kochira - Sochira Achira - N1 wa N2 (place) desu - Doko - Dochira - N1 no N2 - Ko - So - A - Do (Demonstrative words) - O kuni Kanji10 - Technical Japanese Vocabulary (30 Numbers)

UNIT II **9 Hours**

Introduction to time - Ji - Fun - Pun - Introduction of verbs - V Masu - V Masen - V Mashita - V Masendeshita N (Time) Ni V - N1 Kara - N2 Made - N1 to N2 - S Ne - N (Place) e Ikimasu - Kimasu - Kaerimasu - Doko (e) Mo Ikimasen - Ikimasendeshita - N (Vechile) de Ikimasu - Kimasu - Kaerimasu - N (Person / Animal) to V - Itsu - S Yo N o (transitive) - N o Shimasu - Nani o Shimasuka - Nan and Nani - N (place) de V - V Masenka - V Mashou - o - Kanji 10 - Technical Japanese Vocabulary (30 Numbers) .

UNIT III **9 Hours**

N (tool/means) de V - Word/Sentence wa Go de Nani desu ka - N (person) Ni Agemasu, etc - N (person) Ni Moraimasu etc - Mou V Mashita - Introduction to Adjectives - N wa Na adj (Na) desu - N wa II adj (II) desu - Na adj Na n - II adj (II) N - Totemo - Amari - N wa Dou desuka - N1 wa Donna

N2 desuka - S1 Ga S2 - Dore N ga Arimasu - Wakarimasu - N Ga Sukidesu - Kiraidesu - Jozu desu - Heta desu - Donna N - Yoku - Daitai - Takusan - Sukoshi - Amari - Zenzen - S1 kara S2 - Doushite - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

UNIT IV **9 Hours**

N ga Arimasu - Imasu - N1 (place) Ni N2 ga Arimasu - Imasu - N1 (thing/person/place) no N2 (position) - N1 ya N2 - Word (s) desuka - Chirisosu wa Arimasuka - Saying numbers - Quantifier (period) Ni kai V - Quantifier Dake - N dake - Past tense of Noun sentences and Na adjective sentences - Past tense of ii adjective sentences - N1 wa N2 yori adjective desu - N1 to N2 to dochira ga adjective desu ka - N1/N2 no houga adjective desu - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

UNIT V **9 Hours**

N ga hoshi desu - V masu form tai desu - N (place) e V masu form - N Ni - ikimasu - kimasu - kaerimasu N ni V - N o V - dou ko ka - nani ka - go chuu mon - Verb conjugation - Verb groups - Verb te form - V te form kudasai - V te form imasu - V masu from mashouka - S1 ga S2 - N ga V - V te form mo ii desu - V te form wa ikemasen - V te form imasu Shrimasen - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

Total: 45 Hours

Text Book(s)

1. Japanese for Everyone: Elementary Main Textbook 1-2, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

Reference(s)

1. Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

18HSC01 CHINESE **1 0 2 2**

Course Objectives

- To help students appear for HSK Level 1 Exam
- To help students acquire the basics of Chinese language
- To teach the students how to converse in Chinese in various situations

Programme Outcomes (POs)

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. listen and identify individual sounds of Chinese
2. use basic sounds and words while speaking
3. read and understand short passages on familiar topics
4. use basic sentence structures while writing
5. understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

Hello
1.Initials and Finals of Chinese b,p,m,f,d,,n,l,g,k,h,j,q,x
2. Tones Four
3.Chinese Syllables
4.Tone S

UNIT II **9 Hours**

Thank you -
Initials and Finals of Chinese
The Neutral Tone
Rules of Tone Marking and Abbreviation

UNIT III **9 Hours**

1. What"s your name - In the school; -In the classroom; -In the school
The Interrogative Pronoun
2 The Sentence
3 Interrogative Sentences with

UNIT IV **9 Hours**

She is my Chinese teacher -
In the library

The Interrogative Pronouns
The Structural Particle
The interrogative Particle

UNIT V **9 Hours**

Her daughter is 20 years old this year -
1.The Interrogative Pronoun
2. Numbers below 100
3.Indicating a Change
The Interrogative Phrase

Total: 45 Hours

18HSF01 FRENCH **1 0 2 2**

Course Objectives

- To prepare the students for DELF A1 Examination
- To teach them to converse fluently in French in day-to-day scenarios

Programme Outcomes (POs)

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. To help students acquire familiarity in the French alphabet & basic vocabulary
2. listen and identify individual sounds of French
3. Use basic sounds and words while speaking
4. Read and understand short passages on familiar topics
5. Understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

ENTRER EN CONTACT

La langue francaise, alphabets, les numeros, les jours, les mois.
Grammaire Les verbes s"appeler,etre, avoir, les articles definis, indefinis
Communication - Saluer, s"informer sur quelquun, demander de se presenter
Lexique - Les alphabets, les nationalites, age, les pays, les couleurs, les jours de la semaine, les mois de l"annee, les professions

UNIT II **9 Hours**

PARTAGER SON LIEU DE VIE

Les francais et leur habitat, des habitations insolites
Grammaire - Verbes - Conjugaison : Present (Avoir / etre / ER, IR, RE : Regulier et Irregulier) - Adjectifs les propositions de lieu
Communication - Chercher un logement, d"ecrire son voisin, s"informer sur un logement
Lexique - L"habitat, les pieces, l"equipement, la description physique

UNIT III **9 Hours**

VIVRE AU QUOTIDIEN

Grammaire - Articles contractes, verbes vouloir, pouvoir, devoir, adjective interrogative, future proche
Communication- Exprimer ses gouts, parler de ses loisirs, justifier un choix, exprimer une envie

Lexique - le temps libre et les loisirs, les saisons, les activites quotidiennes, le temps (le matin, le soir, la nuit)

UNIT IV **9 Hours**

COMPRENDRE SON ENVIRONNEMENT OUVRIR LA CULTURE

Grammaire - Verbes - Finir, Sortir, les adjectifs demonstratifs, le passe compose, l"imparfait
Communication - Propose quelqu""un de faire quelque chose, raconteur une sortie au passe parler un film
Lexique - Les sorties, la famille, art, les vetements et les accessoires

UNIT V **9 Hours**

GOUTER A LA CAMPAGNE

Grammaire La forme negative, les verbes acheter, manger, payer, articles partitifs, le pronom en de quantite
Communication Accepter et refuse rune invitation, donner des instructions, commander au restaurant
Lexique Les services et les commerces, les aliments, les ustensiles, argent

Total: 45 Hours

Reference(s)

1. Saison A1, Methode de francais
2. Hachette FLE

18GE0P1 NANOMATERIALS SCIENCE 3 0 0 3

Course Objectives

- Impart knowledge on Nano science
- Explore different techniques of producing nano materials
- Create expertise on the applications of nano materials in various fields

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Summarize the origin and advance of nano materials and its classification
2. Compare the different types of methods adopted for synthesizing nano materials
3. Analyze the characterization techniques for analyzing nano materials
4. Explain the physical properties exhibited by nano materials
5. Organize the nano materials developed for advanced technological applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2												
2	3	1												
3	3	2												
4	3	2												
5	3	1												

UNIT I **9 Hours**

NANO SCALE MATERIALS

Introduction-Feynman's vision-national nanotechnology initiative (NNI) - past, present, future - classification of nanostructures, nano scale architecture - effects of the nano meter length scale - changes to the system total energy, and the system structures- effect of nano scale dimensions on various properties -differences between bulk and nano materials and their physical properties.

UNIT II **9 Hours**

NANOMATERIALS SYNTHESIS METHODS

Top down processes - mechanical milling, nanolithography and types based on radiations - Bottom up process physical method: physical vapour deposition, RF sputtering, CVD- chemical method: colloidal and sol-gel methods - template based growth of nano materials - ordering of nano systems, self-assembly and self-organization.

UNIT III **9 Hours**

CHARACTERIZATION TECHNIQUES

General classification of characterization methods - analytical and imaging techniques - microscopy techniques - electron microscopy, scanning electron microscopy, transmission electron microscopy,

atomic force microscopy - diffraction techniques - X-ray spectroscopy – thermo gravimetric analysis of nano materials.

UNIT IV **9 Hours**

SEMICONDUCTOR NANOSTRUCTURES

Quantum confinement in semiconductor nanostructures - quantum wells, quantum wires, quantum dots, super lattices-epitaxial growth of nanostructures-MBE, metal organic VPE, LPE - carbon nano tubes- structure, synthesis and electrical properties -applications- fuel cells - quantum efficiency of semiconductor nano materials

UNIT V **9 Hours**

NANOMACHINES AND NANODEVICES

Micro electro mechanical systems (MEMS) and Nano electro mechanical systems (NEMS)-fabrication, actuators-organic FET- principle, description, requirements, integrated circuits- organic LED: basic processes, carrier injection, excitons, optimization - organic photovoltaic cells- particulate and geometrical nano magnets-magneto resistance.

Total: 45 Hours

Reference(s)

1. Willam A. Goddard, Donald W.Brenner, "Handbook of Nanoscience, Engineering, and Technology", CRC Press, 2012
2. Charles P. Poole Jr and. Frank J. Owens, "Introduction to Nanotechnology", Wiley Interscience, 2007
3. Guozhong Cao, Y. Wang, "Nanostructures and Nanomaterials-Synthesis, Properties & Applications", Imperials College Press, 2011.
4. T. Pradeep, "NANO: The Essentials Understanding Nanoscience and Nanotechnology", McGraw - Hill Education (India) Ltd, 2012
5. Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, "Nanoscale Science and Technology", John Wiley and Sons Ltd, 2006
6. Viswanathan B, Aulice Scibioh M, "Fuel cells: Principles and Applications", University Press, 2009.

18GE0P2 SEMICONDUCTOR PHYSICS AND DEVICES

3 0 0 3

Course Objectives

- Impart knowledge in physical properties of semiconducting materials
- Analyze the factors affecting the operation of semiconductor devices
- Apply the physics of semiconductors to develop semiconductor devices

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Exemplify the band gap, drift and diffusion current densities due to carrier transport in semiconductors
2. Analyze the energy band diagram in thermal equilibrium and space charge width of PN junction
3. Illustrate the operation of Bipolar Junction transistor at different modes and different configurations
4. Illustrate the operation of metal oxide field effect transistor and their memory devices
5. Represent the working mechanism of opto-electronic devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2													
2	2	1												
3	2	1												
4	2	1												
5	2													

UNIT I **9 Hours**

ENERGY BANDS AND CARRIER TRANSPORT PROPERTIES

Energy Bands: Formation of energy bands - doping effects - energy levels - electron and hole concept in semiconductor. Carrier transport: Carrier drift-drift current density - conductivity- diffusion current density - total current density

UNIT II **9 Hours**

P-N JUNCTION

Basic structure and fabrication process of p-n junction - current - voltage characteristics - energy band diagram - equilibrium Fermi levels - depletion region - junction breakdown phenomena - zener - avalanche breakdown.

UNIT III **9 Hours**

BIPOLAR JUNCTION TRANSISTOR

The basic transistor action - operation in the active mode - current gain - static characteristics - carrier distribution in emitter, base and collector region - modes of operation - current - voltage

characteristics of common base and emitter configuration - frequency response and switching of bipolar transistor

UNIT IV **9 Hours**

MOSFET

The ideal MOS diode - basic fundamentals and characteristics - types - CMOS and BiCMOS - CMOS inverter - MOSFET on insulator - thin film transistor (TFT) - silicon on insulators (SOI) devices - MOS Memory structures - DRAM and SRAM

UNIT V **9 Hours**

PHOTONIC DEVICES

Radiative transitions and optical absorption-light emitting diodes-organic LED - infrared LED - semiconductor laser - temperature effect - photo detector - photo diode - silicon and compound semiconductor solar cells - efficiency

Total: 45 Hours

Reference(s)

1. Donald A Neamen, "Semiconductor Physics and Devices", Tata McGraw Hill, 2012
2. S. M. Sze and M. K. Lee, "Semiconductor Devices, Physics and Technology", John-Wiley & Sons, 2015
3. Ben. G. Streetman and S. K. Banerjee , "Solid State Electronic Devices", Pearson Education Ltd, 2015
4. C. Kittel, "Introduction to Solid State Physics", John-Wiley & Sons, 2012
5. J. Millman and C. Halkias, "Electronic Devices and Circuits", Tata McGraw Hill, 2010
6. Hagen Klauk, "Organic Electronics: Materials, Manufacturing and Applications", Wiley-VCH, 2006

18GE0P3 APPLIED LASER SCIENCE 3 0 0 3

Course Objectives

- Impart knowledge on laser science
- Explore different strategies for producing lasers
- Create expertise on the applications of lasers in various fields

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Illustrate the transition mechanisms and the components of a laser system
2. Compare the different types of lasers based on pumping method, active medium and energy levels
3. Compute the rotation of earth, velocity and distance using lasers and apply the same for day today applications
4. Analyze the role of lasers in surgical and endoscopy applications
5. Apply the laser techniques in industrial applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1												
2	2	1												
3	2													
4	2													
5	2													

UNIT I **9 Hours**

LASER FUNDAMENTALS

Introduction - principle - absorption and emission of light - thermal equilibrium - Einstein's prediction - Einstein's relations - A and B coefficients - condition for large stimulated emission - spontaneous and stimulated emission in optical region - light amplification - condition for light amplification - population inversion. Components of lasers - pumping methods - pumping mechanisms - optical resonator

UNIT II **9 Hours**

LASER BEAM CHARACTERISTICS AND TYPES

Characteristics of laser - Classification of lasers - principle, construction, working, energy level diagram and applications of molecular gas laser (CO2 laser) - liquid laser (dye laser) - excimer laser - Solid state laser (Nd:YAG laser) - semiconductor laser (homojunction laser).

UNIT III **9 Hours**

LASERS IN SCIENCE

Introduction - Harmonic generation (SHG) - Stimulated Raman emission - lasers in chemistry - laser in nuclear energy - lasers and gravitational waves - rotation of the earth - measurement of distance - Light detection And Ranging (LIDER) - velocity measurement - holography

UNIT IV **9 Hours**

LASERS IN MEDICINE AND SURGERY

Light induced biological hazards: Eye and skin - Eye laser surgery - photocoagulations - homeostasis - dentistry - laser angioplasty - different laser therapies - advantages & disadvantages - laser endoscopy.

UNIT V **9 Hours**

LASERS IN INDUSTRY

Applications in material processing: laser welding - hole drilling - laser cutting. Lasers in electronics industry: information storage - bar code scanner. Lasers in defence: laser based military weapons - laser walls.

Total: 45 Hours

Reference(s)

1. K. Thiyagarajan and A. K. Ghatak, "LASERS: Fundamentals and Applications", Springer, USA, 2015
2. M. N. Avadhanulu, "An Introduction to Lasers Theory and Applications", S. Chand Publisher, 2013
3. W. Koechner, M. Bass, "Solid State Lasers: a graduate text", Springer Verlag, New York, 2006
4. K. P. R. Nair, "Atoms, Molecules and Lasers", Narosa Publishing House, 2009
5. K. R. Nambiar, "Lasers: Principles Types and Applications", New Age International Publications, 2006
6. A. Sennaroglu, "Solid-State Lasers and Applications", CRC Press, 2006.

18GE0C1 CORROSION SCIENCE AND ENGINEERING 3 0 0 3

Course Objectives

- Understand the loss incurred due to corrosion in different sectors and terminologies related to corrosion
- Identify forms and types of corrosion with suitable mechanism
- Apply various methods of corrosion control, corrosion testing and monitoring

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Explain if corrosion can occur under specific operating conditions in a given equipment or construction and indicate regions of immunity, corrosion and passivity of a metal
2. Compare different corrosion types on metals when exposed to air, water and at high temperatures (> 100 C)
3. Identify the corrosion mechanism on steel, iron, zinc and copper metal surfaces
4. Calculate the rate of corrosion on metals using electrochemical methods of testing
5. Propose the correct materials, design and operation conditions to reduce the likelihood of corrosion in new equipment and constructions

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1												
2	2						1							
3	1	3												
4	2	2												
5	3	3					1							

UNIT I **9 Hours**

CORROSION

Importance of corrosion - spontaneity of corrosion - units of corrosion rate (mdd and mpy) - direct and indirect damage by corrosion - importance of corrosion prevention in industries - Pilling Bedworth ratio and its significance - passivation - area relationship in both active and passive states of metals - Pourbaix digrams of Mg, Al and Fe and their advantages and disadvantages

UNIT II **7 Hours**

TYPES OF CORROSION

Eight forms of corrosion: uniform, galvanic, crevice corrosion, pitting, intergranular corrosion, selective leaching, erosion corrosion and stress corrosion. Catastrophic oxidation corrosion

UNIT III **9 Hours**

MECHANISM OF CORROSION

Hydrogen embrittlement - corrosion fatigue - filiform corrosion - fretting damage and microbes induced corrosion. Corrosion mechanism on steel, iron, zinc and copper metal surfaces

UNIT IV **10 Hours**

CORROSION RATE AND ITS ESTIMATION

Rate of corrosion: Factors affecting corrosion. Electrochemical methods of polarization: Tafel extrapolation polarization and linear polarization. Weight loss method - testing for intergranular susceptibility and stress corrosion. Non destructive testing methods: Visual testing - liquid penetrant testing - magnetic particle testing and eddy current testing

UNIT V **10 Hours**

CORROSION CONTROL METHODS

Fundamentals of cathodic protection - types of cathodic protection(sacrificial anodic and impressed current cathodic protection). Stray current corrosion, problems and its prevention. Protective coatings: Metal coatings: Hot dipping (galvanizing, tinning and metal cladding) - natural inhibitors. Selection of suitable design for corrosion control

FOR FURTHER READING

Corrosion issues in supercritical water reactor (SCWR) systems

Total: 45 Hours

Reference(s)

1. Mouafak A. Zaher, "Introduction to Corrosion Engineering", CreateSpace Independent Publishing Platform, 2016.
2. E.McCafferty, "Introduction to Corrosion Science", Springer; 2010 Edition, January 2010.
3. R. Winstone Revie and Herbert H. Uhlig, "Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering", 4th Edition, John Wiley & Science, 2008.
4. Mars G. Fontana, "Corrosion Engineering", Tata McGraw Hill, Singapore, 2008
5. David E.J. Talbot (Author), James D.R. Talbot, "Corrosion Science and Technology", Second Edition (Materials Science & Technology), CRC Press; 2nd Edition, 2007.
6. http://corrosion-doctors.org/Corrosion-History/Eight.htm

18GE0C2 ENERGY STORING DEVICES 3 0 0 3

Course Objectives

- Understand the concept, working of different types of batteries and analyze batteries used in electric vehicles
- Identify the types of fuel cells and to relate the factors of energy and environment
- Analyze various energy storage devices and fuel cells

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Explain the parameters required for operation of a cell to evaluate the capacity of energy storage devices
2. Identify the electrodes, electrolyte and cell reactions of different types of primary, secondary batteries and infer the selection criteria for commercial battery systems with respect to commercial applications
3. Differentiate fuel cells based on its construction, production of current and applications
4. Compare different methods of storing hydrogen fuel and its environmental applications
5. Relate energy and environmental based on the importance and types of renewable energy for sustainable development

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1												
2	2	3												
3	3	1												
4	2	2												
5	3	3												

UNIT I **6 Hours**

BASICS OF CELLS AND BATTERIES

Components - classification - operation of a cell - theoretical cell voltage - capacity - specific energy - energy density of lithium and lead acid battery - charge efficiency- charge rate - charge retention - closed circuit voltage, open circuit voltage current density - cycle life - discharge rate-over charge-over discharge

UNIT II **10 Hours**

BATTERIES FOR PORTABLE DEVICES AND ELECTRIC VEHICLES

Primary batteries - zinc-carbon, magnesium, and mercuric oxide - recycling/safe disposal of used cells. Secondary batteries - introduction, cell reactions, cell representations and applications - lead acid, nickel-cadmium and lithium ion batteries - rechargeable zinc alkaline battery. Reserve batteries: Zinc-silver oxide, lithium anode cell, photo galvanic cells. Battery specifications for cars and automobiles

UNIT III **10 Hours**

TYPES OF FUEL CELLS

Importance and classification of fuel cells - description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate and direct methanol fuel cells

UNIT IV **10 Hours**

HYDROGEN AS A FUEL

Sources and production of hydrogen - electrolysis - photo catalytic water splitting - methods of hydrogen storage- high pressurized gas - liquid hydrogen type - metal hydride - hydrogen as engine fuel - features, application of hydrogen technologies in the future - limitations

UNIT V **9 Hours**

ENERGY AND ENVIRONMENT

Future prospects of renewable energy and efficiency of renewable fuels - economy of hydrogen energy. Solar Cells: First, second, third and fourth generation solar cell – photo biochemical conversion cell

Total: 45 Hours

Reference(s)

1. M. Aulice Scibioh and B. Viswanathan, Fuel Cells: Principles and Applications, University Press, India, 2009
2. F. Barbir,PEM fuel cells: Theory and practice, Elsevier, Burlington, MA, Academic Press, 2013
3. M. R. Dell Ronald and A. J. David, Understanding Batteries, Royal Society of Chemistry, 2001
4. J. S. Newman and K. E. Thomas-Alyea, Electrochemical Systems, Wiley, Hoboken, NJ, 2012
5. Shripad T. Revankar, Pradip Majumdar, Fuel Cells: Principles, Design, and Analysis, CRC Press, 2016
6. Thomas B. Reddy, Linden's Handbook of Batteries, 4th Edition, McGraw Hill Professional, 2010

18GE0C3 POLYMER SCIENCE 3 0 0 3

Course Objectives

- Explain the properties of different polymers with its mechanism
- Select the appropriate polymerization techniques to synthesize the polymers and its processing
- Identify suitable polymers for various industrial applications

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Illustrate the types of mechanism of polymerization reactions and analyze the natural and synthetic polymers
2. Identify the suitable polymerization techniques to synthesize the high quality polymers
3. Characterize the polymers to identify the structural, thermal ,mechanical and electrical features for specific applications
4. Apply the polymer processing methods to design polymer products
5. Identify and analyze the polymers used in electronic and biomedical applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1												
2	1	2												
3	2	2												
4	1	1	2											
5	1	3	2											

UNIT I **10 Hours**

POLYMERS AND ELASTOMERS

Classification of polymers - Mechanism: Addition polymerization - free radical, cationic, anionic and co-ordination (Ziegler-Natta) polymerization - copolymerization - condensation polymerization (nylon-6,6) -ring opening polymerization (nylon-6). Elastomers: Natural rubber and synthetic rubber: styrene -butadiene rubber (SBR), butyl, neoprene, thiocol rubbers. High performance polymers: polyethers, polyether ether ketone (PEEK), polysulphones and polyimides

UNIT II **8 Hours**

POLYMERIZATION TECHNIQUES

Homogeneous and heterogeneous polymerization - bulk polymerization (PMMA, PVC) - solution polymerization – poly acrylic acid, suspension polymerization (ion-exchange resins) - emulsion polymerization (SBR) - advantages and disadvantages of bulk and emulsion polymerization. Melt solution and interfacial poly-condensation

UNIT III **8 Hours**

CHARACTERIZATION AND TESTING

Characterization of polymers by Infrared Spectroscopy (IR) and Nuclear Magnetic Spectroscopy (NMR) - Thermal properties: TGA and DSC - Testing tensile strength - Izod impact - Compressive strength - Rockwell hardness - Vicot softening point. Test for electrical resistance, dielectric constant, dissipation factor, arc resistance and dielectric strength - water absorption

UNIT IV **9 Hours**

POLYMER PROCESSING

Moulding: Compression - injection - extrusion and blow mouldings. Film casting - calendering. Thermoforming and vacuum formed polystyrene - foamed polyurethanes. Fibre spinning: melt, dry and wet spinning. Fibre reinforced plastics fabrication: hand-layup - filament winding and pultrusion

UNIT V **10 Hours**

SPECIALITY POLYMERS

Preparation and properties of heat resistant and flame retardant polymers. Polymers for electronic applications: liquid crystalline, conducting and photosensitive polymers. Polymer for biomedical applications: artificial organs, controlled drug delivery, hemodialysis and hemofiltration

FOR FURTHER READING

Biodegradable polymers

Total: 45 Hours

Reference(s)

1. V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar, "Polymer Science", New Age International (P) Ltd., New Delhi, 2015
2. Joel R. Fried, "Polymer Science and Technology", Prentice Hall of India (P). Ltd., 2014
3. F. W. Billmeyer,"Text Book of Polymer Science", John Wiley & Sons, New York, 2007
4. Barbara H. Stuart, "Polymer Analysis", John Wiley & Sons, New York, 2008
5. George Odian , "Principles of Polymerization", John Wiley & Sons, New York, 2004
6. R. J. Young and P. A. Lovell, "Introduction to Polymers", CRC Press, New York, 2011

18TT001 LONG STAPLE SPINNING TECHNOLOGY 3 0 0 3

Course Objectives

- To understand the properties of long staple fibres
- To analyse constructional and operational features of long staple spinning machinery

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Classify long staple fibres and select the process sequence for yarn production.
2. Outline carding, gilling and combing processes for long staple yarn production.
3. Evaluate roving and yarn formation processes for long staple yarn production.
4. Assess properties of man made fibres to be blended with long staple natural fibres
5. Select process and quality control tools to produce acceptable yarn quality in long staple spinning systems

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		1										2	
2	2		1										2	
3	2		1										2	
4	2		1										2	
5	2		1										2	

UNIT I **9 Hours**

LONG STAPLE FIBERS

Wool: Properties - Sorting and grading systems - Impurities in wool fibres - Composition of wool fibres - Scouring and carbonizing - Reclaimed wool fibres. Silk fibres - Staple fibre conversion. Bast fibres: Flax - Types - Retting - Fibre extraction.

UNIT II **9 Hours**

CARDING, COMBING AND GILLING

Carding: Requirements - Breaker and finisher carding - Difference between woollen and worsted carding - Condensers. Combing: Types of combers - nip, noble and rectilinear combers - Process variables - Grey combing - Re-combing - Noils. Drawing: Gilling - Open gill - Intersecting gill (screw and chain) - Drafting assembly - Fallers - Drafting rollers - Condensing and Coiling. Oiling of wool fibres: Need - Composition - Application methods - Creel - Delivery spray.

UNIT III **9 Hours**

ROVING AND YARN FORMATION

Speed frame: Drafting assembly - Top roller weighting system - Draft - Suspended flyers - Twist multipliers. Rubbing frame: Factors influencing process: Drafting assembly - Rubbing system - False twisting assembly - Delivery systems: Cans and Tubes. Ring spinning: Features - Draft rollers - Drafting systems - Slip draft - Process variables - Ring and Traveller Specifications - Ring profile: External lubrication of rings - Twistless yarn - Siro-spinning system for two fold yarn production. Compact Spinning of worested yarns

UNIT IV **9 Hours**

PROCESSING OF BLENDS AND STRETCH YARNS

Binary blends: Requirements of polyester for wool blending - Polyester/ Wool blends - Polyester / Acrylic blends. Ternary blends: Polyester / Wool / Nylon blends - Polyester / Wool / Flax - Polyester / Wool / Silk blends. Processing of dyed fibres and their blends: Top dyeing - polychromatic printing and blending. Stretch yarns in worsted spinning: Methods - Core yarn process - Siro spinning: Assembly winding - Twisting.

UNIT V **9 Hours**

PROCESS AND QUALITY CONTROL

Assessment of ex tractable and vegetable impurities - Moisture regain and invoice weight. Fibre length distribution (length and weight basis) - Crimp measurement. Fineness of wool fibres - Scouring yield - Worsted spinning: Faller pin specifications - Selection of fallers in open and intersect type gill boxes. Humidity and moisture regain control in drawing. Steaming: Control parameters and their influences. Hairiness: Causes and remedies. Process control in woollen, flax, jute spinning.

Total: 45 Hours

Reference(s)

1. Woollen and Worsted Spinning, Abhishek Publications, Chandigarh, 2002.
2. W.S. Simpson and G H Crawshaw Wool: Science and Technology, Woodhead Publishing Ltd, 2002
3. W. V. Bergen, Wool Handbook, Vol. I, II, Inter science Publication, New York

18TT002 TEXTURING TECHNOLOGY 3 0 0 3

Course Objectives

- To understand texturing technology and textured yarn.
- To prepare technological solutions for the challenges in the area of texturing.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Select texturing technique based on the raw materials and end-uses.
2. Outline process parameters and the structure of false-twist textured yarn.
3. Outline process parameters and the structure of air jet textured yarn.
4. Outline process parameters and the structure of BCF textured yarn.
5. Appraise chemo-mechanical and thermo-mechanical method of texturing yarns.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2										3	
2	2		2										3	
3	2		2										3	
4	2		2										3	
5	2		2										3	

UNIT I **9 Hours**

CONCEPTS OF TEXTURING

Purpose, Types of textured yarns, Classification of process, Comparison of textured with other types of yarns and fabrics, suitability of POY, LOY and UDY for texturing, Role of spin finish on textured yarns.

UNIT II **9 Hours**

FALSE TWIST TEXTURING

Basics of false-twist texturing, machine variables, process variables, Draw texturing, simultaneous and sequential draw texturing - Twisting devices. Structure and properties of FT textured yarns. Applications of false-twist textured yarns

UNIT III **9 Hours**

AIR JET TEXTURING

Basics of air jet texturing, types of yarns produced, machine variables, process variables, Air texturing jet, structure and properties of Air jet textured yarns. Applications of air-jet textured yarns.

UNIT IV **9 Hours**

BCF PROCESS

Basics of BCF Process, BCF Draw texturing machine, machine parameters, process variables, structure and properties of BCF textured yarns. Applications of BCF textured yarns

UNIT V **9 Hours**

OTHER METHODS OF TEXTURING

Stuffer box and edge crimping methods: Principles, limitations and applications. Knit-de-knit and gear crimping methods, texturing of polypropylene, Chemo-mechanical and thermo-mechanical texturing. Testing of Textured Yarns: Measurement of shrinkage force, Crimp contraction - dye uniformity

Total: 45 Hours

Reference(s)

1. J.W.S. Hearle, L. Hollick and D.K. Wilson, Yarn Texturing Technology, Woodhead Publishing, UK, 1998
2. L. Hes and P. Ursing, Yarn Texturing Technology, Eurotex, Universidade do Minho, 1994
3. Hassan Mohamed Behery Ali Demir, Synthetic Filament Yarn: Texturing Technology, Prentice Hall, 1997.
4. R. S. Gandhi, Textured yarns, MANTRA, 1998
5. D. K. Wilson and T. Kollu, The Production of Textured Yarns by the False Twist Technique, Textile Progress, Vol. 21, No.3, Textile Institute, Manchester, U.K., 1991.

18TT003 APPAREL PRODUCTION PLANNING AND CONTROL **3 0 0 3**

Course Objectives

- To understand the concepts in production planning and control.
- To understand the material management and their movement in the production.
- To apply the various techniques in production planning and control.
- To understand the material management and their movement in the production.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Evaluate the benefits of planning and controlling of different production systems adopted in apparel industry.
2. Prepare product and process planning with respect to different levels of apparel industry
3. Prepare schedules for material loading, production flow in order to control various processes
4. Analyze the stocks in different inventory with integrated planning systems
5. Prepare aggregate planning and related issues and strategies for an apparel industry

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1								2		2	-	3	
2	1								2	-	2	-	3	-
3	1								2		2	-	3	-
4	1	3									3			2
5	1	3									3			2

UNIT I **9 Hours**

INTRODUCTION

Objectives and benefits of planning and control-Functions of production control-Types of production systems -job- batch and continuous-Product development and design-Marketing aspect - Functional aspects-Operational aspect-Durability and dependability aspect- aesthetic aspect. Profit consideration-Standardization, Simplification & specialization- Break even analysis-Economics of a new design.

UNIT II **9 Hours**

PRODUCT PLANNING AND PROCESS PLANNING

Product planning - Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.

UNIT III **9 Hours**

PRODUCTION SCHEDULING

Production Control Systems- Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problems - Line of balance - Flow production scheduling-Batch production scheduling- Product sequencing - Production Control systems- Periodic batch control-Material requirement planning kanban - Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT IV **9 Hours**

INVENTORY CONTROL AND RECENT TRENDS IN PPC

Inventory control - Purpose of holding stock - Effect of demand on inventories-Ordering procedures. Two bin system - Ordering cycle system - Determination of Economic order quantity and economic lot size - ABC analysis - Recorder procedure-Introduction to computer integrated production planning systems - elements of JIT - Fundamentals of MRP II and ERP.

UNIT V **9 Hours**

AGGREGATE PLANNING

Aggregate Units of production, Issues of aggregation- smoothing, bottle neck problem, planning horizon, treatment of demand; Cost in aggregate planning; Aggregate in chase strategy, constant workforce, and mixed strategies and additional strategies; Disaggregating aggregate plans.

Total: 45 Hours

Reference(s)

1. Steven Nahmias, "Production and Operations Analysis", 6th edition; Tata McGraw-Hill, 2009
2. S. K. Mukhopadhyay, "Production Planning & Control: Text and Cases", PHI Learning Pvt. Ltd., 2007
3. Martand Telsang, "Industrial Engineering and Production Management", S. Chand and Company, First edition, 2000
4. Stephen N. Chapman, "The fundamentals of Production Planning and Control.", Pearson Education, 2009
5. K. C. Jain & L.N. Aggarwal, "Production Planning Control and Industrial Management", Khanna Publishers, 1990
6. Upendra Kachru, "Production and operations management Text and cases" Excel books 1st edition 2007.

18TT004 THEORY OF SPINNING 3 0 0 3

Course Objectives

- To teach the underlying theoretical principles of various processes that take place during spinning.
- To impart knowledge on the mechanisms of yarn formation
- To instill an attitude for fundamental research in spinning technology.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Analyse requirements of blending to optimize spun yarn quality
2. Outline opening, cleaning and carding actions used in spinning line.
3. Justify the need of doubling and drafting to improve yarn quality.
4. Evaluate fibre properties and process parameters for control of yarn quality
5. Analyse fibre properties and material flow to control evenness and hairiness of yarns.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1								2	
2	2	1	1		1								2	
3	2	1	1		1								2	
4	2	1	1		1								2	
5	2	1	1		1								2	

UNIT I **9 Hours**

BLENDING

Blending requirements, Principles, Blending delay time, Blend proportion, Perfect blend, Blending deficiencies, Optimum blending. Mixing: Optimization, linear programming, goal programming, Index of blend irregularity.

UNIT II **9 Hours**

OPENING, CLEANING AND CARDING

Intensity of opening. Opening and cleaning principles: tearing, picking, plucking, beating, combing, tossing. Degree of cleaning, carding and doffing disposition, Centrifugal forces. Action between feed

roller and Licker-in, three licker-in theory, main cylinder and flats wide-width theory, Fibre transfer, mechanism of elimination of neps.

UNIT III **9 Hours**

DOUBLING AND DRAFTING

Principle, Perfect draft, Actual draft, Law of Doubling, Addition of irregularity, Roller Drafting, Apron drafting, Drafting by opening roller. Periodic variations, Roller nip movements, Roller speed variation, stick-slip curve. Drafting force, Piecing irregularity in combing

UNIT IV **9 Hours**

YARN FORMATION

Mechanism of twist, Fibre migration phenomena: Obliquity, coherence curve. Twist insertion techniques: False, Flyer, Ring and traveller twisting, up twisting - down twisting - Cabling. Open-end, Self twisting, balancing of twist. Roving bobbin and cop build Tension variation. Traveller lag. Balloon Theory.

UNIT V **9 Hours**

EVENNESS

Random fibre distribution. Feed and regulation: blowroom, carding, Chute feed system, draw frame, comber, roving, yarn regularity. Hairiness.

Total: 45 Hours

Reference(s)

1. R. Chattopadhyay, Advances in Technology of Yarn Production, NCUTE Publication, New Delhi, 2002
2. Carl Lawrence, Fundamentals of Spun Yarn Technology, CRC Press limited, U.K., 2003
3. K. Slater, Yarn Evenness, Textile Progress, The Textile Institute, Manchester, U.K., 1986.
4. W. Klein, The Technology of Short Staple Spinning, Vol. I, V, The Textile Institute, 2010.
5. Anindhaya Ghosh and R. S. Rengasamy, Predictive Model for Strength of Spun Yarns: An Over View, Autex Research Journal, March 2005

18TT005 THEORY OF WEAVING 3 0 0 3

Course Objectives

- To acquire the fundamental understanding of weaving motion
- To develop an attitude to carry out fundamental research in weaving technology

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Analyse principles of shedding motions and shedding operations in a loom
2. Appraise picking motions from the perspectives of design and operations
3. Discuss the critical components involved in beat-up mechanism
4. Appraise projectile and rapier looms from design and operation perspectives.
5. Evaluate air-jet, water jet and multi phase looms for design and operations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		3		2						1		3	2
2	3		3		2						1		3	2
3	3		3		2						1		3	2
4	3		3		2						1		3	2
5	3		3		2						1		3	2

UNIT I **9 Hours**

THEORY OF SHEDDING

Geometry of warp shed -Types of shed, Characteristics of different sheds, Design of cams, Design of heald reversing motion. Matched cam shedding, Factors that limits the size of repeat, Mechanics of dobby shedding, Lever, Cam dobby. Electronic dobby - Geometry of Jacquard shedding. Fine Pitch Jacquard

UNIT II **9 Hours**

THEORY OF PICKING

Dynamics of shuttle movement in the shuttle box, Elastic properties of the picking mechanism, Retardation of shuttle, Rest position of shuttle, Shuttle flight

UNIT III **9 Hours**

MECHANICS OF BEAT UP

Types of Beat-up mechanisms - 4 link and 6 link beat up - Cam beat up - Sley speed and acceleration - Beat up theory - Beat up time. Sley eccentricity and its effects - Dwell period - Warp and cloth control: Bumping conditions - disturbed weaving conditions - causes for variation in pick spacing Weft Measurement; Weft accumulation systems - Pick length measurement - Weft tensioning - Weft unwinding for individual pick.

UNIT IV **9 Hours**

WEFT INSERTION - PROJECTILE AND RAPIER

Weft velocity in shuttleless looms, Rate of weft insertion, Weft insertion cycle, Projectile flight through the warp. Types of Rapier weaving machines, Weft insertion in loop form, Tip transfer system, Rapier guide control in the warp sheet, Rapier speeds

UNIT V **9 Hours**

WEFT INSERTION - AIR JET, WATER JET, MULTI PHASE

Air jet loom =Jet guides - Design concepts of air jet picking - Theory of air jet picking - Timing diagram - Weft motion through the shed - relay nozzles - Textile dust remover. Water jet loom - Tractive force in the weft thread - Jet and weft thread velocity - Braking of the weft thread - Timing diagram for weft insertion. Multiphase weaving: Technological problems in multiphase weaving

Total: 45 Hours

Reference(s)

1. R. Marks, T. C. Robinson, Principles of Weaving, Textile Institute, Manchester, 1989
2. Sabit Adanur, Handbook of Weaving, Technomic publishing company Inc., USA, 2001
3. M. K. Talukdar, P. K. Sriramulu and D. B. Ajgaonkar, Weaving Machines, Mechanisms, Management, Mahajan Publishers Pvt. Ltd., 2004.
4. P. R. Lord and M. H. Mohamed, Conversion of Yarn to Fabric, Woodhead Publishing Limited, 1992.

18TT006 ADVANCED KNITTING TECHNOLOGY 3 0 0 3

Course Objectives

- To acquire the knowledge of advanced technologies in knitting.
- To understand the mechanisms involved in advanced knitting machines
- To analyse the latest developments in knitted fabric structures

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Compare the contrast warp and weft knitted structures.
2. Select tricot and raschel knitting machines for production of knitted fabrics.
3. Analyse features of flat knitting machine to produce flat knit structures.
4. Explain the loop geometry and loop formation in a knitted fabric
5. Select yarn preparation machines and methods for warp knitting.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2		2									2	
2	2	2		2									2	
3	2	2		2									2	
4	2	2		2									2	
5	2	2		2									2	

UNIT I **9 Hours**

WARP KNITTING - TRICOT KNITTING TECHNOLOGY

Fabrics produced with two fully threaded guide bars - Fabrics produced with two partly threaded guide bars - fabrics produced with three or more guide bars - multi - guide bar Tricot - The use of electronics and computers in Tricot - tricot knitting with weft insertion - terry fabric production - sinker pile fabrics - cut press and miss press techniques - double needle bar Tricot.

UNIT II **9 Hours**

WARP KNITTING - RASCHEL KNITTING TECHNOLOGY

Introduction - standard Raschel machines - multi guide bar Raschel machines - jacquard knitting - multiguide bar and jacquard Raschel machines - electronic patterning equipment - double needle bar Raschel machines - Raschel machines for the production of corsetry nets, shoe spacer fabrics, plush lingerie

UNIT III **9 Hours**

FLAT KNITTING MACHINES

Double system flat machines : Cam plate description - yarn carrier sequences - the products of double system machinery - multiple feed machines - stripes - long and short needles eight system flat knitting machines. colour effects on eight system machines - knitted fabrics with fancy stitch effects - special devices on flat knitting machines: Widening on V bed knitting machines - The application of loop transfer. Seamless Knitting; Production of fully-fashioned knitted items

UNIT IV **9 Hours**

SCIENCE OF WARP KNITTING

Yarn count and its relation to machine gauge - warp knitted fabric geometry - Loop models - the machine state loop model - yarn to fabric ratio - the machine of loop formation in warp knitting.

UNIT V **9 Hours**

YARN PREPARATION

Methods of yarn preparation - Indirect /mill warping - Direct Warping - Direct warping equipment for filament yarns -Warping machines - yarn creel - attachments.

Total: 45 Hours

Reference(s)

1. S. Raz, Warp Knitting Production, Verlag Melliand Textilberichte GmbH, Heidelberg, 1987
2. Samuel Raz, Flat Knitting Technology, C.F.Rees GmbH, Druck-Repro-Verlag, Heidenheim, Germany, 1993
3. Chris Wilkens, Warp Knit Machine Elements, U. Wilkens Verlag, 1997.
4. Henry Johnson, Introduction to Knitting Technology, Abhishek Publications, Chandigarh, 2006.
5. Chandrasekhar Iyer, Bernd Mammal and Wolfgang Schach, Circular Knitting, Meisenbach GmbH, Bamberg, 1995.
6. D. B. Ajgaonkar, Knitting Technology, Universal Publication Corporation, Mumbai, 1998.

18TT007 ADVANCES IN CHEMICAL PROCESSING TECHNOLOGY

3 0 0 3

Course Objectives

- To understand the advancements in the chemical processing of textile materials.
- To evaluate the alternative processes using enzymes in preparation and finishing
- To acquire knowledge on energy conservation and pollution control measures

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Analyse process parameters involved in fabric preparatory processes.
2. Suggest dye recipes for textile materials for different depths employing latest developments.
3. Evaluate the concepts involved in textile finishes.
4. Appraise the issues involved in the operation and maintenance of effluent treatment plants.
5. Select suitable printing machines and techniques

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1											3
2	3	2	2											3
3	3	1	3											3
4	3	1	3											3
5	3	2	2											3

UNIT I **9 Hours**

ADVANCES IN PREPARATORY PROCESSES

Combined preparatory processes - Single bath desizing, scouring and bleaching - Bio-scouring and its limitations - Bio-bleaching and combined enzyme assisted processes - Solvent scouring Process - Preparatory process for blends, application of enzymes in textile processing.

UNIT II **9 Hours**

DYEING

Developments in the application of direct, reactive, disperse dyes to textile materials using batch wise and continuous methods - Salt free dyeing of reactive dyes - Dyeing of wool blends - Concept of Right First Time dyeing - Developments in E-control dyeing machines - Low liquor and Low wet pickup techniques, super critical carbon dioxide dyeing.

UNIT III **9 Hours**

FINISHING

Micro and Nano encapsulation and its application in finishing of textile materials - Finishing of technical textiles - Formaldehyde-free crease recovery finishing. Problems and remedies in the flame retardant finishing of polyester and its blends. Bio-polishing - Influence of biopolishing on dyeability and physical properties of fibres and fabrics - developments of new fibres using Bio technology.

UNIT IV **9 Hours**

ENERGY CONSERVATION AND POLLUTION CONTROL

Energy conservation steps in chemical processing - causes and remedies for water and air pollution - Detailed study about characteristic of textile effluent and its norms - Developments in membrane techniques in the effluent treatment. Bio-technology in textile effluent treatment.

UNIT V **9 Hours**

PRINTING

Developments in rotary printing machine, Developments in pigment printing: foam, plastic, foil, rubber, glitter and transparent print. Synthetic thickeners for latest printing techniques - Digital printing - 3D printing- Transfer printing.

Total: 45 Hours

Reference(s)

1. V. A. Shenai, Technology of Printing, Vol. IV, Sevak Publication, Bombay, 1996.
2. John Shore, Cellulosic Dyeing, Society of Dyers and Colorists, 1995.
3. P. W. Harrison, Low-Liquor Dyeing and Finishing, Textile Progress, UK, 1986.
4. R B Chavan, Environmental Issues: Technology Options for Textile Industry, Special Issue, Indian Journal of Fibre and Textile Research, New Delhi, 2001.
5. A C Paulo, Enzymes in Textile Processing, Woodhead Publication, UK, 2002.

18TT008 TEXTILE EFFLUENT TREATMENT 3 0 0 3

Course Objectives

- To understand the need to control the effluents arising from wet processing.
- To suggest different methods of treating the textile effluents.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Characterize textile effluents
2. Characterize colour and turbidity of textile effluents
3. Assess the water quality using standard procedures.
4. Propose inputs for the design of an effluent treatment plant.
5. Suggest suitable methods to reduce the effluent load in textile processing.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1											3
2	3	3	2											3
3	3	3	3											3
4	3	3	2											3
5	3	3	-											3

UNIT I **9 Hours**

SOURCES AND CHARACTERISTICS OF POLLUTION

Characteristics and treatment of effluents: Preparatory process - Colouration - Finishing - Combined effluents. Problem of colours. Synthetic and woollen textile processing effluents: Spin bath components - Wool scouring wastes: Solids - Liquids.

UNIT II **9 Hours**

COLOUR AND TURBIDITY

Primary treatment: Screening - sedimentation - Equalisation - Neutralisation - Coagulation - Floatation. Secondary biological treatments: Activated sludge - Trickling filtration - Aerated lagoons - Secondary sedimentation - Oxidation ponds - Anaerobic digestion - Sludge disposal. Tertiary treatment: Multimedia filtration - chemical coagulation - chemical precipitation - hyper filtration: Ultra filtration - Nano filtration - Reverse osmosis. Dialysis - Chlorination

UNIT III **9 Hours**

WATER AND EFFLUENT ANALYSIS

Water analysis - Colour - Acidity - Alkalinity - Dissolved solids - Suspended solids - Total hardness (Calcium Magnesium). Methods: EDTA Titrimetric - Total iron-thiocynate - Determination of Alkalinity - Chlorides - Dissolved oxygen - Surfactants - Methylene blue - Corrosivity - BOD-COD - TDS Toxicity.

UNIT IV **9 Hours**

EFFLUENT TREATMENT PLANTS

Design of effluent treatment plant: Individual Unit - Common effluent treatment - Collection of samples - Quality assurance programmes in ETP: Audit - Assessment - Recording - Monitor - Re-evaluation. Sludge Management: Source reduction - Bio-elimination - Solid separation - Government Regulations - Norms for treated water.

UNIT V **9 Hours**

REDUCTION OF POLLUTION AND WATER REQUIREMENT

Waste segregation - recovery - reuse - substitution of low polluting chemicals - process modification - economy in water use. Quality requirement of water for processing: Cotton - Synthetics - Wool - Silk - Boiler - Humidification.

Total: 45 Hours

Reference(s)

1. C. S. Rao, Environment Pollution Control Engineering, New Age International Ltd., 1994.
2. P. Cooper, Colour in Dyehouse Effluent, Society of Dyers and Colourists, UK, 1995.
3. N. Manivasakam, Treatment of Textile Processing Effluents, Sakhi Publications, 1995.
4. P. Vankar, Textile Effluent, NCUTE Publication, New Delhi, 2002

18TT009 PROCSS CONTROL IN SPINNING AND WEAVING

3 0 0 3

Course Objectives

- Select suitable raw material and machinery set-up for the manufacturing of the yarn and fabrics with required quality
- Outline the parameters for the satisfactory performance of various intermediate processes involved in spinning and weaving

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Select suitable raw materials for the manufacturing of the yarn with required quality
2. Choose the machinery and process parameters for manufacturing of yarn with required quality and propose measures for trouble shooting in spinning process.
3. Select the machinery and process parameters for the manufacturing of fabrics with required quality
4. Choose the parameters for manufacturing of fabric with required quality and remedial measures for trouble shooting in weaving process.
5. Identify parameters for satisfactory performance of intermediate processes in spinning and weaving

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3	3									2	
2	3	2	2	2	2								3	
3	3	2	2	2	2								3	
4	3	2	3	2									3	
5	3	2		3									3	

UNIT I **9 Hours**

RAW MATERIALS AND SPINNING PREPARATORY PROCESSES

Cotton Mixing quality - Fibre Quality Index (FQI) and its applications - prediction of spinnability and yarn quality - Selection of manufactured fibres (polyester, viscose rayon, acrylic and nylon): Fibre parameters according to end-use requirements including blended yarn production. Bale Management Techniques - blending irregularity. Causes of nep generation - nep removal in carding and combing machines. Use of HVI and AFIS for process control operations.

UNIT II **9 Hours**

YARN QUALITY CONTROL

Cleaning and control of wastes - yarn realisation. Within and between bobbin count variations, control of count variations in preparatory machines and ring frame, yarn unevenness and imperfections, causes for unevenness and imperfections, Analysis and interpretation spectrograms. Yarn faults, causes and methods to reduce faults. Causes and remedial measures for variability in strength. Measures for control of hairiness. Control end breaks in spinning.

UNIT III **9 Hours**

PROCESS CONTROL IN WEAVING PREPARATION

Yarn quality requirements for shuttle and shuttleless looms, Quality and performance in winding, warping, pirn winding, sizing and beam gaiting, weaving package defects, causes and remedies, choice of size recipe, selection of weaving accessories.

UNIT IV **9 Hours**

PROCESS CONTROL IN WEAVING

Fabric defects, causes, control measures. Inspection standards, cloth realization, value loss. Snap study in loomshed, Process performance studies and norms (including preparatory sections).

UNIT V **9 Hours**

PRODUCTIVITY IN SPINNING AND WEAVING

Factors affecting productivity in spinning and weaving, productivity indices, Loom efficiency: factors influencing loom efficiency, maximizing production and productivity in spinning and weaving.

Total: 45 Hours

Reference(s)

1. T. V. Ratnam and K. P. Chellamani, Quality Control in Spinning, SITRA, Coimbatore, 1999.
2. A. R. Garde and T. A. Subramaniam, Process Control in Spinning, ATIRA, Ahmedabad, 1989.
3. A System of Process Control in Weaving, ATIRA, Ahmedabad, 1983.
4. A. J. Chuter, Quality Management in the Clothing and Textile Industry, Woodhead Publishing, UK, 2011
5. M. C. Paliwal and P. D. Kimothi, Process Control in Weaving, ATIRA Publication, Ahmedabad, 1983.
6. W. Klein, Manmade Fiber and their Processing, The Textile Institute, Manchester, U.K.1994.

18TT010 PROCESS AND QUALITY CONTROL IN TEXTILE CHEMICAL PROCESSING

3 0 0 3

Course Objectives

- To acquire knowledge on quality and process control in chemical processing
- To apply and use norms and standards applied to chemical processing

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Organize process control measures in preparatory process.
2. Develop process control measures in dyeing.
3. Appraise process control measures in printing.
4. Analyse process control measures in mechanical finishing process.
5. Develop process control measures in chemical finishing process.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3		2									2
2	3	3	3		2									2
3	3	3	3		2									2
4	3	3	3		2									2
5	3	3	3		2									2

UNIT I **9 Hours**

PROCESS CONTROL IN PREPARATORY

Overview of process and quality control in textile chemical processing. Machine and process parameters influencing the process performance and quality of preparatory processes. Desizing - Scouring - Bleaching - Souring - Mercerization. Quality evaluation of preparatory processed material.

UNIT II **9 Hours**

PROCESS AND QUALITY CONTROL IN DYEING

Machine and process parameters influencing dyeing of fibre, yarn and fabrics made from various fibres with different dyeing techniques. Quality evaluation of dyed material.

UNIT III **9 Hours**

PROCESS AND QUALITY CONTROL IN PRINTING

Machine and process parameters influencing the printing of fabrics made from various fibres with different printing techniques. Quality evaluation of printed material.

UNIT IV **9 Hours**

PROCESS AND QUALITY CONTROL IN FINISHING

Machine and process parameters influencing the Mechanical finishing of fabrics made from various fibres with different finishing techniques. Quality evaluation of mechanically finished textile material.

UNIT V **9 Hours**

PROCESS AND QUALITY CONTROL IN FINISHING

Machine and process parameters influencing the chemical finishing of fabrics made from various fibres with different finishing techniques. Quality evaluation of chemically finished textile material.

Total: 45 Hours

Reference(s)

1. B.P. Saville, Physical Testing of Textiles, The Textile Institute, Woodhead Publishing Limited, Cambridge, 1999
2. R. Ed Postle, S. Kawabata and M. Niwa, Objective Evaluation of Fabrics, Textile Machinery Society, Japan, Osaka, 1993
3. S. R. Karmakar, Chemical Technology in the Pretreatment Process of Textiles, Elsevier Publications, 1999
4. P.C. Mehta, Process and Quality Control, BTRA, 1995.
5. Process control and safety in chemical processing of Textile, Prof Y M India, 2012

18TT011 COLOUR SCIENCE 3 0 0 3

Course Objectives

- To understand the fundamental knowledge of colour science and colour measurement
- To understand the basics of kinetics and thermodynamics related to dyeing

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Use the principles of colour and colour vision for textile applications.
2. Apply colour order systems in textile finishing operations
3. Use colour measurement systems
4. Apply principles of kinetics and thermodynamics in the dyeing of textiles.
5. Select software tools for quality control in colouration

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2		2									2
2	2		2											2
3	2		2											2
4	2		2											2
5	2		2											2

UNIT I **9 Hours**

COLOUR AND COLOUR VISION

Fundamentals of colour science: Eye and colour perception - Colour blindness - colour theory - Tests for defective colour vision. Metamerism, Dichroism, warm and cool colours

UNIT II **9 Hours**

COLOUR ORDER SYSTEM

Munsell system - Ostwald system - CIE matching functions - Determination of Tri-stimulus value - Linear and non linear transformation - industrial colour tolerance limit and calculations - Concept of K-M theory for colour matching - Derivation of KM equation and its application

UNIT III **9 Hours**

COMPUTER COLOUR MATCHING

Sample preparation for colour matching: Determination of optical data of dyes - Recipe formulation and correction - Detailed study about colour measuring instruments - Spectro photometer - limitations

of CCM technique - Sequence of colour matching in industry - invariant and conditional matching. 555 Shade sorting technique

UNIT IV **9 Hours**

KINETICS AND THERMODYNAMICS OF DYEING

Dyeing properties related to the inherent physical structure of the fibre - Interaction between dyes and fibre forming polymers - Study about types of adsorption isotherms - Absorption and desorption technique to determine the dyeing equilibrium - Derivation of affinity equation - determination of dyeing rate - theory of dyeing for different fibres.

UNIT V **9 Hours**

QUALITY CONTROL OF COLOUR

Colour difference equation - factors responsible for colour difference - yellowness and whiteness measurement with AATCC and ASTM standards - online colour measurement for textiles - database preparation for colour matching - colour control system and development of colour software.

Total: 45 Hours

Reference(s)

1. H.S. Shah and R.S. Gandhi, Instrumental Colour Measurements and Computer aided Colour Matching for Textiles, Mahajan Book Distributors, Ahmedabad, 1990.
2. A.T. Peters and H.S. Freeman, Physico-chemical Principles of Colour Chemistry, Blackie,1995
3. Ashim Kumar Chaudry, Colour Science, Mahajan Book Distributors, Ahmedabad, 1990.
4. D. Sule, Computer Colour Analysis, New Age Internationals (P) Ltd, New Delhi, 2002.
5. Narendra S. Gangakhedkar, Science and Technology of Colour, Rutu Prakashan, 2003.

18TT012 PATTERN ENGINEERING 3 0 0 3

Course Objectives

- To impart knowledge on human body measurements and creating pattern from the measurements.
- To develop commercial pattern with design aspect by manipulating the basic pattern.
- To fabricate patterns of different sizes by grading the basic pattern

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.

n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Design and develop patterns based on figure analysis and by choosing suitable measurement technique
2. Design and develop patterns for the basic blocks of garment.
3. Draw and prepare patterns for the body components of sleeve, cuff and collars.
4. Draw and prepare patterns for the body components of yokes and pockets.
5. Develop pattern grading for basic body components to various sizes.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		3										3	-
2	2		3										3	-
3	2		3										3	-
4	2		3										3	-
5	2		3											3

UNIT I **9 Hours**

HUMAN ANTHROPOMETRICS AND SIZING SYSTEMS

Garment manufacturing process flow chart, Measurements and its importance, land mark terms, sequence of taking body measurements - vertical measurements and horizontal measurements. Sizing system: size categories in mens wear, womens wear and childrens wear, international sizing, ASTM standard size chart. Proportion and disproportion of human figure.

UNIT II **9 Hours**

PATTERN MAKING

Pattern making tools, pattern making terms, basic blocks, pattern details, dart, notches, grain line, drill hole marks, ease allowance, seam allowance, style lines, types of pattern, techniques of pattern making - drafting, draping and flat pattern, blending and trueing, Interpretation of design and specification sheet, tolerance, different types of patterns produced during sampling and production.

UNIT III **9 Hours**

DRAFTING

Principles of pattern drafting, Drafting patterns for basic bodice, sleeve, skirt, types of sleeves, collars, yokes, cuffs. shirt and trouser. Skirts - length variation, skirt foundations, styles pleated, tiers, godets, gored, circular, cowl, pegged, skirts with yoke, uneven hem lines, peplums, wrap skirt, cascade wrap, Pants: foundations, culottes, jean, hip hugger, jump suits, bermudas, pedal pushers, capri.

UNIT IV **9 Hours**

FLAT PATTERN TECHNIQUES AND FIT

Dart manipulation methods - pivot, slash & spread and measurement method. Single and double dart series, conversion of dart into style lines, yokes, gathers and multiple darts. Pattern alterations: Fit-importance, standards, influence of clothing fit, importance of altering patterns, principles of pattern alterations, common pattern alterations in various garments, alteration of patterns for irregular figures.

UNIT V **9 Hours**

PATTERN GRADING

3D body scanning, principles, operations and advantages of body scanning technologies. Principles of pattern grading, types draft grading and track grading, two dimensional and three dimensional grading, grading of bodice, sleeve, skirt, trouser, and collar, computerized pattern grading. Types of layouts, laying patterns on different types of fabric, marker planning for different types of garments.

Total: 45 Hours

Reference(s)

1. Helen Joseph Armstrong, Pattern Making for Fashion Designers 4th Edition, Prentice-Hall, New Jersy, 2006
2. Le Pechoux B and Ghosh T K , Apparel Sizing and Fit, Textile Progress, Volume 32, The Textile Institute, Manchester, 2002.
3. Ashdow S P Sizing in clothing Developing effective sizing systems for ready to wear clothing, CRC press, Textile Institute & Wood Head publishers, England, 2007.
4. Connie Amaden Crawford, The Art of Fashion Draping, Fair child Publications, New York, 2005.
5. Harold Carr and Barbara Lathom, The Technology of Clothing Manufacture, Blackwell Sciences, Oxford, 1996

18TT013 GARMENT PRODUCTION MACHINERY AND EQUIPMENT

3 0 0 3

Course Objectives

- To acquire knowledge on the design, construction and operational features of garment production machinery and equipment
- To understand the details of garment machinery and equipment with focus on the means of exploiting the features built in the garment machinery and equipment

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Prepare the operational parameters of spreading, cutting machines and evaluate the performance.
2. Assess sewing machine and its components for their use in apparel manufacture.
3. Evaluate single needle lock stitch machine for apparel manufacture.
4. select appropriate over lock sewing machines for apparel manufacture.
5. Select appropriate work aids in apparel manufacture.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		2										3	1
2	3		2										3	1
3	3		2										3	1
4	3		2										3	1
5	3		2										3	1

UNIT I **9 Hours**

SPREADING AND CUTTING MACHINES

Spreading machines: Spreading table - stationary-portable -fixed machines - travelling spreaders - manual - semi-automatic - automatic. Cutting machines: Vertical blade reciprocating - rotary blade - band knife - die cutter - clickers and presses - shears - hand knives - short knives - table sword knives - notchers - drills - computer-controlled cutting knives - machines using laser, water, plasma and ultrasonic waves.

UNIT II **9 Hours**

SEWING MACHINE

History of sewing machines - classification according to bed types - major parts of sewing machinery and functions. Adjustment of major parts of single needle lock stitch machine: Non-UBT: stand height, pedal, presser foot, height of needle bar, needle to hook relationship, height of feed dog, normal and reverse feed stitch length, feed timing, presser foot pressure, needle and bobbin thread tension, bobbin winding assembly, belt tension.

UNIT III **9 Hours**

SEWING MACHINE ADJUSTMENT (SNLS)

Sewing needle and sewing thread, thread consumption, thread routing. Adjustment on SNLS-UBT: Needle stop position, wiper, thread timing sequence, timing of thread trimmer cam, positioning the moving knife, installation, sharpening, replacing moving knives

UNIT IV **9 Hours**

SEWING MACHINE ADJUSTMENT (OVERLOCK)

Parts, functions and adjustments of over lock: Needle height, feed dog height, differential feed ratio, tilt of the feed dog, position of the upper and lower knives, sharpening of knife and looper

UNIT V **9 Hours**

WORK AIDS

Work-aids and attachments, functions of pullers, guides and folders compensating presser foots left, right, double; feller, hemmer, etc. Collar turning machines, folding machinery, fusing and pressing machinery.

Total: 45 Hours

Text Book(s)

1. Jacob Solinger, Apparel Manufacturing Handbook, Van Nostrand Reinhold Company, 1988

Reference(s)

1. Peyton B. Hudson, Guide to Apparel Manufacturing, Medi Apparel Inc. 1989.
2. H. Carr and B. Latham, The Technology of Clothing Manufacture, Blackwell Scientific Publications, 1988.

18TT014 MANAGEMENT OF APPAREL UNITS 3 0 0 3

Course Objectives

- To understand the managing aspects the apparel industry.
- To understand the basics of managing a garment production factory.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to oneÃ¢??s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Construct organization charts for various sizes of woven, knitted or leather apparel industry
2. Prepare appropriate layout for optimum utilization of resources
3. Evaluate apparel market structure and market operations
4. Prepare project report for an apparel start-up
5. Prepare export documentation according to rules and regulations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2									3	1	3	
2		2									3	1	3	-
3	-	2									3	1		3
4		2									3	1	3	-
5		2									3	1		-

UNIT I **9 Hours**

ORGANIZATION

Apparel industry: Organization of the apparel industry -concept of small scale industry - advantages of SSI units. Classification of Garment Units: Woven - knitted - lingerie - leather garment - sportswear - outer wear - under garments - hospital wear.

UNIT II **9 Hours**

PRODUCTION MANAGEMENT

Production planning and control - production systems - material flow control - optimization of work place arrangement for higher productivity. Types of production layouts: Process oriented - Product oriented. Case study.

UNIT III **9 Hours**

MARKETING

Market structure: Domestic - International-Wholesale - Retail. Buying seasons: Spring - Summer - Autumn -Winter - Holiday. Advertising - different media - trade fare - display - exhibition - buyer - seller meet.

UNIT IV **9 Hours**

SETTING UP A GARMENT UNIT AND LABOUR LAWS

Study of land - Norms of SA-8000 - capital - labour - market demand - preparing a project - large scale industry - advantages over SSI - Bank assistance. Government Schemes. Costing: Garment cost elements - cost calculations (numerical problems).
Labour - Study of labour laws - factory act - labour laws - welfare measures - safety act

UNIT V **9 Hours**

EXPORTS

Exports policy - trade documentation and quota policy - AEPC and its role in the garments industry. Export Documentation. Payment terms.

Total: 45 Hours

Reference(s)

1. Ruth E Glock, Grace I Kunz, Apparel Manufacturing - Sewn Product Analysis - 3rd Edition, Prentice Hall Inc., 2000. Jacob Solinger, Apparel Manufacturing Handbook - Analysis Principles and Practice, Bobbin Blenheim Media Corp; 2nd edition (December 1988).
2. Jacob Solinger, Apparel Manufacturing Handbook - Analysis Principles and Practice, Bobbin Blenheim Media Corp; 2nd edition (December 1988).

18TT015 APPAREL MARKETING AND MERCHANDISING

3 0 0 3

Course Objectives

- To teach the activities of marketing and merchandising in the apparel industry To teach the commercial and sourcing aspects of the garment industry.
- To teach the commercial and sourcing aspects of the garment industry.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to oneÃ¢??s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Construct organization charts for industrial units of varying sizes; plan for realizing export incentives.
2. Organize and implement marketing strategies and goals.
3. Organize production, visual merchandising, product development and line presentation.
4. Prepare materials requirement plan for a given order and identify sourcing resources.
5. Prepare export documentation.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3									1	-	3	-
2	1								2	-	3			1
3	1								2		3		3	
4	1					-			2		3		3	
5	1								2		3		3	

UNIT I **9 Hours**

ORGANIZATION OF THE APPAREL BUSINESS

Introduction to apparel industry - Organization of the apparel industry - Types of exporters - Business concepts applied to the apparel industry - International trade. WTO: Functions and objective. GSP. Export incentives: Duty drawback - DEPB - Import - Export.

UNIT II **9 Hours**

MARKETING

Functional organization of an apparel firm. Responsibilities of a marketing division - Marketing objectives and strategies - Marketing research - Types of markets: Retails and wholesale strategies for merchandise distribution - Retailers- sourcing flows and practices - Marketing plan

UNIT III **9 Hours**

MERCHANDISING

Definition - functions. Role and responsibilities of merchandiser - Visual merchandizing, different types of buyers - communications with the buyers - awareness of current market trends - product development line planning - line presentation

UNIT IV **9 Hours**

SOURCING

Need for sourcing - sourcing materials - manufacturing resources planning - principles of MRP - Overseas sourcing - sourcing strategies. Supply chain and demand chain analysis - Materials management for quick response - Buying houses.

UNIT V **9 Hours**

DOCUMENTATION

Order confirmation, various types of export documents, pre-shipment post-shipment documentation - terms of sale - payment - shipment

Total: 45 Hours

Reference(s)

1. Ruth E Glock, Grace I Kunz, Apparel Manufacturing - Sewn Product Analysis - 3rd Edition, Prentice Hall Inc., 2000
2. V. R. Sampath, P. Perumalraj and M. Vijayan, Apparel Marketing and Merchandising, Kalaiselvam Pathippakam, Coimbatore, 2007.
3. J. A. Jarnow, M. Guerreiro and B. Judelle, Inside the Fashion Business, Macmillan Publishing Company, 1990.
4. Grace I. Kunz, Merchandising: Theory, Principles and Practice, Fairchild Books, 2005.
5. Elaine Stone and A. Jean, Fashion Merchandising - An Introduction, McGraw-Hill Book Company, 1990.

18TT016 COATED AND LAMINATED TEXTILES 3 0 0 3

Course Objectives

- To acquire knowledge on the science and technology of coating and lamination of textile materials.
- To understand the applications of coated and laminated textiles.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to oneÃ¢??s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select polymers and resins for coating applications.
2. Appraise textile fibres and structures for coating applications.
3. Select construction parameters for manufacturing coated fabrics.
4. Select coated textile-structure-based materials for specific end-uses. 5. Characterize coated and laminated textile materials.
5. Characterize coated and laminated textile materials.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2		2		2				1	3	-	2
2	3	3	2		2		2				1	3	-	2
3	3	3	2		2		2				1	3	-	2
4	3	3	2		2		2				1	3	-	2
5	3	3	2		2		2				1	3	-	2

UNIT I **9 Hours**

MATERIALS

Commercial and technical scope of coated and laminated textiles. Materials for coating: Plastic materials -natural and synthetic rubbers, Polyvinyl Chloride, Acrylic polymers. Materials for lamination: Films - polyurethane foam -polyolefin foam.

UNIT II **9 Hours**

MATERIALS AND RHEOLOGY

Adhesives: solvent-based and water-based. Textile Substrate: Requirements of textile substrates for coating, Selection of textile fibres and fabric structure. Rheological behaviour of fluids, Rheology of Plastisols: Apparent viscosity of plastisols, Polymer size and size distribution, Plasticizer and Additives, Viscosity change during fusion.

UNIT III **9 Hours**

COATING AND LAMINATION METHODS

Coating and Lamination Methods: Calendaring coating - Knife coating - Roller coating - Nip and Dip coating - Spray coating - Foam coating - Powder coating-Slot die extruder-Flame lamination - Hot melt lamination.

UNIT IV **9 Hours**

PRODUCTS

Protective Clothing - the spacesuit - garment interlinings - Tarpaulins - Conveyor belts - PTFE coated belts - Hot air balloons - Exhibition board coverings - Labels -Tyres and hoses -applications: Automotive - Marine - Buildings and architecture -Household products.

UNIT V **9 Hours**

QUALITY EVALUATION

Adhesion test -Flexing Test -Abrasion resistance - Fabric handle, drape and stiffness - Fabric strength - Bursting strength - Dimensional stability - Thermal comfort -Flammability testing.

Total: 45 Hours

Reference(s)

1. W. Fung, Coated and Laminated Textiles, Woodhead Publishing, England, 2002.
2. A. K. Sen, Coated Textiles, Principles and Applications, Technomic Publication, Lancaster, 2001.
3. S. C. Anand and W. Horrocks, Technical Textiles, Woodhead limited, Cambridge England, 2000.
4. R. S. Lenk, Polymer Rheology, Applied Science Publishers, London, 2000.
5. W. C. Smith, Smart Textile Coatings and Laminates, Woodhead Publishing, Cambridge England, 2010.

18TT017 NANO TEXTILES 3 0 0 3

Course Objectives

- To understand the concept of nanotechnology and its application in textiles.
- To evaluate the production methods of nanofibres.
- To acquire knowledge on nano-composites and their properties

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Appraise nanofibres produced by electrospinning technique.
2. Develop and characterize carbon nanotubes and nano composites.
3. Develop polymer layered silicate nano-composites.
4. Assess surface modification of textile materials for functional application.
5. Analyse hybrid polymer nano-layers for smart textiles.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		3										3	
2	1		3										-	3
3	1		3										-	3
4	2		3										-	3
5	1		3										-	3

UNIT I **9 Hours**

NANO FIBRES

Process: Electro spinning - properties -improvement - fibre morphology - fibre alignment.

UNIT II **9 Hours**

NANO TUBES AND NANO COMPOSITES

Carbon nano tubes: synthesis - characterization techniques - nano tubes - Polymer fibres - structures - production process - properties - fibre morphology.

UNIT III **9 Hours**

NNANOFILLER POLYPROPYLENE FIBRES

Polymer layered silicate nano composites: structure and properties - Nano composites Dyeing of Polypropylene - Modified propylene for improved dyeability.

UNIT IV **9 Hours**

NANO COATING OF TEXTILES

Surface modification techniques - anti- adhesive nano coating of fibre and textiles - water and oil repellent coating - self-cleaning. Functional textiles: protection - applications

UNIT V **9 Hours**

HYBRID POLYMER NANOLAYERS

Thin hybrid film - smart textiles - polymer to polymer hybrid layers - polymer to particles hybrid layers.

Nano fabrication of thin polymer fibre - "Grafting from" and "Grafting to" techniques for synthesis of polymer films, synthesis of smart switchable coatings

Total: 45 Hours

Reference(s)

1. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, England, 2007.
2. Bharath Bhushan, Springer Handbook of Nanotechnology, Springer, 2004.
3. H. Zeng, L. Zhu, G. Hao and R. Sheng, Synthesis of various forms of Carbon Nanotubes by AC Arc Discharge, Carbon Vol. 36, pp. 259-261, 1998.
4. K. Yamamoto, S. Akiya and Y. Nakayama, Orientation and Purification of Carbon Nanotubes using AC Electrophoresis, Applied Physics, Vol. 31, L 34-L 36, 1999.
5. E. Hammel, X. Tang, M. Trampert, T. Schmitt, K. Mauthner, A. Eder and P. Potschke, Carbon Nanofibers for Composites Applications, Carbon, Vol. 42, pp.1153-1158, 2004.

18TT018 HIGH PERFORMANCE FIBERS 3 0 0 3

Course Objectives

- To understand the structure and manufacturing methods for high performance fibres.
- To understand the physical and chemical properties of high performance fibres.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Compare and contrast HP fibres with apparel grade fibres in terms of structure and properties.
2. Outline the structure, properties and manufacturing methods of non-polymeric fibres.
3. Outline the structure, properties and manufacturing methods of inorganic fibres.
4. Compare manufacturing methods of polymeric high technology fibres.
5. Evaluate the properties of chemical and thermal resistance fibres.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	1						-		3	-	
2	3	2		1						-		3	-	
3	3	2	3	1						-		3	-	
4	3	2	3	1						-		3	-	
5	3	2	3		2					1		3	2	3

UNIT I **9 Hours**

STRUCTURE AND PROPERTIES

Limitations of conventional fibres. Classifications of high performance fibres and applications. Structure and properties of high performance fibres: Micro and fine structural features. Physical properties: tensile, compression and bending properties, fracture morphology.

UNIT II **9 Hours**

NON-POLYMERIC FIBRES

Carbon fibres: Classification, conversion of precursors to carbon fibres: PAN, rayon and pitch based carbon fibres. Structural aspects of PAN based and pitch based carbon fibres. Glass fibres: Types and compositions, Manufacturing processes, fibre structure, properties, applications.

UNIT III **9 Hours**

INORGANIC FIBRES

Ceramic fibres, Classification of silicon carbide fibres. Aluminium Oxide fibres, Compositions of Aluminium Oxide fibres. Manufacturing process, Fibre structure, properties, applications. Lead fibres, preparation of Lead fibre, Structure and properties of lead fibres, applications, Radiation Shielding Materials.

UNIT IV **9 Hours**

POLYMERIC HIGH PERFORMANCE FIBRES

Aramids: spinning, structure and properties, liquid crystal structure, applications. Comparison of para and meta aramids. Gel spun high performance PE fibres: difference between HMPE, UHMWPE and other polyethylene fibres, manufacturing and applications.

UNIT V **9 Hours**

CHEMICAL AND THERMAL RESISTANT FIBRES

Need for chemically and thermally resistant fibres. Chlorinated and fluorinated fibres: manufacturing and properties. Thermally resistant fibres: additives, types of additives and concentration. PEK, PEEK, PPS, PEI, PBI fibres, structure and properties, fibre formation and applications.

Total: 45 Hours

Reference(s)

1. J. W. S. Hearle, High Performance Fibres, Woodhead Publishing Ltd., 2001.
2. S. K. Mukhopadyay, High Performance Fibres, Textile Progress Vol. 25, The Textile Institute, Manchester, 1993
3. Menachem Lewin, Jack Preston, High Technology Fibres, Part A,B, C, Mercel Dekkar Inc, 1993

18TT019 TEXTILE COMPOSITES 3 0 0 3

Course Objectives

- To acquire the knowledge of various manufacturing and processing technologies for composite materials
- To understand mechanical characterisation and applications of textile composites
- To acquire knowledge of ASTM, ISO, BSI standards used in composite materials

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Examine role of Customer, Employee, Employer and Suppliers in TQM.
2. Analyze Quality Costs.
3. Decide quality improvement strategies and methods.
4. Suggest suitable TQM tools for various problem solving
5. Appraise Quality Management Systems and its Cycle

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	1		-				-			-	-
2	3	1		2		-		-					-	
3	3	2	3	1									-	-
4	3	2	3	2	-								-	-
5	3	2	3	-1	2	-					-		-	-

UNIT I **9 Hours**

INTRODUCTION TO TQM

Definition of Quality, Dimensions of Quality. Historical Review: Quality Gurus - Principles of Total Quality Management - Obstacles to TQM Implementation. Leadership: Characteristics of Quality Leaders - The 7 habits of highly effective people - Quality Council - Quality Statements - Strategic planning - Deming Philosophy Customer: Customer satisfaction - Who is the customer -Customer Perception of Quality - Customer feedback - Customer Retention - Customer Complaints - Service Quality

UNIT II **9 Hours**

EMPLOYEES, SUPPLIERS AND PERFORMANCE METRICS

Employee: Employee Involvement - Motivation - Employee satisfaction survey - Empowerment - Teams - Recognition and Reward - Performance Appraisal - Benefits. Supplier: Supplier Partnership - Partnering - sourcing - Supplier Selection - Relationship Development.

Performance Measures: Metrics - Criteria for selection. Quality costs: Categories and elements - Analysis Techniques for Quality Costs

UNIT III **9 Hours**

CONTINUOUS PROCESS IMPROVEMENT

Juran Trilogy - PDSA Cycle - Crosby philosophy - 5S - Kaizen - The seven tools of quality - Control charts for variables and attributes - State of control - Out-of-control processes - Process Capability Cp and Cpk - Six Sigma.

UNIT IV **9 Hours**

TQM TOOLS

Benchmarking Process. New Seven Management Tools. Quality Function Deployment (QFD) - House of Quality. FMEA - Stages of FMEA. Taguchi Quality Loss Function.

UNIT V **9 Hours**

QUALITY SYSTEMS

Need for Other Quality Systems. ISO 9000:2000 Quality System: Elements, Implementation of Quality System, Documentation, Quality Auditing. EMS.

Total: 45 Hours

Reference(s)

1. Dale H. Besterfiled, Total Quality Management, Pearson Education Inc., 2004
2. James R.Evans and William M.Lidsay, The Management and Control of Quality, South-Western (Thomson Learning), 2002
3. M. Zairi, Total Quality Management for Engineers, Woodhead Publishers, 1991

18TT020 TOTAL QUALITY MANAGEMENT 3 0 0 3

Course Objectives

- To impart knowledge on the fundamental principles for achieving quality
- To familiarize the students with the tools of Quality Management
- To educate the students on Quality Management Systems and their Documentation requirements
- To familiarize the students with the tools of Quality Management

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to oneÃ¢??s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Examine role of Customer, Employee, Employer and Suppliers in TQM.
2. Analyze Quality Costs.
3. Decide quality improvement strategies and methods.
4. Suggest suitable TQM tools for various problem solving.

5. Appraise Quality Management Systems and its Cycle.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						2		1		2		3	3	1
2	2	3				2	-	1	-	2	2	3	3	
3		3	3									2	3	3
4	1	3			2							2	3	2
5				2						3		3	3	1

UNIT I **9 Hours**

INTRODUCTION TO TQM

Definition of Quality, Dimensions of Quality. Historical Review: Quality Gurus - Principles of Total Quality Management - Obstacles to TQM Implementation.
Leadership: Characteristics of Quality Leaders - The 7 habits of highly effective people - Quality Council - Quality Statements - Strategic planning - Deming Philosophy
Customer: Customer satisfaction - Who is the customer -Customer Perception of Quality - Customer feedback - Customer Retention - Customer Complaints - Service Quality.

UNIT II **9 Hours**

EMPLOYEES, SUPPLIERS AND PERFORMANCE METRICS EMPLOYEE

EMPLOYEES, SUPPLIERS AND PERFORMANCE METRICS
Employee
Employee Involvement - Motivation - Employee satisfaction survey - Empowerment - Teams - Recognition and Reward - Performance Appraisal - Benefits.
Supplier
Supplier Partnership - Partnering - sourcing - Supplier Selection - Relationship Development.
Performance Measures
Metrics - Criteria for selection. Quality costs: Categories and elements - Analysis Techniques for Quality Costs

UNIT III **9 Hours**

CONTINUOUS PROCESS IMPROVEMENT

Juran Trilogy - PDSA Cycle - Crosby philosophy - 5S - Kaizen - The seven tools of quality - Control charts for variables and attributes - State of control - Out-of-control processes - Process Capability Cp and Cpk - Six Sigma.

UNIT IV **9 Hours**

TQM TOOLS

Benchmarking Process. New Seven Management Tools. Quality Function Deployment (QFD) - House of Quality. FMEA - Stages of FMEA. Taguchi Quality Loss Function.

UNIT V **9 Hours**

QUALITY SYSTEMS

QUALITY SYSTEMS

Need for Other Quality Systems. ISO 9000:2000 Quality System: Elements, Implementation of Quality System, Documentation, Quality Auditing. EMS.

Total: 45 Hours

Reference(s)

1. Dale H. Besterfiled, Total Quality Management, Pearson Education Inc., 2004
2. James R.Evans and William M.Lidsay, The Management and Control of Quality, South-Western (Thomson Learning), 2002
3. M. Zairi, Total Quality Management for Engineers, Woodhead Publishers, 1991

18TT021 MAINTENANCE MANAGEMENT 3 0 0 3

Course Objectives

- To impart the knowledge in settings and maintenance schedule for various machinery in textile mills
- To teach the activities in the machinery audit

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Prepare maintenance schedules for various textile machines.
2. Develop procedures involved in maintaining textile machines.
3. Analyse the performance of machines in terms of efficiency.
4. Select appropriate lubricants for various machine parts
5. Appraise the activities involved in maintenance records

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	2		2				2				1	
2	2	1	2		2				2				1	
3	1	1	3		2				2				1	
4		1	2		2				2				1	
5	2	2			2				2				1	

UNIT I **9 Hours**

CONCEPTS

Maintenance: Objectives - Types - Organizational structure - Duties - personnel. Systems and procedures: Planning - Scheduling - Controlling - Implementation of planned maintenance - Backlogs - Rescheduling. Housekeeping - Cleanliness - Machinery Audit. Maintenance Records: Maintenance Ledger - Machine cards - Maintenance cost control. Safety: Accidents - Causes and prevention - safety in material handling, maintenance.

UNIT II **9 Hours**

SPINNING PREPARATION

Maintenance schedules - Frequency - manpower - Time required - Special tools - Gauges. Maintenance of Card Clothing: Wire inspection - Grinding procedure - Burnishing - Flat end milling - Aprons - Flyer - Bottom roller - Top roller - Cots: selection - mounting - Buffing frequency - Grinding - Berkolising - Acid treatment - Cot life - Top roller greasing

UNIT III **9 Hours**

SPINNING AND POST SPINNING

Maintenance schedules - Frequency - manpower - Time required - Special tools - Gauges. Roller Eccentricity and its control - Tolerances for drafting rollers. Maintenance schedules: Cone winding - Reeling - Bundling Baling Lubrication : Spindle oil topping - Replenishing.

UNIT IV **9 Hours**

WEAVING

Maintenance schedules for cone winding - pirn winding - warping - sizing - auto and non auto weaving machines. Weaving machinery layout - material handling and equipment. Weaving machinery audit

UNIT V **9 Hours**

WEAVING ACCESSORIES MAINTENANCE

Shuttle care - selection - seasoning - life of shuttle. Maintenance of reed. Drop wires maintenance. Maintenance of picker - picking bands - healds - heald frames - pirns - shuttleless loom accessories. Maintenance of Utilities: Maintenance of Powerhouse: Electrical powerhouse - equipment - motors - starters - lighting. Humidification plant - compressors - air lines - generators.

Total: 45 Hours

Reference(s)

1. T. V. Ratnam, Maintenance Management in Spinning, SITRA, Coimbatore, 2009.
2. K. Balasubramanyan, J. S. Manoharan, Maintenance Management in Weaving, SITRA, Coimbatore, 2008.
3. Neeraj Nijhawan, Comprehensive Handbook of Spinning Maintenance, Part 1: Maintenance Management, The Textile Association, Mumbai, India, 2006
4. Neeraj Nijhawan, Comprehensive Handbook of Spinning Maintenance, Part 2: Spinning Accessories, The Textile Association, Mumbai, India, 2006.
5. Neeraj Nijhawan, Comprehensive Handbook of Spinning Maintenance, Part 3: General Engineering, The Textile Association, Mumbai, India, 2006.
6. T. R. Banga, N. K. Agarwal and S. C. Sharma, Industrial Engineering and Management, Khanna Publishers, Chennai, 1995.

18TT022 INDUSTRIAL ENGINEERING 3 0 0 3

Course Objectives

- To impart the fundamental principles of Industrial Engineering as applied to textile field
- To make the students familiar with the techniques of work study with practical textile examples

Programme Outcomes (POs)

b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.

d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Suggest remedial actions for low productivity.
2. Analyze work assignments by work and method study.
3. Deduce measures to improve labour productivity by conducting motion study and time study.
4. Develop alternative layouts by studying existing layout and constraints.
5. Analyze difficulties in existing material handling methods and ambience; suggest modifications to improve labour productivity.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2	2		2		1		2	2	3	3	1
2			2	3		2		1		2	2	3	3	2
3			2	3		2		1		2	2	2	3	2
4		2	2	2							1	3	3	
5		2	2			3	1				1	3	3	1

UNIT I **9 Hours**

PRODUCTIVITY

Scope of Industrial Engineering. Industrial engineering concepts. Productivity indices. Workloads: work assignments - Work content - added work content - reduction of work content - ineffective time - improving productivity - causes for low productivity in Spinning, Weaving, Wet Processing and Garment industries.

UNIT II **9 Hours**

WORK AND METHOD STUDY

Work Study: Definition - Purpose - Techniques of work study - Procedure for work study Method Study: Definition - Procedure. Process charts: Symbols - Process Sequence chart - Outline process chart - Flow process charts (man type, material type, equipment type) - Charts using time scale - multiple activity charts. Diagrams: string diagram - cycle graph - chrono-cycle graph - travel chart. Textile and Garment industry examples

UNIT III **9 Hours**

MOTION AND TIME STUDY

Motion Study: Operation analysis - motion analysis - motion economy - two handed process chart - micro motion study - Therbligs - SIMO chart. Textile and Garment industry examples. Time Study: Procedure - Equipment. Techniques of time study - Stop watch method. Predetermined Motion Time Standards (PMTS) - Rating. Allowances: Standard Time - Standard data. Textile and Garment industry case studies.

UNIT IV **9 Hours**

FACTORY LAYOUTS

Layout: Layout planning. Types of layout: Process, Product, Combination and Fixed. Line Balancing: Line Balancing Objectives - Procedure - Techniques. Applications in Textile and Garment units.

UNIT V **9 Hours**

MATERIAL HANDLING AND WORK ENVIRONMENT

Material Handling: Objectives - principles of material handling - relationship of material handling to plant lay-out material handling equipment - Descriptions and characteristics - Specialized material handling equipment for Textile and garment units.
Work Environment and Services: Lighting - Ventilation - Temperature Control and Humidity Control - Noise Control - Safety - Ergonomics.

Total: 45 Hours

Reference(s)

1. O. P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P) Ltd., New Delhi, 2004
2. Johnson Maurice, Introduction to Work Study, International Labour Organization, Geneva, 1995.
3. Jacob Solinger, Apparel Manufacturing Hand Book-Analysis, Principles and Practice, Boblin Media Corp, Columbia, 1991.
4. James M. Apple, Plant Layout and Materials Handling, John Wiley & Sons, 1997.
5. Ralph M. Barnes, Motion and Time Study Design and Measurement of Work, John Wiley & Sons, New York, 1992
6. A. J. Chuter, Introduction to Clothing Production Management, Blackwell Publishing, Oxford, 2004 Ã¢??

18TT023 UTILITIES ENGINEERING 3 0 0 3

Course Objectives

- To familiarize with fundamentals of utilities engineering
- To understand the operational aspects of utilities in textile mills

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to oneÃ¢??s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Appraise elements and operations of Air Engineering in a Textile Industry context.
2. Analyse electrical layout design, selection of cables, power billing and power management.
3. Assess the requirements of back-up power, size DG Sets and prepare maintenance schedules.
4. Assess water quality needs of industries, understand the methods of Primary, Secondary and Tertiary effluent treatment.
5. Select boilers, air compressors and safety equipment for a factory environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2								2	3	1	2
2	1	1	2								2	3	1	2
3	1	1	2									2	1	2
4	1	1	2								1	2	1	2
5	1	1	2	2		1						3		2

UNIT I **9 Hours**

ELECTRICAL POWER

Transformers : Types - Indoor - Outdoor - Dry - Oil filled. OLTC (on load tap changer). Sizing the capacity of transformers. Power Distribution and wiring. Stabilizers. Power factor management. Power Back Up systems. Solar energy. Electrical Safety. Lightning arrestors

UNIT II **9 Hours**

MOTORS, GENSETS AND COMPRESSORS

Electrical Motors: Types- Characteristics- Selection. Electrical Generators: Types .Selection- Change over systems. Typical Spinning mill Power bill analysis. Compressors & pneumatic systems: Types of compressors: Reciprocating - Screw- Oil free - Centrifugal - Efficiency of each type. Storage and distribution: Air vessels - air lines - valves and controls - Leakage. Driers: Dew Point .Types; Air requirements. Pneumatic Circuits. Compressors and additional devices for modern machines: MVS and air jet looms. Sizing of Compressors and cost of compressed air in spinning mills

UNIT III **9 Hours**

AIR ENGINEERING

Humidification: Need for Humidification - Supply air - measurement of required Air changes - Motor Power - CFM output. Air washer plants: Nozzles system- Fog system- Eliminators and Louvers- Exhaust Air- measurement of required air changes - Water quality - Diffuser material - Duct material - Air filters. Sizing of Humidification plant and heat load. Operational aspects of Humidification plants in a textile mill

UNIT IV **9 Hours**

WATER TREATMENT SYSTEMS

Water Quality: Standards. Water Softening plants: Need for softening the water - methods of softening -cost of softening. Effluent Treatment: Primary, Secondary and Tertiary treatment. Filters: Sand filter - Activated Carbon - Ultra-filtration. Reverse Osmosis Plants: RO membranes - Ph neutralizer - efficiency of RO plants. Categories and usage of water. Cooling water systems.

UNIT V **9 Hours**

OTHER UTILITIES

Boilers: Need for steam - Boiler types- Controls - Sizing. Chilling plants and heat-exchangers. Transport and Material handling. Energy saving measures.

Total: 45 Hours

Reference(s)

1. SITRA norms for spinning mills, The South India Textile Research Association, Coimbatore. 2004

18TT024 HOME TEXTILES 3 0 0 3

Course Objectives

- To analyse textiles based products used in homes and their selection.
- To acquire knowledge on manufacture of home textiles.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Appraise the characteristics of home furnishing textile materials
2. Select floor coverings according to specific needs
3. Assess suitability of curtains and draperies according to customer needs
4. Analyse bed linen requirements in technical terms
5. Select technical parameters for bath towel applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2		2										-
2	2	3	2											-
3	3	2	2											-
4	3	3	3											-
5	-		3	2										-

UNIT I **9 Hours**

HOME FURNISHING

Textile Furnishing: Woven and Non-woven. Selection of: Fibers, Colors, Designs. Kitchen Textiles: Apron-Dish cloth, Bread Bag, Pot Holders. Table textiles: Mats - Table cloths, Types - Materials. Upholstery: Materials - Fixed upholstery, Non-stretch loose covers, Stretch covers - Cushion covers.

UNIT II **9 Hours**

FLOOR COVERINGS

Floor covering: Resilient - Soft Rugs - Pads. Types: Tufted - Needle felt - Woven- Hand tufted. Carpet manufacture: Wilton - Axminister - Knitted, Stitch bonding - Flocking

UNIT III **9 Hours**

CURTAINS AND DRAPERIES

Choice of Fabrics, Curtains, Draperies - Tucks and pleats - Drapery Rods, Hooks, Tape Rings, Pins. Textile wall hanging

UNIT IV **9 Hours**

BED LINEN

Bed Linen: Types: Sheets, Blankets, Blanket Covers, Comforters, Comforter Covers, Bed Spreads, Mattress - Mattress Covers, Pads, Pillows. Made-ups in hospitals, Textiles care labeling. Testing of home textiles: Colour fastness, Shrinkage, Abrasion - Flammability.

UNIT V **9 Hours**

TOWELS

Types: Bath robes, Bead towels, Napkins. Construction: Weave, Pile height - Pattern - Dyeing and Finishing, Absorption tests.
Velour, Types of Velvet, Construction.

Total: 45 Hours

Reference(s)

1. Subrata Das., Performance of Home Textiles, Wood head Publishing India PVT. LTD, 2010.
2. Alexander N.G., Designing Interior Environment, Mass Court Brace Covanorich, New York, 1972.
3. Wingate I.B., & Mohler J.E., Textile Fabrics & Their Selection, Prentice Hall Inc, New York, 1984.

18TT025 MECHANICS OF TEXTILE MACHINES 3 0 0 3

Course Objectives

- To understand the principles of Mechanics as applied to Textile Machinery.
- To apply mechanics for design of Textile Mechanisms.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Select power transmission systems for textile machinery.
2. Suggest the types and use of epicyclical gear trains in textile machinery.
3. Design cone-drum based speed control systems and cams/tappets used in textile machinery.
4. Analyze energy and power requirements of textile machine sub-systems.
5. Analyze stress levels in power transmission elements and control systems in textile machinery.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3									2	3	2	3
2	2	2									2	3	2	2
3	2	3										3	2	3
4	2	3		2			2				1	3	2	3
5	2	3		2								3	2	3

UNIT I **9 Hours**

POWER TRANSMISSION

Selection of drives. Flexible drives: Belts - Types, analysis of belt tension, optimum belt velocity for maximum power transmission, contact angles and belt length. Rigid Drives: Gear trains .Types, nomenclature, velocity ratio of normal gear trains, force analysis in gear drives.Bearing- Types.

UNIT II **9 Hours**

DIFFERENTIAL GEARING

Types, nomenclature, velocity ratio of epicyclic gear trains, force analysis in gear drives. Differential Gearing in Speed Frame and Comber

UNIT III **9 Hours**

DESIGN OF CONE DRUMS AND CAMS

Design perspectives. Construction of cone drums .Feed regulation in scutcher and builder motion in Speed Frame. Construction of cams - Ring frame builder motion, tappet shedding motion

UNIT IV **9 Hours**

MOMENTS, KINETIC / POTENTIAL ENERGY, POWER CONSUMPTION

Calendar roller loading, top arm loading, shuttle movement, bale lifting, power consumption by ring frame traveller and picking process

UNIT V **9 Hours**

STRESSES IN TRANSMISSION SHAFTS AND DRAFTING ROLLERS

Material properties, safety factor, tensile, compressive, shear, bending and torsional stresses. Laws of friction. Application of friction .Tension devices, negative let-off motions, brakes and clutches. Brakes -Band, block, pivoted double block, internal expanding brake. Clutches - Jaw / Toothed, Friction Clutches .Single Plane, Multi Plane, Cone Clutches. Centrifugal clutch

Total: 45 Hours

Reference(s)

1. Rengasamy R S, Mechanics of Spinning Machines, NCUTE, New Delhi, 2002.
2. Slater K, Textile Mechanics, Vol. I, Textile Institute, Manchester, 1977.
3. Slater K, Textile Mechanica, Vol. II Textile Institute, Manchester, 1987.
4. Booth J E,Text ile Mathematics, Vol. II, Textile Institute, Manchester, 1977.

18TT026 SPECIALITY TEXTILES 3 0 0 3

Course Objectives

- To understand the technological aspects of specialty textiles
- To acquire knowledge on the applications of specialty textiles
- To innovate specialty textiles based on the requirements

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Select fancy yarns for a given application
2. Outline the manufacturing processes and applications of narrow fabrics
3. Summarise the processes, techniques and applications of industrial webbings
4. Outline the production processes of braided materials, machines and their applications
5. Choose appropriate machines and processes for the production of carpets with the given specifications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2												2	2
2	2												2	2
3	2	-											2	2
4	2	-											2	2
5	2	-											2	2

UNIT I **9 Hours**

FANCY YARNS

Slub Yarns - Crimp Yarn - Diamond Yarn - Boucle Yarn - Loop Yarn - Snarl Yarn - Mock Chenille Yarn - Knop Yarn - Stripe Yarn - Grandrelle yarn - Neppy yarn or Flaggy yarn - Button Yarn - Fasciated yarn - melange yarn.Methods for the production of fancy yarns in Ring spinning, Rotor spinning and Air Jet spinning. Applications of fancy yarns.

UNIT II **9 Hours**

NARROW FABRICS

Fibre and Yarn types, Fabrics. Preparation process for narrow fabric production-Winding, Warping, Sizing, Drawing-in, Tenting-in. Woven narrow fabrics and their construction-structure of narrow fabrics woven on shuttle less looms. Conventional shuttle loom, unconventional shuttle looms and shuttle less looms for narrow fabrics production. End use. Industrial tapes: Slide fastener tapes - Insulating tapes -Book binders tapes - Labelling Tapes - Border Tapes Elastic Pleated lingerie ribbing.

9 Hours

INDUSTRIAL WEBBINGS

Manufacture of spindle drive webbing- Print webbings - Webbings for automobile safety belts.Industrial nets: Knotted netting and applications.

UNIT IV **9 Hours**

INDUSTRIAL BRAIDS

Classification of braids - Trimmed braids,Flat braids and Circular Braids, Hollow braids. Production techniques. Properties and Application.

UNIT V **9 Hours**

CARPETS

Non-pile carpet weaves and their looms. Pile surfaced carpet weaves and their looms. Needle felt floor coverings.

Total: 45 Hours

Reference(s)

1. R. H. Gong and R. M. Wright, Fancy yarns Their manufactures and applications, Wood head Publishing Limited, 2002
2. Turner J P, " The production and properties of narrow fabrics, Textile Progress, Vol.8 No.4, The Textile Institute ,Manchester,2002
3. Sabit Adanur, "Wellingt Sears Handbook of Industrial Textiles, Technomic publishing company Inc., USA, 1995
4. Jarmila Svedova," Industrial Textiles", Elsevier Science Publishing Co in, ISBN -0444-98754-1, New york, 1990.
5. Alexander N G. Desighing Interior Environment, Mas court Brace Covanorich Inc, Newyork, 1996.
6. Crew AH and Arahamsen H Carpets: Back to Front", Textile Progress, ol.19 No.3, The Textile Institute, Mancheste, 1987.

18TT027 ADVANCED QUANTITATIVE METHODS 3 0 0 3

Course Objectives

- To prepare for competitive examinations for higher studies in textile technology and fibre science
- To understand the concepts in textiles through problem solving

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to oneÃ¢??s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Compile theoretical aspects related to fibre formation using polymers
2. Compute necessary details related to yarn production
3. Compute the necessary details related to fabric production
4. Delineate the concepts of textile testing.
5. Examine textile chemical processes using the process parameters

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3									2	3	1	3
2	2	3									2	3	2	2
3	2	3										3	1	3
4	2	3		2			2				1	3	2	3
5	2	3		2								3	1	3

UNIT I **9 Hours**

FIBERS

Polymers and fibres, polymer spinning, molecular weight, degree of polymerization, molecular architecture, fibre structure, plasticization, crystallization, melting, factors affecting Tg and Tm. Fibre production polymerization of nylon-6, Nylon-66, poly(ethylene terephthalate), poly acrylo nitrile and polypropylene;melt spinning processes for PET, polyamide and polypropylene; wet and dry spinning

processes for viscose and acrylic fibres; post spinning operations such as drawing, heat setting, tow-to-top conversion and different texturing methods. Moisture content and regain, density, birefringence.

UNIT II **9 Hours**

YARN

Winding processes and machines, random, precision and step precision winding. Yarn clearers and tensioners; yarn splicing; warping creels; modern beam and sectional warping machines; sizing of spun and filament yarns, sizing machines; pirn winding. Primary and secondary motions of loom, cam design and kinematics of sley, loom settings and timings; weaving performance; Peirce equations for fabric geometry; elastic model of plain woven fabrics; thickness, cover and maximum set of woven fabrics. Weft and warp knitting, Nonwoven fabrics.

UNIT III **9 Hours**

FABRIC

Winding processes and machines, random, precision and step precision winding. Yarn clearers and tensioners; yarn splicing; warping creels; modern beam and sectional warping machines; sizing of spun and filament yarns, sizing machines; pirn winding. Primary and secondary motions of loom, cam design and kinematics of sley, loom settings and timings; weaving performance; Peirce equations for fabric geometry; elastic model of plain woven fabrics; thickness, cover and maximum set of woven fabrics. Weft and warp knitting, Nonwoven fabrics.

UNIT IV **9 Hours**

TEXTILE TESTING

Sampling techniques, sample size and sampling errors; Statistical analysis of experimental results, frequency distributions, correlation, significance tests, analysis of variance and control charts. Fibre length, fineness, crimp; measurement of cotton fiber maturity and trash content; High volume fibre testing; Measurement of yarn count, twist and hairiness; Tensile testing of fibers, yarns and fabrics; Evenness testing of slivers, rovings and yarns; Classimat faults; fabric thickness, compressibility, air permeability, wetting and wicking, drape, crease recovery, tear strength, bursting strength and abrasion resistance; Instruments and systems for objective evaluation of fabric hand.

UNIT V **9 Hours**

TEXTILE CHEMICAL PROCESSING

Preparatory processes for cotton, wool, silk, man made fibres and their blends. Dyeing of cotton, wool, silk, polyester, nylon and acrylic. Dyeing of polyester/cotton and polyester/wool blends; Dyeing machines; Dyeing of cotton knitted fabrics. Dye fibre interaction; Thermo dynamics and kinetics of dyeing; Determination of wash, light and rubbing fastness. Printing thickeners including synthetic thickeners; Printing auxiliaries; Printing of cotton with reactive dyes, wool, silk, nylon with acid and metal complex dyes, Printing of polyester with disperse dyes; Pigment printing; Transfer printing of polyester; Inkjet printing. Mechanical finishing of cotton. Heat setting of synthetic fabrics; Pollution control and treatment of effluents.

Total: 45 Hours

18TT028 CLOTHING SCIENCE 3 0 0 3

Course Objectives

- To acquire knowledge of textiles from the perspective of human-clothing interface
- To acquire knowledge on the effects of fibre, yarn, fabrics on garment appearance, comfort, durability, protection and care.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Select the transmission characteristics for the development of end-use specific garments.
2. Apply transformation characteristics of textiles to produce functional and aesthetic textiles.
3. Determine fabric hand, fit and size parameters for clothing comfort.
4. Choose component and materials for apparels based on the principles of clothing science
5. Develop apparels for specific end uses.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2											3
2	3	3	2											3
3	3	3	2											3
4	3	3	2											3
5	3	3	2											3

UNIT I **9 Hours**

TRANSMISSION CHARACTERISTICS

Air permeability - Heat transmission - Thermal resistance - Light permeability - Water permeability - Moisture transmission - wicking characteristics - Radioactivity transmission.

UNIT II **9 Hours**

TRANSFORMATION CHARACTERISTICS

Crease resistance and recovery - Crock resistance - Dimensional stability - Hygral expansion - Relaxation shrinkage - Swelling shrinkage and felting shrinkage. Pilling - Scorching and Soiling - Flame retardancy - Fusing and Mildew resistance

UNIT III **9 Hours**

FABRIC HANDLE AND COMFORT

Bending - Compression- Tensile - Shear - surface friction - Bias extension - Formability - Tailorability - Objective evaluation of fabric handle by KES and FAST Fabric parameters and its influence on fabric comfort. Garment fit and size on comfort.

UNIT IV **9 Hours**

AESTHETICS

Subjective and objective evaluation: Drape - Colour, colour fastness - Shade variation and measurement.

Design Logic of Apparel Product. Classification of textile products, Components and Materials - Specification and Properties of textile products - Selection of constituent fibres and yarns - Selection of constituent fabrics and apparels

UNIT V **9 Hours**

DEVELOPMENT OF APPARELS FOR SPECIFIC END USE

Fit analysis for various end uses: Winter - summer wear - innerwear - Sports - Casual - Swim wear. Protective wear; Ballistic protection - UV protection - Functional and quality requirements.

Total: 45 Hours

Reference(s)

1. D. R. Buchanan, The Science of Clothing Comfort, Textile Progress, Vol.31, No.1/2, 1999.
2. K. Slater, Comfort Properties of Textiles, The Textile Institute, Manchester, Vol. 9, No.4, 1997.
3. Pradip V. Metha, An Introduction to Quality Control for the Apparel Industry, ASQC Quality Press, Marcel Dekker Inc New York, 1992.
4. R. Ed Postle, S. Kawabata and M. Niwa, Objective Evaluation of Fabrics, Textile Machinery Society, Japan, Osaka, 1983.
5. Miller, Textiles: Properties and Behaviors in Clothing Use, The Textile Institute, 1998

18TT029 MANAGERIAL PRACTICES IN TEXTILE INDUSTRY

3 0 0 3

Course Objectives

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

Programme Outcomes (POs)

b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

m. Demonstrate the knowledge and understanding of the processes and systems related to textile manufacturing and solve the problems related to production and quality of fibres, yarns and fabrics.

Course Outcomes (COs)

1. Characterize the different sectors of textile industry and their role in the economy
2. Assess contribution of various sectors of textile industry to nation"s economy
3. Critique the efforts taken by the Government of India for the growth of Indian Textile Industry
4. Plan for the utilities in the various sectors of textile Industry
5. Use personnel management principles in textile industry

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1									2	2	2	2	2	
2									2	2	2	2	2	
3							2		3	2	2	2	2	
4		2	2	2		2							2	
5						-	2	2	2	2			2	

UNIT I **9 Hours**

TEXTILE INDUSTRY

Global scenario, Indian textile Industry, Indian Textile Policy, Trade policy, Fiscal policy, NTC, STC, Textile committee, National Hand loom Development Corporation, Mills association, Research Institutions, Technical Textile Units, Current five year Plan: Targets and achievements; statistics on global and national fibre, yarn and fabric production, consumption, exports and imports.

UNIT II **9 Hours**

CENTRAL AND STATE GOVERNMENT SCHEMES

Technology Up-gradation Fund Scheme (TUFS), Textile Workers Rehabilitation Fund Scheme, Group Work Shed Scheme, Comprehensive Powerloom Cluster Development Scheme, Group Insurance scheme, Scheme for Integrated Textile Parks, Hank Yarn Obligation (HYO); Yarn Bank Scheme. Technology Missions for Technical textiles. Centres of Excellence

UNIT III **9 Hours**

MILL ORGANIZATION AND PLANNING

Organizational Structure and Functioning of Centralized and Decentralized Sectors: Spinning, Weaving, Composite mill, Chemical processing Units. ERP, MIS, Cotton Purchase Practices, Inventory control, Spin plan, Weave plan, Product costing, Managerial responsibilities. Selection of site for textile mills, Various types of buildings. Upgradation of plant and production equipment .Capital investment proposals and feasibility.

UNIT IV **9 Hours**

UTILITIES

Power requirements for spinning, weaving, Knitting and Garment machinery, Amenities required, Ventilation, Humidification systems, RH and temperature of various departments. Lighting types, Intensity requirements

UNIT V **9 Hours**

PERSONNEL AND MARKETING MANAGEMENT

Planning, Selection, Training, Welfare safety, Factory act, Industrial dispute act, Trade union act, Bonus act, ESI, wage structure in textiles and apparel industry, Categories of operatives in textile mills, HOK, OHS. Labour handling techniques. Marketing channel, Physical distribution, Roles and responsibility of personal department in a textile industry.

Total: 45 Hours

Reference(s)

1. V. D. Dudeja, Management of Textile Industry, Textile Trade Press, Ahmedabad 1990.
2. A. Ormerod, Textile Product Management, The Textile Institute, Manchester 1992
3. Handbook of Import and Export Procedures, Textile Commissioner Office Reports, Government of India, Ministry of Textiles, Government of India Publications (2005, 2010).

18GE0E1 ENTREPRENEURSHIP DEVELOPMENT I 3 0 0 3

Course Objectives

- Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc

Programme Outcomes (POs)

b. Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Able to gain Knowledge about entrepreneurship, motivation and business.
2. Able to develop small scale industries in different field.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2			1	1								
2		2	2	1	2	1					2			

UNIT I **9 Hours**

BASICS OF ENTREPRENEURSHIP

Nature, scope and types of Entrepreneurship, Entrepreneur Personality Characteristics, Entrepreneurship process. Role of entrepreneurship in economic development

UNIT II **9 Hours**

GENERATION OF IDEAS

Creativity and Innovation, Lateral Thinking, Generation of Alternatives, Fractionation, Reversal Method, Brain Storming, Analogies

UNIT III **9 Hours**

LEGAL ASPECTS OF BUSINESS

Contract act-Indian contract act, Essential elements of valid contract, classification of contracts, sale of goods act- Formation of contract of sale, negotiable instruments- promissory note, bills and cheques, partnership, limited liability partnership (LLP), companies act-kinds, formation, memorandum of association, articles of association.

UNIT IV **9 Hours**

BUSINESS FINANCE

Project evaluation and investment criteria (cases), sources of finance, financial statements, break even analysis, cash flow analysis.

UNIT V **9 Hours**

OPERATIONS MANAGEMENT

Importance- functions-deciding on the production system- facility decisions: plant location, plant layout (cases), capacity requirement planning- inventory management (cases)-lean manufacturing, Six sigma.

Total: 45 Hours

Reference(s)

1. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi: 2005
2. Prasanna Chandra, Projects Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill Publishing Company Limited, New Delhi: 2000.
3. Akhileshwar Pathak, Legal Aspects of Business, Tata McGraw Hill: 2006

18GE0E2 ENTREPRENEURSHIP DEVELOPMENT II 3 0 0 3

Course Objectives

- Evolve the marketing mix for promoting the product / services
- Handle the human resources and taxation
- Understand Government industrial policies / support provided and prepare a business plan

Programme Outcomes (POs)

b. Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

e. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Increase in awareness of the entrepreneurship Development for engineering decisions.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2			2			2	2	2	1			

UNIT I **9 Hours**

MARKETING MANAGEMENT

Marketing environment, Segmentation, Targeting and positioning, Formulating marketing strategies,Marketing research, marketing plan, marketing mix (cases)

UNIT II **9 Hours**

HUMAN RESOURCE MANAGEMENT

Human Resource Planning (Cases), Recruitment, Selection, Training and Development, HRIS, Factories Act 1948 (an over view)

UNIT III **9 Hours**

BUSINESS TAXATION

Direct taxation, Income tax, Corporate tax, MAT, Tax holidays, Wealth tax, Professional tax (Cases).Indirect taxation, Excise duty, Customs, Sales and Service tax, VAT, Octroi, GST (Cases)

UNIT IV **9 Hours**

GOVERNMENT SUPPORT

Industrial policy of Central and State Government, National Institute-NIESBUD, IIE, EDI. State Level Institutions-TIIC, CED, MSME, Financial Institutions

UNIT V **9 Hours**

BUSINESS PLAN PREPARATION

Purpose of writing a business plan, Capital outlay, Technical feasibility, Production plan, HR plan, Market survey and Marketing plan, Financial plan and Viability, Government approvals, SWOT analysis.

Total: 45 Hours

Reference(s)

1. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi: 2005.
2. Philip Kotler., Marketing Management, Prentice Hall of India, New Delhi: 2003
3. Aswathappa K, Human Resource and Personnel Management - Text and Cases, Tata McGraw Hill: 2007.
4. Jain P C., Handbook for New Entrepreneurs, EDII, Oxford University Press, New Delhi: 2002.
5. Akhileshwar Pathak, Legal Aspects of Business, Tata McGraw Hill: 2006.
6. http://niesbud.nic.in/agencies.htm

18TT0XA COTTON FIBERS:OPTIONS AND ALTERNATIVES **0 0 0 1**

Course Objectives

- To evaluate organic cotton and genetically modified cotton
- To understand the alternatives available for cotton

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. To summarise the different types of cotton and cultivation process used for organic cotton
2. To select appropriate fibre for a specific end use

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2												
2	2	3												

Total: 15 Hours

Reference(s)

1. Journal of Natural Fibres
2. http://www.cicr.org.in/

18TT0XB FANCY YARNS **0 0 0 1**

Course Objectives

- To classify various types of fancy yarns, their structure and characteristics.
- To understand the working principles of various machines used for production of fancy yarns
- To understand the various effects of fancy yarns on fabric appearance

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. To evaluate various production methods of fancy yarns
2. To summarize the parameters that affect the quality and performance of fancy yarns

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3												
2	2	3												

Total: 15 Hours

Reference(s)

1. R. H. Gong and R. M. Wright, Fancy yarns "Their manufactures and applications", Wood head Publishing Limited, 2002.

18TT0XC DENIM FABRICS AND GARMENTS 1 0 0 1

Course Objectives

- To understand the key aspects of denim fabric production.
- To understand the various finishing treatments available for denim fabrics

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal, and environmental considerations.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. To analyse the key properties, structure and production of denim fabrics.
2. To suggest the various finishing treatments for denim fabrics

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2				-							
2	2	2	2				2							

Total: 15 Hours

Reference(s)

1. M. S. Parmar, S. S. Satsanji and Jai Prakash, Denim: A Fabric for All, NITRA Publications, 1996.
2. J. V. Rao, Denim Washing, Northern India Textile Research Association, Ghaziabad, 2006.

18TT0XD TESTING OF DYES 1 0 0 1

Course Objectives

- To understand the working principle of various testing instruments meant for measuring the properties of dyes
- To develop the operating procedures for different testing instruments used for analysis of dyes.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. To analyze the strength and purity of textile dyes.
2. To analyze the toxicity of textile dyes.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	2												

Total: 15 Hours

Reference(s)

1. Zollinger H, Color Chemistry, Wiley - VCH, Switzerland, 2003
2. Orientation Programme in Wet Processing - Quality and Process Control, ATIRA Publications.
3. Clayton E, Identification of Dyes on Textile Fibres, Society of Dyers and Colorists, UK, 2000

18TT0XE TESTING OF AUXILIARIES 1 0 0 1

Course Objectives

- To anlayse various auxiliaries used in textile chemical processing
- To develop the operating procedures for different testing instruments used for testing auxiliaries.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. To select the testing instruments meant for measuring the properties of auxiliaries used in textile chemical processing
2. To develop procedures for testing auxiliaries used in textile chemical processing.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2		2										
2	3	3		-										

Total: 15 Hours

Reference(s)

1. Wet Processing Quality and Process Control, ATIRA Publications, Latest version.
2. J. W. Weaver, AATCC Technical Manual, American Association of Textile Chemists and Colorists, North Carolina, 1984

18TT0XF ECO PROCESSING 1 0 0 1

Course Objectives

- To understand ecology related issues connected with the Textile Industry and their consequences.
- To acquire knowledge on the technologies that are in line with preservation of ecology in the area of textile chemical processing

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
j. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to oneÃ¢??s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. To choose the eco-friendly methods of processing of textiles.
2. To outline the effect of toxicity on environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3					2	2			2			
2	2	3					3	3		2	2			

Total: 15 Hours

Reference(s)

1. R. Asokan, Eco-Friendly Textile Wet Processing, NCUTE Publications, New Delhi, 2001.
2. Eco Textiles 98 Bolton Institute 1998.
3. Eco Textiles, Book of Papers, BITRA, 1996.

18TT0XG ERECTION AND COMMISSIONING OF TEXTILE MACHINES

1 0 0 1

Course Objectives

- To acquire knowledge on the basic steps to be followed during erection and commissioning of textile machinery
- To select the appropriate tools and equipment for erection

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. To outline the fundamentals of machinery erection
2. To select the relevant tools and equipment for erection and commissioning of textile machines

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	3	3												

Total: 15 Hours

Reference(s)

1. LMW erection manuals and handouts

18TT0XH WORKLOAD AND WORK ASSIGNMENTS **1 0 0 1**

Course Objectives

- To analyse key principles by which workloads are assigned in the textile industry.
- To understand the standards available on work assignments recommended in various sections of a textile mill.

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. To categorize the various factors concerning work load assignment
2. To prepare a work load plan based on the machinery and production pattern of a spinning mill

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	3	3												

Total: 15 Hours

Reference(s)

1. T. V. Ratnam et al, SITRA Norms for Spinning Mills, The South India Textile Research Association, Coimbatore, 2004.

18TT0XI AIR ENGINEERING IN TEXTILE INDUSTRY **1 0 0 1**

Course Objectives

- To understand the significance of maintaining humidity and temperature in textile manufacture
- To identify design and operational aspects of humidification plants

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. To outline the controls and parameters for maintaining the humidity level
2. To prepare a layout of the humidification system for the given level of machinery.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3												
2	2	3												

Total: 15 Hours

Reference(s)

1. B. Purushothama, Humidity and Ventilation Management in Textile Industry, Wood head Publishing Limited, New Delhi, 2009

18TT0XJ PRODUCT CERTIFICATION 1 0 0 1

Course Objectives

- To understand the importance and necessity for product certification
- To examine the criteria to be fulfilled to obtain the certification for textile products

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Course Outcomes (COs)

1. To outline the importance and necessity for product certification
2. To inspect the criteria to be fulfilled to obtain certification for textile products

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2				2		2						
2	3	3				2		3						

Total: 15 Hours

Reference(s)

1. www.global-standard.org/the-standard/general-description.html
2. www.oeko-tex.com/oekotex100_public/content5.asp?area...
3. www.intertek.com/textiles/certification/

18TT0XK ENERGY CONSERVATION IN THE ETEXTILE INDUSTRY

1 0 0 1

Course Objectives

- To Understand the energy conservation techniques applicable to textile industry

Programme Outcomes (POs)

a. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. To categorize energy consumption of various machines in textile industry
2. To summarize the factors that influence the energy consumption in various processes in textile industry

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2					2							
2	3	3				-	3							

Total: 15 Hours

Reference(s)

1. Energy Conservation in Textile Industry, SITRA, 2005
2. Palaniappan C et al, Renewable Energy Applications to Industries, Narose Publishing House, 1998.
3. Proceedings of International Seminar cum Exhibition ASIA Energy Vision 2020 - sustainable energy supply, November 15-17, 1996.

18TT0YA YARN AND FABRIC MANUFACTURE 3 0 0 3

Course Objectives

- To learn the basic of fiber and yarn manufacturing sequences
- To learn the woven and knitted fabric manufacturing processes.

Course Outcomes (COs)

1. Understand the properties and measurement units of Textile Materials.
2. Understand textile manufacturing processes.
3. Work as a team member in a multi-disciplinary engineering design team.

UNIT I **9 Hours**

FIBRE (INTRODUCTION)

Fibre - Staple fibre Filament Yarn Thread Fabric and Clothing. Properties and applications of Natural fibres: cotton wool silk flax jute coir. Properties and applications of manufactured fibres: Viscose rayon Polyester Nylon Acrylic - polypropylene.

UNIT II **9 Hours**

STAPLE FIBRE YARN MANUFACTURE

Count systems: English Tex Denier. Overview of various yarn manufacturing systems: Short-staple Long-staple. Short-staple spinning machinery and processes blow room, card, comber, draw frame, speed frame, ring frame, and rotor spinning machine. Long-staple spinning machinery and processes: Woollen and worsted spinning machinery card comber gill box draw frames speed frame ring frame.

UNIT III **9 Hours**

FABRIC MANUFACTURE

Fabric production methods: Woven Knitted Nonwoven Felting. Woven fabric production machinery: Hand loom - Plain loom Automatic looms Shuttleless looms. Weaving Processes and Machinery: Winding warping sizing pirn winding plain looms automatic looms Projectile looms - Rapier looms air-jet looms.

UNIT IV **9 Hours**

FABRIC MANUFACTURE (CONT..)

Knitted fabric production machinery and processes: Warp and weft knitting; Circular Flat-bed Warp knitting machines. Non-woven production machinery and processes: Web formation Bonding (Needling, hydro entangling, bonding).

UNIT V **9 Hours**

GENERAL

Overview of textile colouration and finishing machinery and processes: Scouring bleaching mercerising dyeing printing finishing.
High-bulk acrylic yarn production. Texturing technology. Weaves and structures. Loom attachments: Dobby Drop-box Jacquard. Standard types of fabrics and end-uses. Silk reeling and silk fabric weaving.

Total: 45 Hours

Reference(s)

1. 1. Bernard P. Corbman, Textiles: Fiber to Fabric, McGraw Hill, 1983.
2. 2. Andrea Wynne, Textiles (Motivate Series, Macmillan texts for industrial vocational & technical education), 1997.

3. 3. J. Gordon Cook, Handbook of Textile Fibres: Natural Fibres: Volume 1, Woodhead Textiles Series No. 4, Woodhead Publishing Limited, UK, 2001.
4. 4. J. Gordon Cook, Handbook of Textile Fibres: Manmade Fibre: Volume 2, Woodhead Textiles Series No. 4, Woodhead Publishing Limited, UK, 1999.
5. 5. W. Klein, Vol. 1, 3, The Technology of Short Staple Spinning, A Practical Guide to Opening & Carding and A Practical Guide to Combing, Drawing and Roving frame, The Textile Institute, Manchester, U.K., 1998.
6. 6. P. Marks and A. T. C. Robinson Principles of Weaving, The Textile Institute, 1989.

18TT0YB COLOURATION OF TEXTILES 3 0 0 3

Course Objectives

- To learn the different types of fabric colouration techniques
- To learn the different types of textile dyeing and printing machinery operations.

Course Outcomes (COs)

1. Understand how to prepare textile materials for coloration
2. Assess suitability of base material suitable for value addition
3. Communicate about colour requirements for various rendering applications.

UNIT I **9 Hours**

PREPARATORY PROCESSES

Characteristic properties of cotton, wool, silk, blended fabrics - wet process sequences - Singeing - principles and methods. Desizing - hydrolytic, oxidative and enzymatic methods. Scouring - mechanism and evaluation - scouring of coloured fabrics. Wool scouring and carbonizing - Silk Degumming.

UNIT II **9 Hours**

BLEACHING AND MERCERISATION

Bleaching: Mechanism - hypochlorite and hydrogen peroxide bleaching - sodium chlorite bleaching - bleaching of blends. Evaluation of bleached materials. Mercerisation: Theory - principles - methods - machine - Assessment. Liquid ammonia treatment.

UNIT III **9 Hours**

COLOUR, MEASUREMENT AND COLOUR MATCHING

Colour: Electromagnetic spectrum- visible range, Measurement of colour strength - colour matching-theory and applications. Spectrophotometer and colour matching system, Quality control using colour matching system, colour difference - pass / fail system and shade sorting

UNIT IV **9 Hours**

COLOURATION OF TEXTILE MATERIALS

Theory of dyeing: substantivity and affinity. Classification of dyes, Properties and applications- direct - reactive - vat - azoic dyes - acid dyes - metal complex - disperse dyes. Dyeing of blends. Fastness : wash - light - rubbing - perspiration - sublimation.

UNIT V **9 Hours**

MACHINERIES

Washing range - kier - J-box - loose stock - package dyeing machine - Winch - jigger - soft flow - jet dyeing - beam dyeing - padding mangle - steamer - agers - dryers

Total: 45 Hours

Reference(s)

1. 1. E. R. Trotman, Dyeing and Chemical Technology of Textile Fibres, Charles Griffin and Co. Ltd., London. 1990.
2. 2. V. A. Shenai, Technology of Bleaching and Mercerzing - Vol. III, Sevak Publications, Mumbai 1991.
3. 3. V. A. Shenai, Technology of Dyeing - Vol. VI, Sevak Publications, Mumbai 2000

4. 4. V. A. Shenai, Technology of Printing - Vol. IV, Sevak Publications, Mumbai 1996.
5. 5. R. S. Bhagwat, Handbook of Textile Processing, Colour Publication, Mumbai, 1999
6. 6. S. R. Karmakar, Chemical Technology in the Pre-treatment Processes of Textiles, Elsevier, New York, 1994.

18TT0YC TEXTILES IN ENGINEERING APPLICATION

3 0 0 3

Course Objectives

- To learn the basic textile material properties and it's application on various engineering fields

Course Outcomes (COs)

1. Understand the properties of Textile Materials.
2. Choose textile based materials for a given product specification.
3. Work as a team member in a multi-disciplinary engineering design team

UNIT I **9 Hours**

OVERVIEW OF TEXTILES

Introduction to textile technology: Fibres, Yarn Numbering systems, Spinning, Weaving, Knitting, Nonwovens, Chemical Processing, Garmenting, Manufactured Fibres Technology. Physical and Chemical properties of textile fibres - Suitability of textile materials for high-end engineering applications.

UNIT II **9 Hours**

TECHNICAL FIBRES COMPOSITES

High strength and modulus organic fibres, High chemical and thermal resistance organic fibres. High performance inorganic fibres, Ultra fine and Novelty fibres. Textile Composites
Reinforcement fibres, matrix materials, Classification of textile reinforcement structures, Composite manufacturing techniques.

UNIT IV **9 Hours**

TEXTILES IN CIVIL ENGINEERING

Tyre cord manufacturing techniques. Airbags: materials and properties- Manufacturing techniques. Seat belts and fabrics - liner fabrics. Reinforcing textile material for concrete and other civil structural elements. Geo textiles functions and applications - road and railway construction

UNIT III **9 Hours**

TEXTILES IN AUTOMOBILE ENGINEERING

Tyre cord manufacturing techniques. Airbags: materials and properties- Manufacturing techniques. Seat belts and fabrics - liner fabrics. Reinforcing textile material for concrete and other civil structural elements. Geo textiles functions and applications - road and railway construction.

UNIT IV **9 Hours**

TEXTILES IN HEALTH CARE INDUSTRY AND SAFETY

Classification and fibres used - requirements. Detailed study and application of textiles in: implantable - non-implantable - extracorporeal devices. Health care and hygienic products. Waterproof fabrics - breathable fabrics - Fire protection - Heat and cold protection - Ballistic protective clothing - Camouflage textiles - NBC protection.

Total: 45 Hours

Reference(s)

1. 1. Sabit Adanur and Wellington Sears, Handbook of Industrial Textiles, Technomic Publishing company Inc., USA, 1995.
2. 2. R. Horrocks and S. C. Anand, Handbook of Technical Textiles, Woodhead Publishing Limited and The Textile Institute, 2000
3. 3. Alagirusamy and A. Das, Technical Textile Yarns, CRC press, 2010.
4. 4. P. W. Harrison, The Design of Textiles for Industrial Applications, Textile Institute, Manchester, 1998.
5. 5. Pushpa Bajaj and A. K. Sengupta, Industrial Applications of Textiles for Filtration and Coated Fabrics, Textile Progress Vol.14, 1992.