B. Tech. (Textile Technology)

2015 Regulations, Curriculum & Syllabi

BANNARI AMMAN INSTITUTE OF TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai
Approved by AICTE - Accredited by NBA New Delhi, NAAC with 'A' Grade and ISO 9001:2008 Certified)
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REGULATIONS 2015 (CHOICE BASED CREDIT SYSTEM) (Common to all B.E./B.Tech. Degree Programmes)

Regulation 2015 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 2015 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 2015-2016 for Regular admission (Academic year 2016-2017 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. Electrical and Electronics Engineering
vii. Electronics and Communication Engineering
viii. Electronics and Instrumentation Engineering
ix. Mechanical Engineering
x. Mechatronics

B. Tech. Programmes

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

3. STRUCTURE OF THE PROGRAMME

3.1 Every programme shall have a distinct curriculum with syllabi consisting of theory, laboratory, mini-project, life-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 c**ourses including Engineering Graphics, Workshop Practices, Basics of Electrical, Electronics, Civil, Mechanical Engineering, Engineering Mechanics and Computer Programming.

(iii) **Humanities and Social Science c**ourses including Language Courses, Management Courses, Life Skills and Professional Ethics.

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

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

The assortment of different courses shall be designed that the student, at the end of the programme, would be able to be trained not only in his / her relevant professional field but also as a socially mindful human being.

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, with 1 credit per lecture period per week, 1 credit for 2 periods of tutorial, 1 credit for 2 periods of laboratory courses, and 1 credit for 2 periods of seminar/project work per week.

3.3 A Diagnostic Test will be administered to all the B.E. / B.Tech. students after the admission to assess the proficiency in English and based on the score they will be brought under two streams namely, Stream A and Stream B. Students under Stream A will study **Communicative English I** and Stream B will study **Basic English I** under Language Elective I in the First Semester. In the Second Semester, Stream A will be further divided into two categories based on their English language proficiency assessed in the Continuous Assessment, while the upper segment can enroll and study **German / Japanese / French / Chinese / Hindi** and the remaining students of that Stream will study **Communicative English II**. The students under Stream B will study **Basic English II** or may opt for **Communicative English II** based on the assessment carried out at the end of the semester I.

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 / Open Elective) from any branch of B.E/B.Tech. Programmes, besides 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 three electives as open electives from the list of open electives of the branch / branches other than his / her branch of specialisation. There shall be no pre-requisite course(s) for such open electives.

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 VII 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 and a maximum batch size for a given course shall not exceed 40. In the 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, but will not be considered for computing the Cumulative Grade Point Average (CGPA). However, if a student wishes to avail the exemption from any one of the Electives (other than open elective) of the Semester VIII, he / she can do so by exercising his / her option in writing to the respective Head of the Department during the beginning of the VIII Semester, following the equivalence norm, that **one regular elective (**in the **VIII Semester)** is equivalent to **three one-credit courses** completed by the student during the previous semesters, IV to VII. Details of the one credit courses offered by the department shall be forwarded to the Office of the Controller of Examinations. However one credit courses completed during I to III semesters shall be maintained in the Grade sheet as "Additional credits earned" (not considered for the computation of GPA/CGPA).

3.7 Fast Track System shall enable students to undergo a semester-long Internship or Special Training during Semester VIII. A student who secures a minimum CGPA of 8.50 in Semester IV with no current arrears, as on that date and maintains the CGPA of 8.50 till VI Semester without any arrears shall be eligible to opt for Fast Track System and such student is required to complete three elective courses satisfactorily, while completion of Semester VII, as additional Credits during the semesters V to VII.

3.8 Every student shall be required to carry out a Project Work in the Department / Industry or by exercising Fast track during VIII Semester in consultation with the Faculty Guide and submit the project report, in the prescribed format, at the end of the VIII Semester for the valuation.

3.9 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.

3.10 A Student may be permitted to credit online courses with the approval of the Departmental Consultative Committee constituted by the Head of the Department, subject to a maximum of three credits. Such students may be exempted from attending the classes, if such course(s) are offered in the semester. Summary of such on-line courses, taken by the students, along with the offering agency shall be presented to the Academic Council for information and further suggestions. However, those students need to obtain certification from the agency / agencies offering the course, to become eligible for writing or seeking exemption (core elective course) from the End Semester Examination. In case of credits earned through online mode, from the other Institute / University, the credits may also be transferred directly after due approval from the Departmental Consultative

Committee and the Office of the Controller of Examinations. A student can get exemption for a maximum of 3 credits during the entire programme (in lieu of Discipline elective or Open elective).

4. VALUE ADDED COURSES / ADD-ON COURSES

A Student can opt for the Value Added Courses / Add-on Courses offered by the various Department / Centres for which the batch size will not exceed 40 per course 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 or 450 periods of 60 minutes each or equivalent. 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 the case, if a student fails to register in the 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. Total number of credits of such courses cannot exceed 6 in a given Semester. However the maximum number of credits that a student can register in a particular semester shall not exceed 30 credits (regardless to the reappearance credits). In such cases, the attendance requirement as stated Clause 7 is mandatory.

6.4.3 The minimum number of credits that a student can register in a particular semester shall not be less than 18 credits (except VII / VIII semester).

6.4.4 The student shall register for the project work in the VIII semester 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, 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 Laboratory Course/ Project work / Seminar or any other EEC courses (Specified in Clause 3.1) 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.

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 In the case of reappearance registration for a course (vide Clause 6.5), the student has to register for examination in that course by paying the prescribed fee.

7.6 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. If necessary, the Faculty Advisor may also discuss with or inform the parents about the progress / performance of the students concerned.

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 one credit courses / 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 practical 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. Supplementary Examinations may also be conducted, at such times, for the benefit of the students as decided by the Controller of Examinations.

10.4 For the End Semester examinations, both theory and practical courses including 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 and Evaluation Board of the Institute.

11. PASSING REQUIREMENTS AND PROVISIONS

11.1 A student who secures not less than 50% of total marks prescribed for a course, vide Clause 16, comprising a minimum of 50% of the marks prescribed for the End Semester Examination, shall be declared to have passed the course successfully and earned the prescribed credits for that course, applicable for all registered courses.

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 register and 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'.

11.1.2 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 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	178	134
Agricultural Engineering	177	133
Automobile Engineering	179	134
Civil Engineering	176	131
Computer Science and Engineering	176	131
Electrical and Electronics Engineering	176	132
Electronics and Communication Engineering	177	132
Electronics and Instrumentation Engineering	177	133
Mechanical Engineering	179	135
Mechatronics	177	133
B.Tech. Programmes		
Biotechnology	175	131
Fashion Technology	176	132
Information Technology	176	131
Textile Technology	175	131
Food Technology	175	131

11.2.1 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 institutions to Bannari Amman Institution of Technology or rejoins from previous regulation to this regulation.

11.3 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 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 12.3), while the Letter Grade is an index of the performance of a student in a said course.

12.3 The performance of a student will be reported using Letter Grades, each carrying certain points as detailed below:

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.

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

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

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 GPA and all the semesters, under consideration, in the case CGPA.

12.5 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).

12.6 For the non credit courses Grades shall be indicated as given in the Clause 16 and shall not be counted for the computation of GPA/CGPA.

12.7 **Photocopy / Revaluation:** A student, who seeks the re-valuation of the answer script is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the Department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation through proper application to the Controller of Examinations. 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.

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 qualifies for the award of the Degree having passed all the courses of study of all the Eight Semesters (six semesters for lateral entry students) at the first opportunity, after the commencement of his / her study and securing a CGPA not less than 8.50 (vide clause 12.3) shall be declared to have passed with **First Class with Distinction**.

13.2 **First Class**: A student who qualifies for the award of the Degree having passed all the courses of study of all the eight semesters (six semesters for lateral entry students) after the commencement of his / her study and securing a CGPA not less than 6.50 shall be declared to have passed with **First Class** (not exceeded the total duration as specified in the Clause 5).

13.3 **Second Class**: All other students who qualify for the award of the Degree shall be declared to have passed in **Second Class.**

13.4 Course Completion Certificate shall be given to a student, provided he / she should have registered all the courses and also registered for the examinations in those courses (subject to Clause 6.0 and 7.0).

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 such request for withdrawal is made prior to the submission of the Continuous Assessment marks of the course(s) with the recommendations from the Head of the Department.

14.3 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.

15. AUTHORIZED BREAK OF STUDY FROM A PROGRAMME

15.1 A student is permitted to go on break of study for a maximum period of one year either as two breaks of one semester each or a single break of one year.

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 shall be governed by the rules and regulations of DoTE and the Curriculum and Regulations in force at the time of rejoining, subject to the Clause 11.2.1.

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 (total duration or two semesters whichever is earlier) 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:	
	Test I (15)	
	Test II (15)	
	Open book test (10)	
	Library - Seminars / Assignments (Two) (10)	
	End Semester Examination	**50**
	Total Marks	**100**

II	**THEORY COURSES WITH LAB COMPONENT**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Test I (10)	
	Test II (10)	
	Conduct of Experiment	
	Preparation(5)	
	Experiment and Results (5)	
	Record Note#	
	Final Lab Examination (20)	
	End Semester Examination (QP pattern as per (I))	**50**
	Total Marks	**100**

III	**LABORATORY COURSES**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Conduct of Experiment	
	i. Preparation (5)	
	ii. Experiment and Results (10)	
	iii. Record / Observation# (5)	
	Test – Cycle I (15)	
	Test – Cycle II (15)	
	End Semester Examination	
	Experiments & Results (40)	**50**
	Viva Voce – (10)	
	Total Marks	**100**

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

IV	**TECHNICAL SEMINAR**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Presentation I (25)	
	Presentation II (25)	
	End Semester Examination	
	Report[#] (20) *Presentation (20)* *Viva voce (10)*	**50**
	Total Marks	**100**
V	**PROJECT**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Review I	
	Literature survey (10)	
	Problem Identification (5)	
	Methodology (10)	
	Review II	
	Continuation in Methodology (10)	
	Results / Progress (15)	
	End Semester Examination	
	Report[#] (20) *Presentation (20)* *Viva voce (10)*	**50**
	Total Marks	**100**
VI	**LANGUAGE ELECTIVE**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test 1	
	Listening (10) *Speaking (5)* *Reading (5)* *Writing (5)*	**25**
	Test 2	
	Listening (10) *Speaking (5)* *Reading (5)* *Writing (5)*	**25**
	Oral Exam	**50**
	Total Marks	**100**

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

VII	**ONE-CREDIT COURSE**	**Marks**
	Test	**30**
	Quiz	**20**
	Final Examination	**50**
	Total Marks	**100**

VIII	**MINI-PROJECT**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Review I	**25**
	Review II	**25**
	Project Evaluation	
	Report (25)#	**50**
	Presentation&Viva Voce (25)	
	Total Marks	**100**

IX	**LIFE SKILLS**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test I	**25**
	Test II	**25**
	Final Examination	**50**
	Total Marks	**100**
	Grades (Excellent / Good / Satisfactory/Not Satisfactory)	

X	**VALUE ADDED / CERTIFICATE COURSES**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test I	**25**
	Test II	**25**
	Final Evaluation / Test	**50**
	Total Marks	**100**
	Grades (Excellent / Good / Satisfactory / Not Satisfactory)	

XI	**ENGINEERING GRAPHICS**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Class work (based on attendance) (5)	
	Assignments (Minimum 8 Assignments) (20)	
	Model Examination (25)	
	End Semester Examination	**50**
	Total Marks	**100**

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Optional Test: *A student becomes eligible to appear for the one 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

Heads of Departments, in order to provide the experiential learning to the students, shall take efforts to arrange at least two industrial visits / field visits in a semester. 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, failing which he/she shall not be permitted to appear for the End Semester examinations of semester II and there onwards. Such students are permitted to appear for the End Semester examinations of semester II and there onwards only after completing satisfactorily the requirements.

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.

The Question Paper pattern (Theory Examination) for UG Programme is given below:

PART A		
Objective Type Questions: 20	**(20X1 = 20 Marks)**	**20**
PART B		
Short Answer Questions: 10	**(10X2 = 20 Marks)**	**20**
PART C		
Long Answer Questions: 5	**(5X12 = 60 Marks)**	**60**

	Total	**100**

Programme Educational Objectives (PEOs)

I. Understand the properties of textile materials to enable selection of materials for different kinds of textile and apparel manufacturing systems.

II. Understand various technological systems of manufacturing quality textile materials and apply them for the development of new processes and products.

III. Understand the management responsibilities related to issues such as social, ethical, environmental and personnel aspects of the textile industry.

Programme Outcomes (POs)

Engineering Graduates will be able to:

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 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.

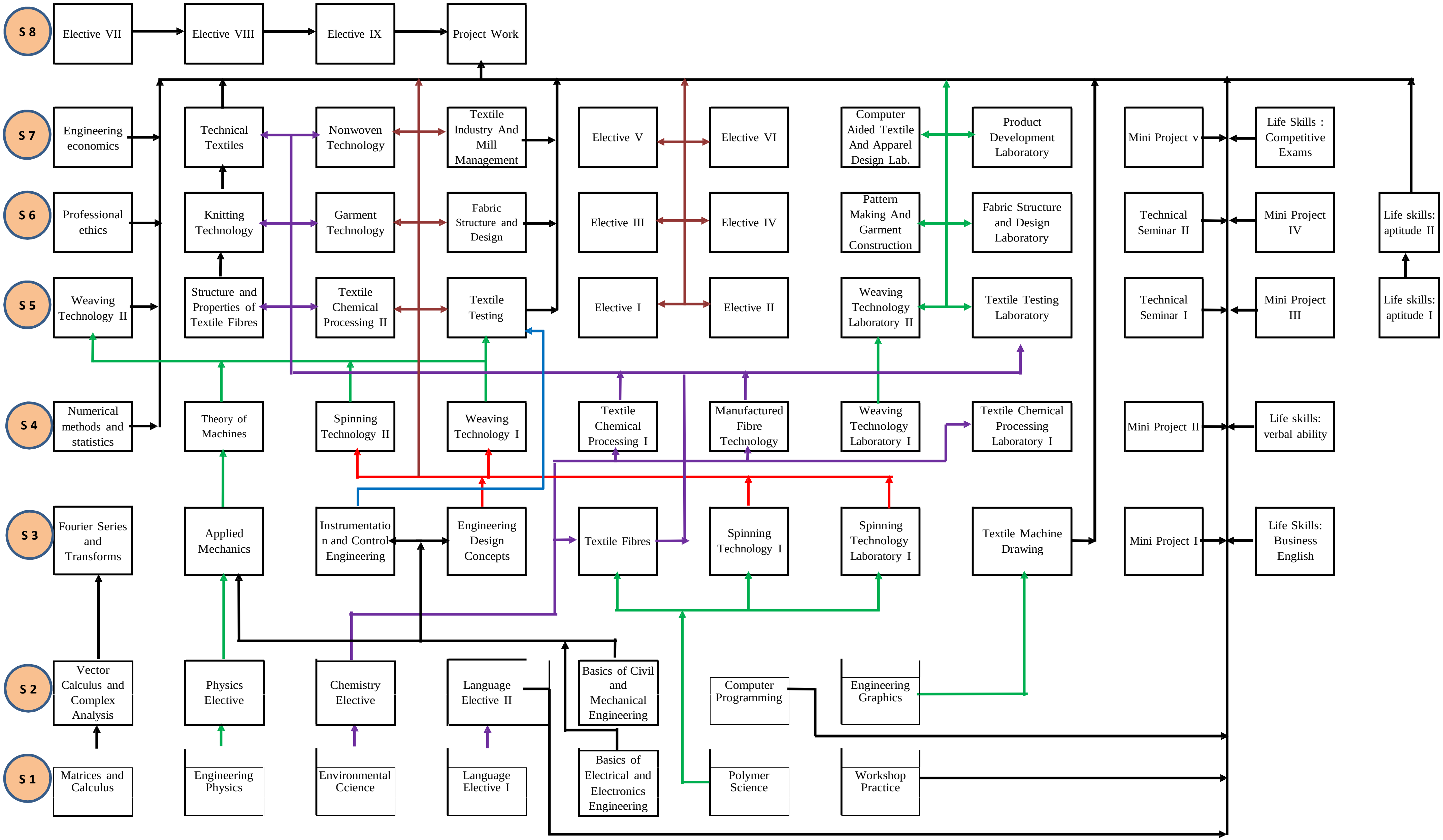
k. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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.

MAPPING OF PEOs AND POs

POs	a	b	c	d	e	f	g	h	i	j	k	l
PEO I	X	X		X	X		X		X	X		
PEO II	X	X	X	X	X	X	X	X	X		X	X
PEO III			X	X		X	X	X	X	X	X	X

DEPARTMENT OF TEXTILE TECHNOLOGY
CURRICULUM DESIGN & INTERLINKING OF COURSES



B.TECH TEXTILE TECHNOLOGY

Minimum Credits to be Earned :175

FIRST SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C	Maximum Marks			Category
		PEOs	POs					CA	ES	Total	
15MA101	MATRICES AND CALCULUS[*]	II	a,b	3	2	0	4	50	50	100	BS
15PH102	ENGINEERING PHYSICS[*]	II	a	2	0	2	3	50	50	100	BS
15CH103	ENVIRONMENTAL SCIENCE[*]	II	g	2	0	2	3	50	50	100	HSS
	LANGUAGE ELECTIVE I[#]	-	-	-	-	-	3	100	-	100	HSS
15GE105	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING[Δ]	II	a	2	0	2	3	50	50	100	ES
15TT106	POLYMER SCIENCE	I,II,III	a,b,i,k	3	0	0	3	50	50	100	PC
15GE107	WORKSHOP PRACTICE[Ω]	II	a,e	0	0	2	1	50	50	100	ES
Total				12	2	8	20	**400**	**300**	**700**	**-**

SECOND SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C	Maximum Marks			Category
		PEOs	POs					CA	ES	Total	
15MA201	VECTOR CALCULUS AND COMPLEX ANALYSIS[*]	II	a,b	3	2	0	4	50	50	100	BS
	PHYSICS ELECTIVE[*]	-	-	-	-	-	4	50	50	100	BS
	CHEMISTRY ELECTIVE[*]	-	-	-	-	-	4	50	50	100	BS
	LANGUAGE ELECTIVE II[#]	-	-	-	-	-	3	100	-	100	HSS
15GE205	BASICS OF CIVIL AND MECHANICAL ENGINEERING[⊕]	II	a	3	0	0	3	50	50	100	ES
15GE206	COMPUTER PROGRAMMING[Ψ]	II	a,b,d,e,g	3	0	2	4	50	50	100	ES
15GE207	ENGINEERING GRAPHICS[λ]	II	a, b, d, e	0	0	4	2	50	50	100	ES
Total				9	2	6	24	**400**	**300**	**700**	**-**

[*] Common to all branches of B.E./B.Tech

[#] Common to all branches of B.E./B.Tech (Continuous Assessment)

[Δ] Common to AE,AG,AU,CE,ME,MTRS,BT,TT,FD (I Semester) and to CSE,FT,IT (II Semester)

[Ω] Common to AE,AG,AU,ME,MTRS,BT,FT,TT,FD (I Semester) and to CE,CSE,ECE,EEE,EIE,IT (II Semester)

[⊕] Common to CSE,ECE,EEE,EIE,FT,IT (I Semester) and to MTRS, BT,TT, FD (II Semester)

[Ψ] Common to CE (I Semester) and to AE,AG,AU,ME,MTRS,BT,FT,TT,FD (II Semester)

[λ] Common to CE,CSE,ECE,EEE,EIE,IT (I Semester) and to AE, AG,AU,ME,MTRS,BT,FT,TT,FD (II Semester)

THIRD SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
		PEOs	**POs**					**CA**	**ES**	**Total**	
15MA301	FOURIER SERIES AND TRANSFORMS[α]	II	a,b	3	2	0	4	50	50	100	BS
15TT302	APPLIED MECHANICS	II	a,b,d,e	3	0	0	3	50	50	100	BS
15TT303	INSTRUMENTATION AND CONTROL ENGINEERING	II	a,b,d,e	2	0	2	3	50	50	100	ES
15TT304	ENGINEERING DESIGN CONCEPTS	I,II,III	a,b,c,i	3	0	0	3	50	50	100	ES
15TT305	TEXTILE FIBRES	I,II,III	a,b,c,i	3	0	0	3	50	50	100	PC
15TT306	SPINNING TECHNOLOGY I	I,II,III	a,b,c,d,e,f	4	0	0	4	50	50	100	PC
15TT307	SPINNING TECHNOLOGY LABORATORY I	I,II,III	a,b,c,d,e,g ,i	0	0	2	1	50	50	100	PC
15TT308	TEXTILE MACHINE DRAWING	II	a,b,d,e	0	0	2	1	50	50	100	ES
15TT309	MINI PROJECT I	I,II,III	a-l	0	0	2	1	100	-	100	EEC
15GE310	LIFE SKILLS: BUSINESS ENGLISH[Φ]	III	j	0	0	2	-	100	-	100	EEC
Total				18	2	10	23	**600**	**400**	**1000**	**-**

FOURTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
		PEOs	**POs**					**CA**	**ES**	**Total**	
15MA401	NUMERICAL METHODS AND STATISTICS[β]	II	a,b	2	2	0	3	50	50	100	BS
15TT402	THEORY OF MACHINES	II	a,b,d,e	3	0	0	3	50	50	100	ES
15TT403	SPINNING TECHNOLOGY II	I,II,III	a,b	3	0	2	4	50	50	100	PC
15TT404	WEAVING TECHNOLOGY I	I,II,III	a,b,c,g,h,i	4	0	0	4	50	50	100	PC
15TT405	TEXTILE CHEMICAL PROCESSING I	I,II,III	a,b,c,d,e,f, g,h,i,j,k	4	0	0	4	50	50	100	PC
15TT406	MANUFACTURED FIBRE TECHNOLOGY	I,II,III	a,b	3	0	0	3	50	50	100	PC
15TT407	WEAVING TECHNOLOGY LABORATORY I	I,II,III	a,b,c,d,e,f, g,h,i,j	0	0	2	1	50	50	100	PC
15TT408	TEXTILE CHEMICAL PROCESSING LABORATORY I	I,II,III	a,b,d,e,f,g, i	0	0	2	1	50	50	100	PC
15TT409	MINI PROJECT II	I,II,III	a-l	0	0	2	1	100	-	100	EEC
15GE410	LIFE SKILLS: VERBAL ABILITY[Φ]	III	j	0	0	2	-	100	-	100	EEC
Total				19	2	10	24	**600**	**400**	**1000**	**-**

[α] Common to all branches of B.E./B.Tech. except CSE
[Φ] Common to all branches of B.E./B.Tech (Non-Credit Course)
[β] Common to AG,AU,ME,MTRS,EEE,EIE,BT,TT,FT,FD

FIFTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
		PEOs	**POs**					**CA**	**ES**	**Total**	
15TT501	WEAVING TECHNOLOGY II	I,II,III	a,b,c,d,e,h,i,k	3	0	0	3	50	50	100	PC
15TT502	STRUCTURE AND PROPERTIES OF TEXTILE FIBRES	I,II,III	a,c,f,g,h,i,j,k	4	0	0	4	50	50	100	PC
15TT503	TEXTILE CHEMICAL PROCESSING II	I,II,III	a,b,c,e,f,g,h,i	3	0	2	4	50	50	100	PC
15TT504	TEXTILE TESTING	I,II,III	a,b,d,g,i	3	0	0	3	50	50	100	PC
	ELECTIVE I	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE II	-	-	-	-	-	3	50	50	100	PE
15TT507	WEAVING TECHNOLOGY LABORATORY II	I,II,III	a,b,c,d,e,i,k	0	0	2	1	50	50	100	PC
15TT508	TEXTILE TESTING LABORATORY	I,II,III	a,b,c,d,e,f,g,h,i,j,k	0	0	2	1	50	50	100	PC
15TT509	TECHNICAL SEMINAR I	I,II,III	i,j	0	0	2	1	50	50	100	EEC
15TT510	MINI PROJECT III	I,II,III	a-l	0	0	2	1	100	-	100	EEC
15GE511	LIFE SKILLS: APTITUDE I$^{\Phi}$	III	a,b	0	0	2	-	100	-	100	EEC
Total				13	0	12	24	**650**	**450**	**1100**	**-**

SIXTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	Maximum Marks			
		PEOs	**POs**					**CA**	**ES**	**Total**	**Category**
15GE601	PROFESSIONAL ETHICS^{+}	III	f,g,h	2	0	0	2	50	50	100	HSS
15TT602	KNITTING TECHNOLOGY	I,II,III	a,b,c,g	3	0	0	3	50	50	100	PC
15TT603	GARMENT TECHNOLOGY	I,II,III	a,b,c,d,e,f,g,h,i,j	3	0	0	3	50	50	100	PC
15TT604	FABRIC STRUCTURE AND DESIGN	I	b	3	0	0	3	50	50	100	PC
	ELECTIVE III	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE IV	-	-	-	-	-	3	50	50	100	PE
15TT607	PATTERN MAKING AND GARMENT CONSTRUCTION LABORATORY	I,II,III	a,b,c,d,e,f,g,h,i,j	0	0	2	1	50	50	100	PC
15TT608	FABRIC STRUCTURE AND DESIGN LABORATORY	I,II,III	a,b,c,d,e,f,g,h,i,j	0	0	2	1	50	50	100	PC
15TT609	TECHNICAL SEMINAR II	I,II,III	i,j	0	0	2	1	50	50	100	EEC
15TT610	MINI PROJECT IV	I,II,III	a-l	0	0	2	1	50	50	100	EEC
15GE611	LIFE SKILLS: APTITUDE II$^{\Phi}$	III	a,b	0	0	2	-	100	-	100	EEC
Total				11	0	10	21	**600**	**500**	**1100**	**-**

$^{\Phi}$ Common to all branches of B.E./B.Tech (Non-Credit Course)

$^{+}$ Common to AE, AU,CE,ME,MTRS,BT,FT,TT, FD (VI Semester) and to CSE,ECE,EEE,EIE,IT (VII Semester)

SEVENTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	Maximum Marks			
		PEOs	**POs**					**CA**	**ES**	**Total**	**Category**
15GE701	ENGINEERING ECONOMICS[$]	III	a,f,g,k,l	3	0	0	3	50	50	100	ES
15TT702	TECHNICAL TEXTILES	I,II,III	a	3	0	0	3	50	50	100	PC
15TT703	NONWOVEN TECHNOLOGY	I,II,III	a,b,c,d,e,g,h,i,j	3	0	0	3	50	50	100	PC
15TT704	TEXTILE INDUSTRY AND MILL MANAGEMENT	I,III	b,e,f	3	0	0	3	50	50	100	PC
	ELECTIVE V	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE VI	-	-	-	-	-	3	50	50	100	PE
15TT707	COMPUTER AIDED TEXTILE AND APPAREL DESIGN LABORATORY	I,II,III	a,b,c,d,e,f,g,h,i,j	0	0	2	1	50	50	100	PC
15TT708	PRODUCT DEVELOPMENT LABORATORY	I,II,III	a,b,c,d,e,g,h,i,j	0	0	2	1	50	50	100	PC
15TT709	MINI PROJECT IV	I,II,III	a-l	0	0	2	1	100	-	100	EEC
15GE710	LIFE SKILLS : COMPETITIVE EXAMS[Φ]	III	a,b,l	0	0	2	-	100	-	100	EEC
Total				12	0	8	21	**600**	**400**	**1000**	**-**

EIGHT SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	Maximum Marks			
		PEOs	**POs**					**CA**	**ES**	**Total**	**Category**
	ELECTIVE VII	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE VIII	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE IX	-	-	-	-	-	3	50	50	100	PE
15TT804	PROJECT WORK	I,II,III	a-l	-	-	-	9	50	50	100	EEC
Total				**-**	**-**	**-**	**18**	**200**	**200**	**400**	**-**

[$] Common to CSE,ECE,EEE,EIE,IT (VI Semester) and to AE, AG,AU,CE,ME,MTRS,BT,FT,TT, FD (VII Semester)

[Φ] Common to all branches of B.E./B.Tech (Non-Credit Course)

Electives

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
LANGUAGE ELECTIVES							
15LE101	BASIC ENGLISH I	II	j	3	0	0	3
15LE102	COMMUNICATIVE ENGLISH I	II	j	3	0	0	3
15LE201	BASIC ENGLISH II	II	j	3	0	0	3
15LE202	COMMUNICATIVE ENGLISH II	II	j	3	0	0	3
15LC203	CHINESE	II	j	3	0	0	3
15LF203	FRENCH	II	j	3	0	0	3
15LG203	GERMAN	II	j	3	0	0	3
15LH203	HINDI	II	j	3	0	0	3
15LJ203	JAPANESE	II	j	3	0	0	3
PHYSICS ELECTIVES							
15PH201	PHYSICS OF MATERIALS	I	a	3	0	2	4
15PH202	APPLIED PHYSICS	I	a	3	0	2	4
15PH203	MATERIALS SCIENCE	I	a	3	0	2	4
15PH204	PHYSICS OF ENGINEERING MATERIALS	I	a	3	0	2	4
15PH205	SOLID STATE PHYSICS	I	a	3	0	2	4
CHEMISTRY ELECTIVES							
15CH201	ENGINEERING CHEMISTRY	I	a	3	0	2	4
15CH202	APPLIED CHEMISTRY	I	a	3	0	2	4
15CH203	APPLIED ELECTROCHEMISTRY	I	a	3	0	2	4
15CH204	INDUSTRIAL CHEMISTRY	I	a	3	0	2	4
15CH205	WATER TECHNOLOGY AND GREEN CHEMISTRY	I	a	3	0	2	4
DISCIPLINE ELECTIVES							
15TT001	LONG STAPLE SPINNING TECHNOLOGY	I,II,III	a,b,d	3	0	0	3
15TT002	TEXTURING TECHNOLOGY	I,II,III	b,k	3	0	0	3
15TT003	APPAREL PRODUCTION PLANNING AND CONTROL	I,II,III	a,b,c,i	3	0	0	3
15TT004	QUANTITATIVE METHODS IN TEXTILES	I,II,III	a,b,c,g,h,i	3	0	0	3
15TT005	PROCESS AND QUALITY CONTROL IN SPINNING AND WEAVING	I,II,III	a,b,c,g,h,i	3	0	0	3
15TT006	THEORY OF SPINNING	I,II,III	a,b,i	3	0	0	3
15TT007	THEORY OF WEAVING	I,II,III	a,b	3	0	0	3

15TT008	ADVANCED KNITTING TECHNOLOGY	I,II,III	a,b	3	0	0	3
15TT009	ADVANCES IN CHEMICAL PROCESSING TECHNOLOGY	I,II,III	a,c,f,g,h,i,j,k	3	0	0	3
15TT010	TEXTILE EFFLUENT TREATMENT	I,II,III	a,b,c,e,g,h,i	3	0	0	3
15TT011	PROCESS AND QUALITY CONTROL IN TEXTILE CHEMICAL PROCESSING	I,II,III	a,c,f,g,h,i,j	3	0	0	3
15TT012	COLOUR SCIENCE	I,II,III	a,b,c,e,g,h,i	3	0	0	3
15TT013	CLOTHING SCIENCE	I,II,III	a,g,h,i,j,k	3	0	0	3
15TT014	PATTERN ENGINEERING	I,II,III	a,b,c,i	3	0	0	3
15TT015	GARMENT PRODUCTION MACHINERY AND EQUIPMENT	I,II,III	a,b,c,i	3	0	0	3
15TT016	MANAGEMENT OF APPAREL UNITS	I,II,III	a,b,c,i	3	0	0	3
15TT017	APPAREL MARKETING AND MERCHANDISING	I,II,III	a,b,c,i	3	0	0	3
15TT018	COATED AND LAMINATED TEXTILES	I,II,III	a,b,c	3	0	0	3
15TT019	NANO TEXTILES	I,II,III	a,c,h,i	3	0	0	3
15TT020	HIGH PERFORMANCE FIBRES	I,II,III	a,b,d,i,k	3	0	0	3
15TT021	TEXTILE COMPOSITES	I,II,III	a,b	3	0	0	3
15TT022	TOTAL QUALITY MANAGEMENT	I,II,III	a,b,c,j,k	3	0	0	3
15TT023	MAINTENANCE MANAGEMENT	I,II,III	a,b,d,e	3	0	0	3
15TT024	INDUSTRIAL ENGINEERING	I,II,III	a,b,c,i	3	0	0	3
15TT025	UTILITIES ENGINEERING	I,II,III	a,b,c	3	0	0	3
15TT026	HOME TEXTILES	I,II,III	a,b,c,d,h,j,k	3	0	0	3
15TT027	MECHANICS OF TEXTILE MACHINES	I,II,III	a,b,c,i	3	0	0	3
ENTREPRENEURSHIP ELECTIVES							
15GE001	ENTREPRENEURSHIP DEVELOPMENT I	II	b,c,d,e,f & k	3	0	0	3
15GE002	ENTREPRENEURSHIP DEVELOPMENT II	II	b,e,h,i,j & k	3	0	0	3
PHYSICAL SCIENCE ELECTIVES							
15GE0P1	NANOMATERIALS SCIENCE	I,II	a	3	0	0	3
15GE0P2	SEMICONDUCTOR PHYSICS AND DEVICES	I,II	a	3	0	0	3
15GE0P3	APPLIED LASER SCIENCE	I,II	a	3	0	0	3
15GE0C1	CORROSION SCIENCE	I,II	a	3	0	0	3
15GE0C2	ENERGY STORING DEVICES AND FUEL CELLS	I,II	a	3	0	0	3
15GE0C3	POLYMER CHEMISTRY AND PROCESSING	I,II	a	3	0	0	3
OPEN ELECTIVES							
15TT0YA	YARN AND FABRIC MANUFACTURE	I,II,III	a,b,c	3	0	0	3
15TT0YB	COLORATION OF TEXTILES	I,II,III	a,f,g,h,i,j	3	0	0	3
15TT0YC	TEXTILES IN ENGINEERING APPLICATION	I,II,III	a,b,c	3	0	0	3
15TT0YD	GENERAL TEXTILE TECHNOLOGY	I,II,III	a	3	0	0	3

ONE CREDIT COURSES							
15TT0XA	COTTON FIBRES: OPTIONS AND ALTERNATIVES	I,II,III	a,b	-	-	-	1
15TT0XB	FANCY YARNS	I,II,III	a,b	-	-	-	1
15TT0XC	DENIM FABRICS AND GARMENTS	I,II,III	a,b	-	-	-	1
15TT0XD	TESTING OF DYES	I,II,III	a,h,i	-	-	-	1
15TT0XE	TESTING OF AUXILIARIES	I,III	d,e	-	-	-	1
15TT0XF	ECO PROCESSING	I,II,III	a,h,j,k	-	-	-	1
15TT0XG	ERECTION AND COMMISSIONING OF TEXTILE MACHINES	I,II,III	a,b	-	-	-	1
15TT0XH	WORKLOAD AND WORK ASSIGNMENTS	I,II,III	a,b	-	-	-	1
15TT0XI	AIR ENGINEERING IN TEXTILE INDUSTRY	I,II,III	a,b	-	-	-	1
15TT0XJ	PRODUCT CERTIFICATION	I,II,III	a,b	-	-	-	1
15TT0XK	ENERGY CONSERVATION IN THE TEXTILE INDUSTRY	I,II,III	a,b	-	-	-	1
ADDITIONAL ONE CREDIT COURSES (I to III Semesters)							
15GE0XA	HEALTH AND FITNESS	-	-	-	-	-	1
15GE0XB	FOUNDATION COURSE IN COMMUNITY RADIO TECHNOLOGY	-	-	-	-	-	1
15GE0XC	VEDIC MATHEMATICS	-	-	-	-	-	1
15GE0XD	INTRODUCTION TO ALGORITHMS	-	-	-	-	-	1
15GE0XE	ETYMOLOGY	-	-	-	-	-	1
15GE0XF	HINDUSTANI MUSIC	-	-	-	-	-	1
15GE0XG	CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING	-	-	-	-	-	1
15GE0XH	AGRICULTURE FOR ENGINEERS	-	-	-	-	-	1
15GE0XI	INTRODUCTION TO DATA ANALYSIS USING SOFTWARE	-	-	-	-	-	1
15GE0XJ	ANALYSIS USING PIVOT TABLE	-	-	-	-	-	1
BRIDGE COURSES							
15TTB01	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING						
15TTB02	POLYMER SCIENCE						

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	7	12	7	3	-	-	-	-	29	17	15%	20%
2	ES	4	9	7	3	-	-	3	-	26	15	15%	20%
3	HSS	6	3	-	-	-	2	-	-	11	6	5%	10%
4	PC	3	-	8	17	16	11	11	-	66	38	30%	40%
5	PE	-	-	-	-	6	6	6	9	27	15	10%	15%
6	EEC	-	-	1	1	2	2	1	9	16	9	10%	15%
	Total	20	24	23	24	24	21	21	18	175	100	-	-

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

15MA101 MATRICES AND CALCULUS 3 2 0 4

Course Objectives

- Interpret the introductory concepts of Matrices and Calculus, which will enable them to model and analyze physical phenomena involving continuous changes of variables
- Summarize and apply the methodologies involved in solving problems related to fundamental principles of Matrices and Calculus.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Analyze the characteristics of a linear system with eigen values and vectors.
2. Identify and model the real time problem using first order linear differential equations.
3. Apply the suitable techniques and solve the higher order ordinary differential equations.
4. Characterize the functions and get the solutions of the unconstrained maxima and minima
5. Evaluate the functions to get the surface area and volume using multiple integral.

Articulation Matrix

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

UNIT I **12 Hours**

MATRICES

Eigen Values and Eigen Vectors of a real matrix - Properties of Eigen Values-Stretching of elastic membranes. Cayley - Hamilton Theorem - Quadratic form: Reduction of a quadratic form to a canonical form.

UNIT II **8 Hours**

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

Leibnitz's Equations - Modelling and solutions using Newtons law of cooling of bodies - solutions to R-L and R-C electric circuits.

UNIT III **13 Hours**

ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Linear differential equations of second and higher order with constant coefficients. Linear differential equations of higher order with variable coefficients: Cauchys linear differential equation - Method of variation of parameters for second order differential equations.

UNIT IV **12 Hours**

MULTIVARIABLE CALCULUS

Functions of Two Variables and their solutions- Total Differential - Derivative of implicit functions- Jacobians Unconstrained maxima and minima.

UNIT V **11 Hours**

MULTIPLE INTEGRALS

Double integration with constant and variable limits-Region of integration -Change the order of integration -Area as double integral in cartesian coordinates. Triple integral in Cartesian coordinates.

FOR FURTHER READING

Applications of mass spring system in ordinary differential equations of higher order

Total: 86 Hours

Reference(s)

1. C. Ray Wylie and C Louis Barrett, Advanced Engineering Mathematics, Sixth Edition, Tata McGraw-Hill Publishing Company Ltd, 2003.
2. Erwin Kreyszig , Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited,New Delhi 2015.
3. Peter V. O Neil , Advanced Engineering Mathematics, Seventh Edition , Cengage Learning India Private Limited, 2012.
4. B.S. Grewal, Higher Engineering Mathematics, Forty Third Edition, Khanna Publications , New Delhi 2014.
5. Glyn James, Advanced Engineering Mathematics, Third Edition,Wiley India, 2014.
6. T.Veerarajan, Engineering mathematics for First Year,Tata McGraw-Hill Publishing company Limited, New Delhi, 2014.

15PH102 ENGINEERING PHYSICS 2 0 2 3

Course Objectives

- Impart knowledge in properties of matter, crystallography and ultrasonics
- Understand the applications of lasers and fiber optics
- Implement the principles of quantum physics in the respective engineering 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 analyse 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. Analyze the concept of properties of matter and apply the same for practical applications
2. Identify the suitable laser source for fiber optic communication applications
3. Analyze the properties of ultrasonic waves and apply the same for day today applications
4. Classify the different types of crystal structures and analyze their properties
5. Apply the Schrodinger wave equation to illustrate the motion of quantum particles

Articulation Matrix

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

UNIT I **8 Hours**

PROPERTIES OF MATTER

Elasticity: elastic and plastic materials - Hooke's law - elastic behavior of a material -stress -strain diagram- factors affecting elasticity. Three moduli of elasticity- Poisson's ratio-torsional pendulum-twisting couple on a cylinder. Young's modulus- uniform bending -non- uniform bending. Viscosity: coefficient of viscosity -streamline and turbulent flow -experimental determination of viscosity of a liquid -Poiseuille's method.

UNIT II **6 Hours**

APPLIED OPTICS

Interference: air wedge- theory- uses- testing of flat surfaces- thickness of a thin wire. Laser: introduction- principle of laser- characteristics of laser- types: CO2 laser -semiconductor laser (homo junction). Fiber optics: principle of light transmission through fiber- expression for acceptance angle and numerical aperture- types of optical fibers (refractive index profile and mode)- fiber optic communication system (block diagram only).

UNIT III **5 Hours**

ULTRASONICS

Ultrasonics: introduction- properties of ultrasonic waves-generation of ultrasonic waves-magnetostriction- piezo electric methods- detection of ultrasonic waves. Determination of velocity of ultrasonic waves (acoustic grating). Applications of ultrasonic waves: SONAR- measurement of velocity of blood flow -study of movement of internal organs.

UNIT IV **5 Hours**

SOLID STATE PHYSICS

Crystal Physics: lattice -unit cell -crystal systems- Bravais lattices- Miller indices- 'd' spacing in cubic lattice- calculation of number of atoms per unit cell, atomic radius, coordination number and packing density for SC, BCC, FCC and HCP structures- X-ray diffraction: Laue's method - powder crystal method.

UNIT V **6 Hours**

QUANTUM MECHANICS

Quantum Physics: development of quantum theory- de Broglie wavelength -Schrodinger's wave equation- time dependent and time independent wave equations- physical significance. Application: particle in a box (1d)- degenerate and non-degenerate states. Photoelectric effect: quantum theory of light work function- problems.

FOR FURTHER READING

Neutrions - expanding universe

1 **1 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **2 Hours**

EXPERIMENT 1

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

3 **2 Hours**

EXPERIMENT 2

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.

4 **2 Hours**

EXPERIMENT 3

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.

5 **2 Hours**

EXPERIMENT 4

Determine the coefficient of viscosity of the given liquid by Poiseulles method.

6 **2 Hours**

EXPERIMENT 5

Form the interference fringes from the air wedge setup and calculate the thickness of the given wire.

7 **2 Hours**

EXPERIMENT 6

By applying the principle of diffraction, determine the wavelength of given laser and the average particle size of lycopodium powder using laser source.

8 **2 Hours**

EXPERIMENT 7

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.

Total: 45 Hours

Reference(s)

1. D. S. Mathur, Elements of Properties of Matter, 5th edition, S Chand & Company Ltd., New Delhi, 2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B. K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd., 2013.

15CH103 ENVIRONMENTAL SCIENCE 2 0 2 3

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)

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.
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. 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														
2		2												
3			3			3	1							
4														
5														

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 process) - 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)

FOR FURTHER READING

Human rights:E - waste and biomedical waste -Identification of adulterants in food materials

1 **2 Hours**

EXPERIMENT 1

General instructions to students for handling the reagents and safety precautions.

2 **4 Hours**

EXPERIMENT 2

Estimation of dissolved oxygen in a water sample/sewage by Winklers method

3 **4 Hours**

EXPERIMENT 3

Estimation of chloride content in water by argentometric method

4 **4 Hours**

EXPERIMENT 4

Estimation of calcium in lime by complexometric method

5 **4 Hours**

EXPERIMENT 5
Estimation of chromium in leather tannery effluents

6 **4 Hours**

EXPERIMENT 6
Determination of percentage purity of washing soda

7 **4 Hours**

EXPERIMENT 7
Estimation of heavy metals in the given solution by EDTA method

8 **4 Hours**

EXPERIMENT 8
Determination of Prussian blue dye concentration by spectrophotometer

Total: 60 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. Ravikrishnan, Environmental Science and Engineering, 5th revised Edition, Sri Krishna Hitech Publishing company (P) Ltd, Chennai, 2010
3. T. G. Jr. Miller, S. Spoolman, 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
5. A. K. De, Environmental Chemistry, 7th Edition , New age international publishers, New Delhi, 2014

15GE105 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

2 0 2 3

Course Objectives

- To understand the basic concepts of electric circuits and magnetic circuits.
- To illustrate the construction and operation of various electrical machines and semiconductor devices.
- To Learn the fundamentals of communication systems.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Apply the fundamental laws to electric circuits and compute the different alternating quantities.
2. Apply the laws of magnetism for the operation of DC motor.
3. Examine the construction and working principle of different AC machines
4. Analyze the different speed control methods of DC motors and special machines.
5. Analyze the performance characteristics and applications of semiconductor devices.

Articulation Matrix

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

UNIT I **7 Hours**

ELECTRIC CIRCUITS

Definition of Voltage, Current, Electromotive force, Resistance, Power & Energy, Ohms law and Kirchoffs Law & its applications - Series and Parallel circuits - Voltage division and Current division techniques - Generation of alternating emf - RMS value, average value, peak factor and form factor-Definition of real, reactive and apparent power.

UNIT II **5 Hours**

DC MACHINES

Introduction of magnetic circuits - Law of Electromagnetic induction, Flemings Right & Left hand rule- Types of induced emf - Definition of Self and Mutual Inductance - DC Motor- Contruction - Working Principle- Applications.

UNIT III **6 Hours**

AC MACHINES

Single Phase Transformer - Alternator - Three phase induction motor - Single phase induction motor - Contruction - Working Principle - Applications.

UNIT IV **5 Hours**

ELECTRICAL DRIVES

Speed control of dc shunt motor and series motor - Armature voltage control - Flux control - Construction and operation of DC servo motor - Construction and operation of DC servo motor stepper motor.

UNIT V **7 Hours**

ELECTRON DEVICES AND COMMUNICATION

Characteristics of PN Junction diode and Zener diode - Half wave and Full wave Rectifiers - Bipolar Junction Transistor - Operation of NPN and PNP transistors - Logic gates - Introduction to communication systems.

FOR FURTHER READING

Voltage Regulator - Stepper motor - Energy meter - SMPS, Satellite and Optical communication.

1 **4 Hours**

EXPERIMENT 1

Analyze the VI characteristics of a fixed resistor and a lamp by varying its temperature.

2 **4 Hours**

EXPERIMENT 2

Apply the voltage division and current division techniques for series and parallel connections of lamp loads.

3 **4 Hours**

EXPERIMENT 3

Understand the concept of electromagnetic induction using copper coil.

4 **4 Hours**

EXPERIMENT 4

Understand the construction and working principle of DC machines.

5 **6 Hours**

EXPERIMENT 5

Determine the VI Characteristics of PN Junction diode and plot the input and output wave shapes of a half wave rectifier.

6 **4 Hours**

EXPERIMENT 6

Realize the working of transistor as an electronic switch through experiments.

7 **4 Hours**

EXPERIMENT 7

Lighting applications using logic gates principle.

Total: 60 Hours

Reference(s)

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall (India) Pvt. Ltd., 2010

3. A. Sudhakar, Shyammohan S Palli, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill, 2010
4. R. S. Sedha, A Textbook of Applied Electronics, S.Chand & Company Ltd, 2013
5. Muthusubramanian & Salivahanan, Basic Electrical and Electronics Engineering and Communication Engineering, Seventh Edition, Tata MCGraw Hill Education Private Limited, 2011

15TT106 POLYMER SCIENCE 3 0 0 3

Course Objectives

- To impart the knowledge on the chemistry of polymers, polymer production and processing methods
- To educate the students on the production, properties of important fibre forming polymers, their applications and properties
- To teach the students on the recycling and reuse of polymer wastes

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 analyse 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.
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. Select suitable polymerization technique(s), methods and additives for synthetic fibres
2. Outline the synthesis and properties of synthetic polymers, and their applications
3. Outline the synthesis and properties of regenerated polymers (fibres)and their applications
4. Suggest the characterisation methods to analyse structure and properties of polymers / fibres
5. Outline the needs of polymer processing and recycling

Articulation Matrix

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

UNIT I **9 Hours**

POLYMERIZATION - MECHANISMS AND TECHNIQUES

Polymer: Definition - Criteria for fibre forming polymers Classification - Polymerization Mechanisms: Chain (Ionic, Radical and Co-ordination - Ziegler Natta) and Step (Condensation) polymerizations and Copolymerization (Ionic, Radical and Condensation). Polymerization Techniques - Bulk, Solution, Suspension, Emulsion, Solid and Gas Phase, Poly condensation Techniques - Melt, Solution and Interfacial polymerization

UNIT II **9 Hours**

POLYMER PRODUCTION:

Polyester (PET, PBT, PTT) and Polyamides (Nylon 6, Nylon 6, 6), Polyacrylonitrile (Acrylic and Modacrylics), Polyurethane Polyethylene (LDPE, HDPE), Polypropylene, Polycarbonate, Polyvinylchloride, Poly (tetrafluoroethylene). Properties and Applications.

UNIT III **9 Hours**

REGENERATED CELLULOSE AND PROTEIN FIBRES

Manufacture of Spinning dope for Viscose, Cuprammonium and Acetate rayon, Modified high wet modulus - Polynosic yarn, Solvent for dissolution: Conventional and eco-friendly - super high wet modulus yarn. Effect of process parameters on polymer properties. Regenerated proteins: Casein and Soyabean.

UNIT IV **9 Hours**

CHARACTERIZATION OF POLYMERS:

Degree of polymerization, Different average molecular weights (Number, Weight and Z-average), Determination of weight average by light scattering, number average by end group analysis, gel permeation chromatography and osmometry and viscosity average by Ubbelhode Viscometer. Thermal characterization of polymers: Principles, methods, interpretation of DSC, TGA and DTGA results.

UNIT V **9 Hours**

POLYMER PROCESSING AND REUSE OF POLYMERS

Additives for Polymers: fillers, Plasticizers, Antioxidants, UV stabilizers, Colouring agents and Additive for functional properties. Polymer Processing Methods: Moulding, Extrusion, Calendaring, Film Casting. Recovery from polyester, nylon polymers. Polyester: Recovery as polymer, recovery as monomers. Nylon: Recovery from liquid waste, solid waste. Reuse of acrylic and polypropylene wastes.

UNIT VI **9 Hours**

SELF STUDY

Basis for selection of polymerization techniques, List of manufacturers of synthetic fibres, Comparison of Regenerated protein fibres with natural protein fibres. DSC and TGA thermograms of PET and Nylon, Effect of additives on properties of polymers

Total: 54 Hours

Reference(s)

1. Joel R. Fried, Polymer Science and Technology, Prentice Hall of India,2003.
2. V. B. Gupta and V. K. Kothari, Manufactured Fibre technology, Chapman & Hall Publication 1997.
3. V. R. Gowariker, N.V. Viswanathan and Jayadev Sreedhar, Polymer Science, New Age Publication Ltd, New Delhi, 2003.

15GE107 WORKSHOP PRACTICE 0 0 2 1

Course Objectives

- To provide hands on training for fabrication of components using carpentry, sheet metal and welding equipment / tools.
- To gain the skills for making fitting joints and household pipe line connections using suitable tools.
- To develop the skills for preparing the green sand mould and to make simple household electrical connection
- To provide hands on training for dismantling and assembling of petrol engines, gear box and pumps.
- To develop the skills for making wood/sheet metal models using suitable tools

Programme Outcomes (POs)

Course Outcomes (COs)

1. Fabricate simple components using carpentry, sheet metal and welding equipment/tools
2. Make fitting joints and household pipe line connections using suitable tools.
3. Prepare green sand mould and make simple household electrical connections using suitable tools
4. Dismantle and assemble petrol engines, gear box and pumps.
5. Make simple models using wood and sheet metal.

Articulation Matrix

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

1 **1 Hours**

EXPERIMENT 1
Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box)

2 **2 Hours**

EXPERIMENT 2
Fabrication of a simple component using thin and thick plates. (Example: Book rack)

3 **1 Hours**

EXPERIMENT 3
Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box].

4 **1 Hours**

EXPERIMENT 4
Prepare a "V" (or) Half round (or) Square joint from the given mild Steel flat.

5 **2 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 **2 Hours**

EXPERIMENT 6

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

7 **2 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 **2 Hours**

EXPERIMENT 8

Dismantling and assembly of Centrifugal Monoblock / Gear Pump / Gear box.

9 **1 Hours**

EXPERIMENT 9

Dismantling and assembly of two stroke and four stroke petrol engine.

10 **1 Hours**

EXPERIMENT 10

Mini Project(Fabrication of Small Components).

Total: 15 Hours

15MA201 VECTOR CALCULUS AND COMPLEX ANALYSIS

3 2 0 4

Course Objectives

- Implement the Complex Analysis, an elegant method in the study of heat flow, fluid dynamics and electrostatics.
- Summarize and apply the methodologies involved in solving problems related to fundamental principles of Calculus viz: Differentiation, Integration and Vectors.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Determine & apply the important quantities associated with vector fields such as the divergence, curl and scalar potential.
2. Apply the theoretical aspects of vector integral calculus in their core areas.
3. Explain the differentiation properties of vectors.
4. Identify the complex functions and their mapping in certain complex planes.
5. Use the concepts of integration to complex functions in certain regions.

Articulation Matrix

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

UNIT I **13 Hours**

VECTOR CALCULUS

Gradient -Divergence -Curl - Directional derivative- Solenoidal -Irrotational vector fields -Line Integral -Surface integrals.

UNIT II **12 Hours**

INTEGRAL THEOREMS OF VECTOR CALCULUS

Green's theorem in a plane- Stoke's Theorem- Gauss divergence theorem- Applications involving cubes and parallelepiped.

UNIT III **11 Hours**

ANALYTIC FUNCTIONS

Analytic Functions- Necessary and Sufficient conditions of Analytic Function- Properties of Analytic function - Determination of Analytic Function using Milne Thompson method -Applications to the problems of Potential Flow.

UNIT IV **11 Hours**

MAPPING OF COMPLEX FUNCTIONS

Physical interpretation of mapping- Application of transformation: translation, rotation, magnification and inversion of multi valued functions - Linear fractional Transformation (Bilinear transformation).

UNIT V **13 Hours**

INTEGRATION OF COMPLEX FUNCTIONS

Cauchy's Fundamental Theorem - Cauchy's Integral Formula - Taylor's and Laurent's series-Classification of Singularities - Cauchy's Residue Theorem.

FOR FURTHER READING

Applications to Electrostatic and Fluid Flow.

Total: 90 Hours

Reference(s)

1. C. Ray Wylie and C. Louis Barrett, Advanced Engineering Mathematics, Tata McGraw-HillPublishing Company Ltd, 2003
2. Erwin Kreyszig , Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited,New Delhi 2015
3. J. A. Brown and R. V. Churchill, Complex Variables and Applications , Sixth Edition, McGraw Hill,New Delhi, 1996
4. B. S. Grewal, Higher Engineering Mathematics, Forty third Edition, Khanna Publications , New Delhi 2014
5. Peter V. O. Neil, Advanced Engineering Mathematics, Seventh Edition ,Cengage Learning India Private Limited, 2012
6. Glyn James, Advanced Engineering Mathematics, Third Edition,Wiley India,2007

15GE205 BASICS OF CIVIL AND MECHANICAL ENGINEERING

3 0 0 3

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.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Illustrate the concepts and fundamental philosophies of Civil Engineering.
2. Classify the components of building with its functions and material qualities.
3. Identify various mechanical properties of materials and illustrate the various manufacturing processes
4. Classify and explain the working principles and operations of Internal Combustion Engines and Refrigeration cycles.
5. Identify different Energy sources and classify types of boilers, turbine and power plants.

Articulation Matrix

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

UNIT I **7 Hours**

INTRODUCTION TO CIVIL ENGINEERING

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

UNIT II **7 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 Beams Lintels Columns Doors and windows Introduction to Green Building and Interior Design

UNIT III **7 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.

UNIT IV **8 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.

UNIT V **8 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.

UNIT VI **8 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.

Total: 45 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

15GE206 COMPUTER PROGRAMMING 3 0 2 4

Course Objectives

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

Programme Outcomes (POs)

Course Outcomes (COs)

1. Develop solutions using problem solving techniques and number system conversions
2. Develop 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 developing 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														
2														
3														
4														
5														

UNIT I **8 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 **9 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 **10 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 **9 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 **9 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 **1 Hours**

EXPERIMENT 1

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

2 **1 Hours**

EXPERIMENT 2

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

3 **1 Hours**

EXPERIMENT 3

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

4 **2 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 **3 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 **2 Hours**

EXPERIMENT 8

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

9 **2 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: 61 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

15GE207 ENGINEERING GRAPHICS 0 0 4 2

Course Objectives

- To learn conventions and use of drawing tools in making engineering drawings.
- To draw orthographic projections of points, line and solids.
- To draw the section of solids and development of surfaces of the given objects.
- To draw the isometric projections and perspective projections of the given solids.
- To introduce CAD software to draw simple two dimensional drawings.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Recognize the conventions and apply dimensioning concepts while drafting simple objects.
2. Draw the orthographic projection of points, line, and solids.
3. Draw the section of solid drawings and development of surfaces of the given objects.
4. Draw the isometric and perspective projection of the given objects.
5. Draw the simple two dimensional drawings using computer aided drawing tool.

Articulation Matrix

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

1 **6 Hours**

CONVENTIONS AND BASIC DRAWINGS

Importance - conventions - ISO and BIS - drawing tools and drawing sheets - lettering, numbering, dimensioning, lines and Symbols-Conic sections - types constructions -ellipse, parabola and hyperbola - eccentricity and parallelogram method.

2 **6 Hours**

ORTHOGRAPHIC PROJECTIONS

Principles - first and third angle projections - Points - first angle projection of points, straight lines - parallel, perpendicular and inclined to one reference plane, solid - cylinders, pyramids, prisms and cones.

3 **6 Hours**

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACE

Section of solids - simple illustrations. Development of surfaces - cylinders, pyramids, prisms, cones and simple truncated objects.

4 **6 Hours**

ISOMETRIC AND PERSPECTIVE PROJECTIONS

Importance - orthographic to isometric projection - simple and truncated solids- perspective projections of simple solids.

5 **6 Hours**

INTRODUCTION TO COMPUTER AIDED DRAWING (NOT FOR END SEMESTER EXAMINATION)

Basics commands of AutoCAD - two dimensional drawing, editing, layering and dimensioning - coordinate Systems -Drawing practice - orthographic views of simple solids using AutoCAD.

Total: 30 Hours

Reference(s)

1. K Venugpoal, Engineering Drawing and Graphics, Third edition, New Age International, 2005.
2. Basant Agrawal, Mechanical drawing, Tata McGraw-Hill Education, 2008.
3. Engineering Drawing Practice for Schools & Colleges, BUREAU OF INDIAN STANDARDS-SP46, 2008.
4. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Charotar Publishing House Pvt. Limited, 2008.
5. K.V.Natarajan, A Text Book of Engineering Graphics, Dhanalakshmi Publishers, 2013.
6. George Omura, Brian C. Benton, Mastering AutoCAD 2015 and AutoCAD LT 2015: Autodesk Official Press, Wiley Publisher, 2015.

15MA301 FOURIER SERIES AND TRANSFORMS 3 2 0 4

Course Objectives

- Understand the concepts of Fourier series, Transforms and Boundary Conditions, 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.
- Summarize and apply the mathematical aspects that contribute to the solution of one dimensional wave equation
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Identify the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series.
2. Formulate a function in frequency domain whenever the function is defined in time domain.
3. Apply the Fourier transform, which converts the time function into a sum of sine waves of different frequencies, each of which represents a frequency component.
4. Classify a partial differential equation and able to solve them.
5. Use the Z-transform to convert a discrete-time signal, which is a sequence of real or complex numbers, into a complex frequency domain representation.

Articulation Matrix

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

UNIT I **12 Hours**

FOURIER SERIES

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

UNIT II **12 Hours**

LAPLACE TRANSFORM

Laplace Transform- Existence Condition -Transforms of Standard Functions - Unit step function, Unit impulse function- Properties- Transforms of Derivatives and Integrals - Initial and Final Value Theorems - Laplace transform of Periodic Functions - Inverse Laplace transforms.

UNIT III **11 Hours**

FOURIER TRANSFORM

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

UNIT IV **11 Hours**

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of Second Order Quasi Linear Partial Differential Equations - Fourier Series Solutions of One Dimensional Wave Equation - One Dimensional Heat Equation - Steady State Solution of Two-Dimensional Heat Equation - Fourier Series Solutions in Cartesian Coordinates.

UNIT V **12 Hours**

Z -TRANSFORM

Z-Transform - Elementary Properties - Inverse Z-Transform - Convolution Method- Partial fraction method - Solution of Difference Equations using Z-Transform.

FOR FURTHER READING

Solutions of one dimensional wave equation and heat equations using Laplace transforms method.

Total: 88 Hours

Reference(s)

1. Larry.C.Andrews and Bhimsen.K.Shivamoggi, Integral Transforms for Engineers, First Edition, PHI Learning, New Delhi, 2007
2. Ian.N.Sneddan, The Use of Integral Transforms, Second Edition, McGraw Hill companies, 1972.
3. E. Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, Inc, Singapore, 2008.
4. Peter V. O. Neil,Advanced Engineering Mathematics, Seventh Edition, Cenage Learning India Private Ltd, 2012.
5. B.S. Grewal, Higher Engineering Mathematics, Fortieth Edition, Khanna Publications, New Delhi 2007.
6. C. Ray Wylie and C. Louis Barrett,Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd, 2003.

15TT302 APPLIED MECHANICS 3 0 0 3

Course Objectives

- To impart knowledge on the static behaviour of particles and structures
- To impart knowledge on 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 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.

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	2													
2	2	1												
3	1	2	2											
4	2	1	2											
5	1	2												

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. Dr.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. Er.R.K.Rajput, Strength of Materials, S.Chand & Company Ltd., New Delhi 2011

15TT303 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 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.
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. Summarize the functional elements, statics and dyanmic charsitics of measurement systems
2. Interpret the construction and operation of resitive, 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 principlemethod 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	3	1	1								1	1	2	3
2	3	1	1								1	1	2	3
3	3	1	1								1	1	2	3
4	3	3	2	1	2						1	1	1	1

5	3	3	2	1	2						1	1	1	1

UNIT I **5 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 **5 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 x-y plotter - magnetic disc storage - data loggers.

UNIT IV **7 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 **7 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 **6 Hours**

EXPERIMENT 2

Light intensity measurement using photo electric transducer.

3 **3 Hours**

EXPERIMENT 3

Measurement of force using strain gauge and load cell

4 **3 Hours**

EXPERIMENT 4

Measurement of temperature using Thermocouple.

5 **3 Hours**

EXPERIMENT 5

Temperature measurement using Thermistor.

6 **6 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

15TT304 ENGINEERING DESIGN CONCEPTS 3 0 0 3

Course Objectives

- To understand the principles of Engineering Design, types of Engineering Materials, overview of manufacturing processes and the process of transformation of an idea to a product.
- To understand the role of Design Engineering in 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 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.
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.
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. Analyse the role of creativity in design process and process of translation of an idea into a product with suitable documentation process.
2. Ability to choose materials and manufacturing process for a given product specification.
3. Summarize the types and applications of different types of drive elements and their lubrication requirements.
4. Explain the role of control systems, sensors, hydraulics and pneumatics in the working of textile machinery.
5. Recognize the need for Engineering and Safety Standards in manufacturing and design,

Articulation Matrix

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

4	1	2	2									3	1	2
5			2			3	2				2	3	2	3

UNIT I **9 Hours**

ENGINEERING DESIGN: CONCEPT TO REALITY

Engineering design introduction.Design process - design interfaces. Creativity: Principles. Presentation: Concept- Function- System - Specification - Production. Design Report. Product life cycle concepts.

UNIT II **9 Hours**

ENGINEERING MATERIALS AND PROCESSES

Metals, Nonmetals,Composites: Properties - Uses and Limitations. Basic manufacturing processes

UNIT III **9 Hours**

MOTIVE POWER

Electric Motors: Types - Characteristics - Applications. Transmission: Gears - Chains - Pulleys. Bearings: Types - Characteristics - Applications. Lubrication: Types - Characteristics - Applications.

UNIT IV **9 Hours**

CONTROL SYSTEMS

Introduction to Control Engineering: Feedback Systems - Sensors and Transducers. Controllers: PID - PLC. Pneumatic and Hydraulics: Elements - Circuits

UNIT V **9 Hours**

ENGINEERING STANDARDS

Standards: Purpose in Design, Manufacturing, Process, Quality and Safety. Fits and Tolerances. Ergonomics. CAD in textile design: Applications

FOR FURTHER READING

IPR & Writing a patent, Textile Composites, Pneumatic Material transportation systems in textile manufacturing, Trouble shooting electrical & electronic circuits, Quality Standards in the textile industry

Total: 45 Hours

Reference(s)

1. Ken Hurst, Engineering Design Principles, Elsevier, 2010.
2. R K Rajput , Engineering Materials, S. Chand & Co, 2008.
3. G K Lal, Fundamentals of Design and Manufacturing ÃƒÂ¢?? A Technicians and Engineers Guide, Narosa Publishing House, 2008.
4. C J Chesmond, Basic Control System Technology , Viva Books Pvt. Ltd, 2001.
5. Andrew Parr, Hydraulics and Pneumatics, Jaico Book House Pvt. Ltd. , 2005.
6. George E Dieter , Engineering Design, McGraw-Hill, 3rd Edition

15TT305 TEXTILE FIBRES 3 0 0 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.

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.

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. Classify the natural fibres based on their origin, characteristics, properties and their applications.
2. Outline the production of bast fibres from different sources, extraction processes and properties of the fibres.
3. Explain the regenerated cellulosic and protein fibres in terms of characteristics, manufacturing, properties and applications.
4. Explain polyamide and polyester fibres in terms of characteristics, manufacturing, properties and applications.
5. Identify fibres using physical, chemical and microscopic methods.

Articulation Matrix

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

3	2	2	1	1			1		2			3		
4	3	2	3	1			2		2			3		
5	3	2	1	2	1		2		2	1		3	2	3

UNIT I **9 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 **9 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 **9 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 **9 Hours**

POLYAMIDE FIBRES AND POLYESTER FIBRE

Classification of Nylon fibres - Manufacture of Nylon 6 - Nylon 66 - Chemical structure and properties - End usesof polyamides -properties and application

Manufacture of polyester - Chemical structure - Physical and chemical properties - End uses.

UNIT V **9 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.

Total: 45 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.

15TT306 SPINNING TECHNOLOGY I **4 0 0 4**

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

UNIT II **9 Hours**

CARD

Objectives of carding process - Design, Constructional Features and working principles of a modern card and card feeding systems. Processing of cotton, manmade fibers 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. Principles of auto levelers. Technological developments

UNIT III **9 Hours**

DRAWFRAME

Objectives of drawframes - Design, Constructional features and working principles of drawframes. Top and bottom roller characteristics and maintenance - Processing of cotton, manmade fibres and blends. Principles of doubling and drafting - theory of friction field - drafting waves and control of fibres. Technological developments.

UNIT IV **9 Hours**

COMBER

Comber preparatory processes: Objectives - characteristics of good lap. Methods of lap preparation - Lap forming machines. Comber: Objectives - Combing cycle - Design, constructional features and working principles of comber machine; Process parameters. Charles Gegauf's 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.

SELF STUDY

Fire protection and safety; Card clothing mounting and maintenance; Developments in Comber Lap Preparation; Developments in Builder motion.
Industry visit: state-of-the-art spinning machinery.

Total: 45 Hours

Reference(s)

1. W. Klein, Rieter Manual of Spinning Volume 1â€“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.

15TT307 SPINNING TECHNOLOGY LABORATORY I

0 0 2 1

Course Objectives

- To impart hands-on practical knowledge about the concepts learnt in the Course, Spinning Technology I
- 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 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.
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	2	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 **5 Hours**

EXPERIMENT 1

Measurement and Calculation of Speeds of Ginning Machine, calculation of ginning outturn.

2 **5 Hours**

EXPERIMENT 2

Measurement and Calculation of Waste (Zone wise), Cleaning Efficiency Calculations in Blowroom Line.

3 **5 Hours**

EXPERIMENT 3

Measurement of speeds of beaters, Settings and Production calculations in Blowroom line.

4 **5 Hours**

EXPERIMENT 4

Card - Draft and Production calculations, Card Waste study (Zone wise) Cleaning Efficiency Calculation.

5 **5 Hours**

EXPERIMENT 5

Drawframe - Draft calculation and Sliver hank Control.

6 **5 Hours**

EXPERIMENT 6

Comber - Speed, Draft calculations and estimation and alteration of Comber noil percentage - Head to head variation and total noil perentage.

7 **5 Hours**

EXPERIMENT 7

Draft, Twist and Production calculations in speed frame.

8 **5 Hours**

EXPERIMENT 8

Characteristics and Estimation of Roving stretch percentage and settings to control roving stretch in speed frame.

9 **5 Hours**

EXPERIMENT 9

Design Experiment
Application Oriented Experiment
Mini Project

Total: 45 Hours

15TT308 TEXTILE MACHINE DRAWING 0 0 2 1

Course Objectives

- 1. 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)

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. 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		3									
2			3		3									
3			3		3									

1 **2 Hours**

EXPERIMENT 1

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

2 **2 Hours**

EXPERIMENT 2

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

3 **2 Hours**

EXPERIMENT 3

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

4 **8 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 **8 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 **8 Hours**

EXPERIMENT 6

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

Total: 30 Hours

15TT309 MINI PROJECT I 0 0 2 1

Course Objectives

- Identify a problem in the field of textiles or related discipline.
- Design, develop, experiment, 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.
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. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools and techniques that contribute to the solution of the project.
4. Prepare report and give oral presentation / demonstrations

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	3	3	2
3									3	3	3		3	
4	3													

Total: 0 Hours

15GE310 LIFE SKILLS: BUSINESS ENGLISH **0 0 2 0**

Course Objectives

- To acquire command in both the receptive skills (Listening and Reading)and the productive skills(Writing and Speaking) of English language
- Employ various types of sentences in business correspondence
- To acquire language skills needed for B2 level of the CEFR/ Common European Framework of Reference for Languages

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen to business conversations and understand specific information and overall idea
2. Read and understand business texts
3. Write coherent business letters, e-mails and reports using appropriate sentence structures and cohesive devices
4. Communicate orally in business situations using necessary verbal and non verbal devices
5. Appear for the Business English Certificate (BEC)Vantage level examination conducted by Cambridge Assessment English

Articulation Matrix

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

1 **15 Hours**

UNIT I LISTENING AND READING

Listening for writing short answers - filling gaps in Listening for writing short answers - filling gaps in sentences - identifying topic, context and function - identify different functions of language in business situations - identify prompts -identify paraphrases of required information
Scanning - reading for gist - understanding sentence structure - error identification - identify paraphrases - cohesive words and phrases - understand the importance of analysing the distractors - identify grammatical and semantic relationships

2 **15 Hours**

UNIT II WRITING AND SPEAKING

Business Emails - notes - memos to colleagues or friends - Giving instructions - explaining a development - asking for comments - requesting information - agreeing to requests - explaining - apologising - reassuring - complaining - describing - summarising - recommending - persuading
Turn-taking - sustaining interaction - initiating - responding - giving personal information - Talking about present circumstances, past experiences and future plans - expressing opinion - speculating - organising a larger unit of discourse - giving information - expressing and justifying opinions - speculating - comparing and contrasting - agreeing and disagreeing

Total: 30 Hours

Reference(s)

1. Whitehead, Russell and Michael Black. Pass Cambridge BEC Vantage Self-Study Practice Tests with Key, Heinle,a part of Cengage Learning, Delhi, 2003.

15MA401 NUMERICAL METHODS AND STATISTICS

2 2 0 3

Course Objectives

- By enrolling and studying this course the students will be able to understand the methods to solve polynomial equations and Implement the mathematical ideas for interpolation numerically
- Summarize and apply the methodologies involved in solving problems related to ordinary and partial differential equations
- Apply the concepts testing of hypothesis in their core areas
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment

Programme Outcomes (POs)

Course Outcomes (COs)

1. Classify the equations into algebraic, transcendental or simultaneous and apply the techniques to solve them numerically
2. Demonstrate and obtain the differentiation and integration of functions using the numerical techniques
3. Obtain the solutions of all types of differential equations, numerically.
4. Apply basic statistical inference techniques, including confidence intervals, hypothesis testing to science/engineering problems.
5. Design an experiment for an appropriate situation using ANOVA technique.

Articulation Matrix

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

UNIT I **6 Hours**

SOLUTION OF EQUATIONS

Solution of algebraic and transcendental equations: 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 II **5 Hours**

INTERPOLATION, DIFFERENTIATIONAND INTEGRATION

Interpolation: Newton's forward and backward interpolation formulae - Numerical differentiation: Newton's forward and backward interpolation formulae.
Numerical integration: Trapezoidal rule- Simpson's rules for single integrals- Two point Gaussian quadrature formula.

UNIT III **7 Hours**

SOLUTIONS OF DIFFERENTIAL EQUATIONS

Solution of first order ordinary differential equations: Fourth order Runge- Kutta method - Solution of partial differential equations: Elliptic equations: Poisson's equation- Parabolic equations by Crank Nicholson method- Hyperbolic equations by explicit finite difference method.

UNIT IV **6 Hours**

TESTING OF HYPOTHESIS

Sampling distributions- Large sample test: Tests for mean- Small sample tests: Tests for mean (t test), F- test- Chi-square test for Goodness of fit and Independence of attributes

UNIT V **6 Hours**

DESIGN OF EXPERIMENTS

Completely randomized design - Randomized block design - Latin square design.

FOR FURTHER READING

Collection of data and use the testing of hypothesis to analyze the characteristics of the data.

Total: 60 Hours

Reference(s)

1. Grewal B. S, Numerical Methods in Engineering and Science with Programms in C & C++, Ninth Edition, Khanna Publications, 2010.
2. Sankara Rao. K, Numerical Methods for Scientists and Engineers, Third Edition, PHI Learning Private Limited, New Delhi, 2009.
3. Gerald C. F and Wheatley P.O, Applied Numerical Analysis, Seventh Edition, Pearson Education, New Delhi, 2004.
4. Johnson R.A, Miller and Freund's Probability and Statistics for Engineers, Seventh Edition, Prentice Hall of India, New Delhi, 2005.
5. Walpole R.E, Myers R.H, Myers R.S.L and Ye K, Probability and Statistics for Engineers and Scientists, Seventh Edition, Pearsons Education, Delhi, 2002.

15TT402 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 analyse 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 can Determine velocity and acceleration of simple mechanisms.
2. Select, design and construct the cam profile graphically based on follower motions.
3. Select and design Friction drives like flat and V-belts for power transmission.
4. Learn the nomenclature of gear and analyze gear trains.
5. Construct and Analyze turning moment diagrams of an engine and understand 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	-	-												
3	-	-												
4	-													
5	-													

UNIT I **9 Hours**

BASICS OF MECHANISMS

Basic concepts of Link, Pair, Chain, Mechanism - Machine and Structure - 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

Introduction - Types of cams and follower - 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 **12 Hours**

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 **6 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 MOMENT DIAGRAM, FLYWHEEL AND BALANCING

Introduction - Turning moment diagram for a single cylinder four stroke Internal Combustion Engines - Fluctuation of Energy.
Introduction to Flywheel (Basics only). Importance of 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, NewYork, 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

15TT403 SPINNING TECHNOLOGY II 3 0 2 4

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 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.
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. Examine the machinery features of ring frames and outline the techniques and procedures for the production of yarns with/without compacting devices.
2. Outline the principles, constructional and operational details of rotor spinning machines.
3. Examine the principles, constructional and operational aspects of air jet spinning machines
4. Evaluate SIRO, SOLO, Core and wrap spinning technologies and demonstrate capability of using them for producing yarns for specific end uses
5. Demonstrate knowledge on the principles, constructional and operational aspects of friction spinning systems.

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 **12 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 **12 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 **12 Hours**

TOW TO TOP YARN CONVERSION 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 - 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: 5-line high drafting system - twin spinning - roller jet spinning - vortex spinning - Applications.

UNIT IV **12 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.

UNIT V **12 Hours**

FRICTION 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.

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

FOR FURTHER READING

Comparison of ring and compact yarn properties, Fibre quality requirements for rotor spinning Comparision of commercially available airjet spinning machines. Twistless and Self-twist spinning, Recycling of wastes and waste handling machines.
Industrial visit to Ring, Rotor, Friction and Airjet spinning industries.

1 **4 Hours**

EXPERIMENT 1

Speeds, draft, twist and production calculations in Ring frame

2 **4 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 **3 Hours**

EXPERIMENT 7

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

8 **3 Hours**

EXPERIMENT 8

Producing 3 different counts in rotor spinning after changing process parameters

Total: 90 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.

15TT404 WEAVING TECHNOLOGY I 4 0 0 4

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 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. Compare and contrast the different types of winding methods and machines in terms of working principles as well as various important settings.
2. Outline 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. Classify the loom motions; outline the principles, constructional and operational aspects of various types of shedding devices.
5. Outine the principles, constructional and operational details of picking, 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 **12 Hours**

WINDING 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. Processing of cotton and blended yarns.

UNIT II **12 Hours**

WEFT WINDING

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

Warping

Objectives - Beam warping machines - sectional warping machine. Processing of cotton and blended yarns.

Sizing

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

UNIT III **12 Hours**

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 **12 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 **12 Hours**

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.

UNIT VI **12 Hours**

FOR FURTHER READING

Package characteristics - Size storage equipments - Positive and negative tappet - Box plan and pattern card for drop box motions.

Total: 72 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 â€“ 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

15TT405 TEXTILE CHEMICAL PROCESSING I 4 0 0 4

Course Objectives

- To impart overall knowledge about preparation of fibre, yarn and fabrics for preparatory and dyeing of textile materials and machinery used.
- To impart overall knowledge about the preparatory and dyeing process and 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 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.
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. Choose bleaching and mercerising techniques
3. Appraise the concepts of colour science and methods of measurement of colour parameters
4. Appraise the principles of dyeing; outline the constructional and operational aspects of 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											3
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: objectives, principles and methods - assessment. Desizing: objectives - hydrolytic and oxidative methods. 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 Colour mixing - 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**

THEORY OF DYEING AND DYEING MACHINES

Dyes - properties - Auxochrome, chromophore and common dye structure - dye-fibre interactions - Substantivity - Affinity - Adsorption isotherms. Rate of dyeing and half dyeing time. 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.

UNIT V **9 Hours**

DYEING

Classification of dyes (Application and chemical structure) - Properties, Mechanism and Application: Direct, Reactive, Acid, Basic, Vat, Disperse, Sulphur, Azoic and Metal complex dyes for Cellulose, PET and Protein fibres. Dyeing of P/C blend. Assessment of dyed materials: light - washing - rubbing (wet and dry) - perspiration - sublimation fastness.

FOR FURTHER READING

Stripping of Dyes - Direct, Reactive, vat, Aicd, Basic and Disperse.

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.

15TT406 MANUFACTURED FIBRE TECHNOLOGY 3 0 0 3

Course Objectives

- To impart knowledge on manufacture of different fibres
- To educate on the post spinning operations of synthetic 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 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.
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. Appraise the principles of synthetic fibre formation and production techniques.
2. Choose speciality fibres for specific end-uses.
3. Evaluate spin finish application techniques, drawing and heat setting.
4. Assess materials, methods and outcome of mass colouration of fibres and texturing of synthetic yarns.
5. Appraise the relationship between structure and properties during spinning manufactured fibres.

Articulation Matrix

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

5	2	2	3	2	2		2		2	1		3	2	3

UNIT I **9 Hours**

SPINNING OF MAN MADE FIBRES

Introduction to fibre forming processes. Melt - Wet- Dry - Dry-Jet - Wet and Gel Spinning of polymeric fibres. Characteristics based fibre classification. 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**

SPECIALITY FIBRES

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

UNIT III **9 Hours**

POST SPINNING OPERATIONS

Spin finishes: Need and composition of spin finish Ã¢?? spin finish application techniques Ã¢?? spin finish for filament Ã¢?? staple fibre production. Drawing: Need for Drawing Ã¢?? Drawing Unit Ã¢?? Spin-draw process Ã¢?? Draw warping. Heat Setting: Need for heat setting

UNIT IV **9 Hours**

MASS COLOURATION, TEXTURING AND TOW CONVERSION

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

UNIT V **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. Solubility of polymers.

FOR FURTHER READING

Fibres produced by melt, dry, wet and Dry-jet-Wet and Gel Spinning methods, Solubility of polymers, Stability and measurement of degree of set, Tow to top and Tow to yarn converters, Nano 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, Fibrechemistry Ã¢?? The Processing of Manmade Fibres, Springer New York Publications, 2004
5. S. P. Mishra, Fibre Science and Technology, New Age International Publication, 2000

15TT407 WEAVING TECHNOLOGY LABORATORY I

0 0 2 1

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 and determination of yarn quality after sizing

2 **4 Hours**

EXPERIMENT 2
Production and Efficiency calculation in Semi Automatic and Automatic Pirn Winder

3 **4 Hours**

EXPERIMENT 3

Create a section in sectional warping machine for a given design

4 **4 Hours**

EXPERIMENT 4

Analysis of Cone and Pirn characteristics and Pirn Building Mechanism.

5 **4 Hours**

EXPERIMENT 5

Dismantling, assembling and setting of Tappet Shedding Motion

6 **4 Hours**

EXPERIMENT 6

Dismantling, assembling and setting of Over Pick Mechanism

7 **4 Hours**

EXPERIMENT 7

Dismantling, assembling and setting of Under Pick Mechanism

8 **4 Hours**

EXPERIMENT 8

Dismantling, assembling and setting of Take-up Mechanism

9 **4 Hours**

EXPERIMENT 9

Design Experiment

10 **4 Hours**

EXPERIMENT 10

Application Oriented Experiment

11 **5 Hours**

EXPERIMENT 11

Mini Project

Total: 45 Hours

15TT408 TEXTILE CHEMICAL PROCESSING LABORATORY I

0 0 2 1

Course Objectives

- To impart practical knowledge in wet processing preparation for textile materials.
- To compare the various processes in pre-treatment carried out for textile materials.
- To test 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 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.
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 **0 Hours**

EXPERIMENT 1

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

2 **0 Hours**

EXPERIMENT 2

Comparison of BAN and Tensile strength of Mercerized Cotton Yarn.

3 **0 Hours**

EXPERIMENT 3

Comparison of hydrogen peroxide and sodium hypochlorite bleached samples for whiteness

4 **0 Hours**

EXPERIMENT 4

Dyeing of cotton using direct and reactive dyes.

5 **0 Hours**

EXPERIMENT 5

Dyeing of wool/silk with acid/basic dyes

6 **0 Hours**

EXPERIMENT 6

Dyeing of polyester with disperse dyes

7 **0 Hours**

EXPERIMENT 7

Dyeing of cotton with vat dyes

8 **0 Hours**

EXPERIMENT 8

Assessment of ISO wash fastness, rubbing and perspiration fastness of fabrics dyed with reactive/direct dyes.

Total: 0 Hours

15TT409 MINI PROJECT II **0 0 2 1**

Course Objectives

- Formulate a real world problem, identify the requirement and develop the design solutions.
- Identify technical ideas, strategies and methodologies.
- Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
- Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
- Prepare report and present oral demonstrations

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.
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. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools and techniques that contribute to the solution of the project.
4. Prepare report and give an oral presentation or demonstrations.

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								3		3	3	3	2
3									3	3	3		3	
4									-			-		

Total: 0 Hours

15GE410 LIFE SKILLS: VERBAL ABILITY 0 0 2 0

Course Objectives

- Read and understand business passages
- Employ various types of sentences in Business Correspondence
- Equip students with strategies for vocabulary development

Programme Outcomes (POs)
Course Outcomes (COs)

1. Read and understand business related articles
2. Identify errors in the given sentences
3. Attempt vocabulary related questions in competitive exams
4. Write coherent business letters, e-mails, reports and proposals
5. Write instructions and descriptions related to business contexts

Articulation Matrix

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

1 **15 Hours**

UNIT 1

Synonyms - Antonyms - Word groups - Verbal analogies - Etymology - Critical Reasoning - Cloze Test - One Word Substitutes - Idioms and Phrases - Text and Paragraph Completion

2 **15 Hours**

UNIT 2

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. Raymond Murphy. English Grammer in use - A self study reference and Practice book for intermediate learners of English IVed. United Kingdom: Cambridge University Press. 2012.
2. Lewis, Norman. Word Power Made Easy. Goyal Saab Publisher, 2011.
3. Baron's the Official Guide for New GMAT Review 2015. New Jersey : John Wiley & Sons, Inc.

15TT501 WEAVING TECHNOLOGY II 3 0 0 3

Course Objectives

- To teach the principles of fabric manufacture using different types of shuttleless weaving machines
- To impart knowledge on the working of different mechanisms and settings in auto and shuttleless looms with their accessories.

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 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. Select type and loom parameters of shuttle automatic looms and projectile looms for the fabric production.
2. Choose type of rapier looms; select loom parameters for fabric production.
3. Plan for air quality and quantity requirements for air jet weaving; choose air-jet loom paramters for fabric production.
4. Plan for waterr quality and quantity requirements for water jet weaving; choose water jet loom and multi-phase loom paremters for fabric production.
5. Select storage and selvedge devices for shuttleless weaving machines.

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 **9 Hours**

PROJECTILE WEAVING MACHINE

Automatic Loom
Different types â€“ Pirn changing mechanism â€“ Temple and eye cutters â€“ Loom drives.
Projectile Weaving Machine
Yarn quality requirements for shuttleless looms â€“ Gripper projectile machines â€“ Working elements and weft insertion cycle in projectile machine â€“ Torsion bar picking mechanism.

UNIT II **9 Hours**

RAPIER WEAVING MACHINE

Classifications Rigid and flexible Single and double Principle of tip and loop transfer Weft insertion cycles Rapier drives salient features. Timing diagrams.

UNIT III **9 Hours**

AIR JET WEAVING MACHINES

Requirements for sley drive in shuttleless weaving â€" Air-jet machines â€" Principle of weft insertion â€" Weft insertion cycle. Air quality and quantity requirements.

UNIT IV **9 Hours**

WATER JET WEAVING MACHINES AND MULTIPHASE WEAVING

Water-jet machines â€" Principle of weft insertion â€" Weft insertion cycle â€" Water quality and quantity requirements.

Working principle â€" Shedding and beat-up mechanisms â€" Circular multiphase weaving machine.

UNIT V **9 Hours**

STORAGE DEVICES AND SELVEDGES

Weft selection, measuring and storage devices and their working principle. Selvedges: Half cross leno ? Full cross leno ? Twisted ? Tuck-in ? Bonded and fused. General
Comparison of shuttleless loom technologies ? Special preparatory technologies for shuttleless looms ? yarn quality requirements ? processing of cotton and blended yarns.

Total: 45 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.

15TT502 STRUCTURE AND PROPERTIES OF TEXTILE FIBRES

4 0 0 4

Course Objectives

- To understand the fundamentals of fibre structure and physical characterization methods.
- To interpret 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.
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.
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. Relate structure and properties of textile materials at micro and molecular level.
2. Apply the concepts of moisture absorption behavior of fibres.
3. Interpret the mechanical performance of fibres.
4. Assess optical and frictional characteristics of textile materials.
5. Analyse electrical and thermal properties of textile fibres.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3					3					2	3	3	
2	2					3					1	3	3	
3	2					3					2	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 â€“ Flax â€“ Jute â€“ Silk â€“ Wool â€“ Viscose â€“ Polyester â€“ Polyamide â€“ Polyacrylonitrile â€“ Polyolefins. Structural models and their limitations. Investigation methods of fibre structure and their limitations. Microscopic methods: SEM, TEM, AFM. X-ray diffraction methods (WAXS, SAXS), Spectroscopic methods: UV-vis. FTIR. Density measurements, sonic modulus.

UNIT II **9 Hours**

MOISTURE ABSORPTION PROPERTIES OF FIBRES

Moisture content and regain - hysteresis - Regain curves - moisture imbibition. Theories of moisture sorption. Measurement methods of regain and their limitations. Molecular explanation of hysteresis.

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 **9 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 various textile fibres and their significance. 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, Lustre index, factors influencing lustre. 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 **9 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: Thermo gravimetric analysis and interpretation of results.

FOR FURTHER READING

Comparison of crystallinity and density values of natural fibres, Calculation of conditioning time, Stress-strain characteristics of an ideal fibre, Significance of friction coefficient, Typical TGA graph of cotton and viscose.

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.

15TT503 TEXTILE CHEMICAL PROCESSING II 3 0 2 4

Course Objectives

- To teach about printing and finishing of textile materials.
- To teach the design, constructional and operational features of textile Printing and Finishing 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 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.
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 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	3	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	3					1	2					3

UNIT I **9 Hours**

PRINTING METHODS

Printing methods: Hand, block, screen, roller, rotary, inkjet, digital, Transfer, garment printing. Working of printing machines. Drawback and advantages of each method. Photoelectric method of screen preparation.Styles of Printing : Direct, Discharge and Resist Style Printing Ingredients: Printing paste- properties and needs.
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 and Pigments

UNIT III **9 Hours**

FINISHING

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

UNIT IV **9 Hours**

FUNCTIONAL FINISHES

Flame retardant finish: Mechanism - durable and non-durable finishes - Assessment methods of FR finish. Water repellent and water proof finishes: Wetting - Contact angle - assessment methods. Soil release
finish: mechanism - soils and soiling, detergency of particulate - 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 standards : BIS.

FOR FURTHER READING

Printing of garment parts, Printing of blends, Role of AATCC / ASTM in quality assessment, Denim washing, Difference between ETP and CETP.

1 **0 Hours**

EXPERIMENT 1

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

2 **0 Hours**

EXPERIMENT 2

Printing of white and colour khadi paste/Pigment.

3 **0 Hours**

EXPERIMENT 3

Tie and Dye / Batik Resist style of colouration using reactive dyes.

4 **0 Hours**

EXPERIMENT 4

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

5 **0 Hours**

EXPERIMENT 5

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

6 **0 Hours**

EXPERIMENT 6

Assessment of flame retardancy of fabric finished with flame retardant.

7 **0 Hours**

EXPERIMENT 7

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

Total: 45 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.

15TT504 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 and interpret the results.
- Choose instruments and testing methods for 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.
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.
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. Select suitable sampling technique for fibres, yarns and fabrics; choose instruments, perform tests of fibres and interpret the results
2. Choose instruments, perform tests of yarns and interpret the results
3. Choose instruments, perform tests of fabrics and interpret the results
4. Demonstrate knowledge of primary and total hand values; perform tests of drape using KES modules
5. Choose instruments, perform tensile tests of textile materials and interpret the results

Articulation Matrix

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

3	1			2	2	1	1			2		1	3	1
4	1			2	2	1	1			2		1	3	1
5	1			2	2	1	1			2		1	3	1

UNIT I **9 Hours**

SAMPLING AND FIBRE TESTING

Sampling

Sampling techniques ÃƒÂ¢?? Sampling: Fibre ÃƒÂ¢?? Yarn ÃƒÂ¢?? Fabric ÃƒÂ¢?? sampling errors. Standard test atmosphere ÃƒÂ¢?? measurement of relative humidity. Fibre Testing

Moisture content and regain: Measurement methods ÃƒÂ¢?? Drying methods ÃƒÂ¢?? Limitations. Fibre Length Measurement: Principles ÃƒÂ¢?? Methods ÃƒÂ¢?? Expression of results. Fibre Fineness Measurement: Principle ÃƒÂ¢?? Methods ÃƒÂ¢?? Factors influencing measurement. Measurement of cotton fibre maturity, trash and micro dust. High Volume instruments ÃƒÂ¢?? Advanced fibre information system.

UNIT II **9 Hours**

YARN TESTING

Yarn count systems Ã¢?? measuring instruments; Yarn Twist: Single Ã¢?? Ply Ã¢?? Cord Ã¢?? Measurement Ã¢?? Contraction. Crimp rigidity. Unevenness Ã¢?? Measurement principles Ã¢?? Methods Ã¢?? results Ã¢?? U% Ã¢?? CV% - Imperfections Ã¢?? irregularity diagrams Ã¢?? spectrograms Ã¢?? Interpretation of results. Seldom occurring faults: Classification Ã¢?? Measurement Ã¢?? Analysis. Hairiness: Measurement principles Ã¢?? Interpretation.

UNIT III **9 Hours**

FABRIC

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

UNIT IV **9 Hours**

FABRIC (CONT.)

Primary and total hand value. KES and FAST modules, results and interpretation. Fabric scanning systems. Measurement of Dimensional stability.

Friction: Measurement methods for fibre, yarn and fabrics.

UNIT V **9 Hours**

TENSILE TESTING

Tensile Testing

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

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

FOR FURTHER READING

Vibration based instruments for fineness measurement; Measurement of Crimp rigidity; Factprs influencing permeability; Factors influencing measurement of friction; Uster Statistics. Industry Visit: HVI, AFIS, Tensojet and KES instruments

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 Ã¢?? 322 Ã¢?? 335, 1999.

15TT507 WEAVING TECHNOLOGY LABORATORY II

0 0 2 1

Course Objectives

- To provide hands-on knowledge on the mechanisms and settings in 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 shuttle and shuttleless looms and their attachments
2. Operate and maintain shuttle and shuttleless looms and their attachments.
3. Dismantle, assemble and set the shuttle looms 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 **5 Hours**

EXPERIMENT 1

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

2 **5 Hours**

EXPERIMENT 2

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

3 **5 Hours**

EXPERIMENT 3

Dismantling, assembling and setting of negative dobbies

4 **5 Hours**

EXPERIMENT 4

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

5 **5 Hours**

EXPERIMENT 5

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

6 **5 Hours**

EXPERIMENT 6

Study of automatic pirn changing mechanism and warp stop motions.

7 **5 Hours**

EXPERIMENT 7

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

8 **5 Hours**

EXPERIMENT 8

Weft accumulator settings and adjustment

9 **3 Hours**

EXPERIMENT 9

Design based Experiment

10 **3 Hours**

EXPERIMENT 10

Application Oriented Experiment

Total: 46 Hours

15TT508 TEXTILE TESTING LABORATORY 0 0 2 1

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 **3 Hours**

EXPERIMENT 1

Fibre length by Baer Sorter and Digital Fibrograph

2 **3 Hours**

EXPERIMENT 2

Moisture regain of fibre sample; Fibre bundle strength by Stelometer

3 **3 Hours**

EXPERIMENT 3
Fibre fineness by air-flow instrument; Linear density of sliver, roving, and yarn;

4 **3 Hours**
EXPERIMENT 4
Single and ply yarn twist and evenness

5 **3 Hours**
EXPERIMENT 5
Single yarn strength; lea strength; impact strength of yarn lea/fabric

6 **3 Hours**
EXPERIMENT 6
Fabric thickness, drape, stiffness and crease recovery

7 **3 Hours**
EXPERIMENT 7
Fabric tensile strength; fabric tearing strength; fabric bursting strength

8 **3 Hours**
EXPERIMENT 8
Fabric abrasion resistance and fabric pilling

9 **3 Hours**
DESIGN
Design Experiment Design Experiment

10 **3 Hours**
EXPERIMENT 10
Mini Project / Application Oriented Practical

Total: 30 Hours

Reference(s)

1. Department Supplied Laboratory manual

15TT509 TECHNICAL SEMINAR I 0 0 2 1

Course Objectives

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.

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. Review technical literature related to textiles or allied disciplines
2. Demonstrate high level of presentation skills
3. Demonstrate mastery over intonation and stress on words and sentences to improve communication

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								3		3	3	3	2
3									3	3	3		3	

Total: 0 Hours

15TT510 MINI PROJECT III **0 0 2 1**

Course Objectives

- Identify a problem in the field of textiles or related discipline.
- Design, develop, experiment, 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.
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. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools and techniques that contribute to obtain the solution of the project.
4. Prepare report and give an oral presentation / demonstrations.

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	3	3	3
3									3	3	3		3	
4	-													

Total: 0 Hours

15GE511 LIFE SKILLS: APTITUDE I 0 0 2 0

Course Objectives

- To expose the undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Distinguish the pattern of coding and decoding.
2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions
3. Evaluate critically the real life situations by resorting and analyzing analytical reasoning of key issues and factors
4. Calculate the percentages and averages

Articulation Matrix

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

1 **3 Hours**

CODING AND DECODING

Introduction - Description of Coding method - Coding patterns - Concepts of Coding and Decoding - Problems involving Coding and Decoding methods

2 **3 Hours**

SEQUENCE AND SERIES

Introduction - Sequences of real numbers - Number and Alphabet series - Description of Number and Alphabet series - Analogy - Odd man out- Power series

3 **3 Hours**

DATA SUFFICIENCY

Introduction to Data Sufficiency - Overview of the wide variety of Data Sufficiency problems - Basic introduction on how to determine what information is sufficient to solve a given problem - Common pitfalls to avoid

4 **3 Hours**

DIRECTION

Introduction to Direction - sense test - Overview of the wide variety of Direction problems -Direction - Plotting diagrams

5 **3 Hours**

PROBLEM ON AGES

Introduction- basic concept - usage of percentage and averages- applications

6 **3 Hours**

ANALYTICAL REASONING

Introduction - basic concept - non verbal analytical reasoning - arrangements

7 **3 Hours**

BLOOD RELATION

Introduction - Basic concept - Kinds of relation - Tree diagram - Relations

8 **3 Hours**

BLOOD RELATION

Introduction -Basic concept - Kinds of relation - Tree diagram - Relations

9 **3 Hours**

VISUAL REASONING

Introduction - Basic concepts - Odd man out - Next series - Mirror image and water image

10 **3 Hours**

SIMPLIFICATIONS

Introduction - Basic concepts - Arithmetic operations -Equation solving methods - Puzzles

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
3. Dr.R S Aggarwal, Quantitative Aptitude, Seventh Revised Edition, S.Chand Publishing Company Ltd, 2013.
4. Edgar Thorpe , Course In Mental Ability And Quantitative Aptitude For Competitive Examinations, Third Edition, Tata McGraw-Hill Publishing Company Ltd, 2013.
5. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, Fifth Edition, Tata McGraw-Hill Publishing Company Ltd, 2013

15GE601 PROFESSIONAL ETHICS 2 0 0 2

Course Objectives

- To understand Human values, ethical theory, codes of ethics, work place responsibilities, rights, engineering experimentation, global issues and contemporary ethical issues.
- To understand personal ethics, legal ethics, cultural associated ethics and engineers responsibility

Programme Outcomes (POs)

Course Outcomes (COs)

1. Explain the human values.
2. Implement the importance of ethics and professionalism.
3. Illustrate the effect of social exprementation.
4. Identify the work place responsiblities and uphold right issues.
5. Construct duties pertaining to global issues.

Articulation Matrix

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

UNIT I **6 Hours**

HUMAN VALUES

Morals and Ethics - Honesty - Integrity - Values - Work Ethic - Civic Virtue - Respect for Others - Living Peacefully - Caring and Sharing - Self-Confidence - Courage - Co-operation - Commitment - Empathy.

UNIT II **6 Hours**

ENGINEERING ETHICS AND PROFESSIONALISM

Scope of 'Engineering Ethics'- Variety of moral issues - Types of inquiry - Accepting and sharing responsibility - Ethical dilemmas - Moral autonomy - Kohlberg's and Gilligan's theory - Consensus and controversy - Profession and Professionalism - Models of Professional Roles - Right action theories - Senses of corporate responsibility - Codes of ethics: Importance - justification - limitation - Abuse - Sample codes NSPE - IEEE - Institution of Engineers (India).

UNIT III **6 Hours**

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - Engineers as responsible experimenters - Balanced outlook on law - Cautious optimism - Safety and risk - Assessing and reducing risk - Safe exits - The Challenger case study - Bhopal Gas Tragedy - The Three Mile Island and Chernobyl.

UNIT IV **6 Hours**

WORKPLACE RESPONSIBILITIES AND RIGHTS

Fundamental Rights - Responsibilities and Duties of Indian Citizens - Teamwork - Ethical corporate climate - Collegiality and loyalty - Managing conflict - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - Occupational crime - Professional rights - Employee rights.

UNIT V **6 Hours**

GLOBAL ISSUES

Multinational corporations: Technology transfer and appropriate technology - International rights - promoting morally just measures - Environmental ethics: Engineering, ecology - economics - Human and sentient centred - and bio and eco centric ethics - Computer ethics and internet - Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership.

FOR FURTHER READING

The Challenger case study - Bhopal Gas Tragedy - The Three Mile Island and Chernobyl case studies - Fundamental Rights, Responsibilities and Duties of Indian Citizens -Sample code of ethics like IETE, ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management.

Total: 30 Hours

Reference(s)

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.
2. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
3. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi,2006.
4. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey, 2004.
5. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics - Concepts and Cases, Wadsworth Thompson Learning, United States, 2005.
6. http://www.slideworld.org/slidestag.aspx/human-values-and- Professional-ethics

15TT602 KNITTING TECHNOLOGY 3 0 0 3

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. Select pattern mechanisms in flat knitting for flat knitted structures.
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

UNIT I INTRODUCTION

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

UNIT II 9 Hours

UNIT II 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**

UNIT III 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**

UNIT IV 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**

UNIT V 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.

FOR FURTHER READING

Comparison of warp and weft knitted fabrics; Fabric defects -Causes and Remedies; Computer controlled knitting machines; Quality control in warp knitting; Production Calculations. Industry Visit: Knitting factories

Total: 45 Hours

Reference(s)

1. David J Spencer, Knitting Technology, 3rd Edition, Wood head Publishing, 2001.
2. N. Anbumani, Knitting â€“ 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.

15TT603 GARMENT TECHNOLOGY 3 0 0 3

Course Objectives

- To teach principles and practice of apparel manufacturing.
- To impart knowledgeon 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 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.
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	3		3											2
3	3	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 Ã¢?? Types of defects. Common fabric problems for apparel manufacturers.

UNIT II **9 Hours**

CUTTING

Basics of Pattern making and grading.Introduction to cutting - Marker planning: requirements - Efficiency Marker making - Cut order planning.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. 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

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.

SELF STUDY

Industrial Engineering in apparel production - production planning and control - fabric selection criteria.

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.

15TT604 FABRIC STRUCTURE AND DESIGN 3 0 0 3

Course Objectives

- To teach the basics of woven fabric designand its influence on fabric properties
- To teach the different weaves and methods of production.
- To impart knowledge on colour theory and application to woven 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 analyse 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 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		3

UNIT I **9 Hours**

BASIC WEAVES

Elements of fabric design: Design, draft , peg plan, repeat. Plain, Twill, Satin, Sateen and Derivatives. Ordinary and Brighton honeycomb ÃƒÂ¢?? Huck-a-back and modification ÃƒÂ¢?? Mock leno ÃƒÂ¢?? Distorted mock leno ÃƒÂ¢?? Crepe weaves.Cloth geometry ÃƒÂ¢?? Cover factor

UNIT II **9 Hours**

SPECIAL WEAVES

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

UNIT III **9 Hours**

ORNAMENTAL WEAVES

Gauze and Leno weaves: Russian Cord ÃƒÂ¢?? Net Leno ÃƒÂ¢?? Madras Muslin structures. Ornamentation structures: Damasks ÃƒÂ¢??BrocadesÃƒÂ¢??TapestryÃƒÂ¢??SwivelÃƒÂ¢??Lappet. Applications of special jacquards: Self twilling ÃƒÂ¢?? Sectional ÃƒÂ¢?? Inverted hook ÃƒÂ¢?? Cross border jacquards.

UNIT IV **9 Hours**

PILE AND DOUBLE CLOTH

Pile fabrics Ã¢?? Warp pile Ã¢?? Fast wire pile Ã¢?? Terry weaves Ã¢?? Terry stripes and checks Ã¢?? Weft Pile Ã¢?? Plain back and Twill back velveteen Ã¢?? Lashed Pile Corduroy Ã¢?? Weft plush.

Double cloth: Classification Ã¢?? types of stitches Ã¢?? wadded double cloth Ã¢?? warp and weft wadded double cloth Ã¢?? centre warp and weft stitched double cloth.

UNIT V **9 Hours**

COLOUR THEORY AND DROP DESIGNS

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

FOR FURTHER READING

Methods and processes of producing crepe fabrics, Weaves for trouser materials - Geographic locations of carpetproduction in India, Silk Sarees.

Total: 45 Hours

Reference(s)

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

15TT607 PATTERN MAKING AND GARMENT CONSTRUCTION LABORATORY

0 0 2 1

Course Objectives

- To impart hands-on experience on pattern drafting
- To teach the students about the types of seams and stitches, sewing threads and their quality.
- To impart knowledge on various garment parts and their variations
- To impart 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 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.
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. Draft pattern for the given measurements.
2. Evaluate properties of stitches and seams.
3. Apply different embroidery stitches on apparel.

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

1 **0 Hours**

EXPERIMENT 1
Development of patterns forplain shirt

2 **0 Hours**

EXPERIMENT 2
Development of patterns for Blouse and baby frock

3 **0 Hours**

EXPERIMENT 3
Development of patterns for menÃ¢??s trouser

4 **0 Hours**

EXPERIMENT 4
Development of patterns for Salvarkameez

5 **0 Hours**

EXPERIMENT 5

Development of graded patterns Ã¢?? Plain shirt/Ladies pants

6 **0 Hours**

EXPERIMENT 6

Preparing an embroidery design using computerised embroidery machine

7 **0 Hours**

EXPERIMENT 7

Preparing samples for seams and seam finishes

8 **0 Hours**

EXPERIMENT 8

Construction of menÃ¢??s wear / womenÃ¢??s wear

Total: 0 Hours

15TT608 FABRIC STRUCTURE AND DESIGN LABORATORY

0 0 2 1

Course Objectives

- To teach the structure of different weaves.
- To impart knowledge on how different types of fabric parameters can be used for designing fabrics given an application.
- To provide fundamentals of colour theory in order to apply in fabric design and construction

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.
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. Construct Design, Draft and Lifting Plans for different weaves
2. Analyse the designs using a combination of weaves and colours
3. Analyse the structures and fabric parameters of different types of knitted fabrics

Articulation Matrix

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

1 **0 Hours**

EXPERIMENT 1
Plain / Twill / Satin / Sateen Weaves

2 **0 Hours**

EXPERIMENT 2
2. Honey comb weave, Huck-a-Back weave

3 **0 Hours**

EXPERIMENT 3
3. Extra Warp / Extra Weft

4 **0 Hours**

EXPERIMENT 4
4. Pile Fabrics (Warp

5 **0 Hours**

EXPERIMENT 5

Analysis of Backed Fabric

6 **0 Hours**

EXPERIMENT 6

Analysis of Double Cloth

7 **0 Hours**

EXPERIMENT 7

7. Mock Leno, Bedford cords

8 **0 Hours**

EXPERIMENT 8

8. Knitted : Single Jersey, Interlock, Rib Structures.

Total: 0 Hours

15TT609 TECHNICAL SEMINAR II 0 0 2 1

Course Objectives

- Review technical literature related to textiles or allied disciplines
- Demonstrate high level of presentation skills
- Demonstrate mastery over intonation and stress on words and sentences to improve communication

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.
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. Review technical literature related to textiles or allied disciplines
2. Demonstrate high level of presentation skills
3. Demonstrate mastery over intonation and stress on words and sentences to improve communication

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								3		3	3	3	2
3									3	3	3		3	

Total: 0 Hours

15TT610 MINI PROJECT IV **0 0 2 1**

Course Objectives

- Identify a problem in the field of textiles or related discipline.
- Design, develop, experiment, 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.
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. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools and techniques that contribute to obtain the solution of the project.
4. Prepare report and give an oral presentation / demonstrations.

Articulation Matrix

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

Total: 0 Hours

15GE611 LIFE SKILLS: APTITUDE II 0 0 2 0

Course Objectives

- The undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values

Programme Outcomes (POs)
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. Evaluate the Counting techniques, Permutation and Combination, Recursion and generating functions

Articulation Matrix

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

1 **3 Hours**

UNIT 1 NUMBER SYSTEMS

Introduction - definition- classification on Numbers -power cycles and remainders - short cut process - concept of highest common factor - concept of least common multiple - divisibility - number of zeros in an expression

2 **3 Hours**

UNIT 2 PERCENTAGES

Introduction - definition and Utility of percentage - importance of base/denominator for percentage calculations - concept of percentage values through additions - fraction to percentage conversion table

3 **3 Hours**

UNIT 3 AVERAGES

Introduction - average of different groups - addition or removal of items and change in average-replacement of some of the items

4 **3 Hours**

UNIT 4 RATIO, PROPORTIONS AND VARIATION

Introduction- Ratio- properties-dividing a given number in the given ratio - comparison of ratios - proportions - useful results on proportion- continued proportion - relation among the quantities more than two - variation

5 **3 Hours**

UNIT 5 PROFIT AND LOSS

Gain/Loss and percentage gain or percentage loss-multiplying equivalents to find sale price - relation among cost price, sale price, gain/loss and percentage gain or percentage loss - an article sold at two different selling price - two different articles sold at same selling price - percentage gain or percentage loss on selling price - percentage gain or percentage loss on whole property

6 **3 Hours**

UNIT 6 TIME AND WORK

Introduction - Basic concepts -Concepts on working with different efficiency - Pipes and Cisterns - Work Equivalence (Man Days) -Alternative approach

7 **3 Hours**

UNIT 7 TIME, SPEED AND DISTANCE

Definition - Basics of Time, Speed and Distance - Relative speed - Problems based on Trains? Problems based on Boats and Streams -Problems based on Races - time taken with two difference modes of transport - time and distance between two moving bodies

8 **3 Hours**

UNIT 8 PERMUTATION AND COMBINATION

Definition - Fundamental rules - Theorems on Permutation - Theorems on Combination

9 **3 Hours**

UNIT 9 PROBABILITY

Concept and importance of probability - underlying factors for Real- Life estimation of probability - Basic facts about probability - some important consideration while defining event.

10 **3 Hours**

UNIT 10 MIXTURES AND ALLIGATION

Definition - alligation rule - mean value (cost price) of the mixture - some typical situations where allegation can be used.

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
3. Dr.R S Aggarwal, Quantitative Aptitude, Seventh Revised Edition, S.Chand Publishing Company Ltd, 2013.
4. Edgar Thorpe , Course In Mental Ability And Quantitative Aptitude For Competitive Examinations, Third Edition, Tata McGraw-Hill Publishing Company Ltd, 2013
5. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, Fifth Edition, Tata McGraw-Hill Publishing Company Ltd, 2013

15GE701 ENGINEERING ECONOMICS 3 0 0 3

Course Objectives

- To introduce the concepts of micro, macro economic systems and business decisions in organizations.
- To acquire knowledge on laws of demand & supply and methods of forecasting the demand
- To emphasis the systematic evaluation of the costs, breakeven point for return on economics and diseconomies
- To acquaint in pricing methods, payback and competition in modern market structure
- To obtain knowledge on macro economics, various taxes and financial accounting procedures

Programme Outcomes (POs)

Course Outcomes (COs)

1. Explain the micro economic environment for creating a favourable business environment.
2. Make use of the major concepts and techniques of engineering economic analysis in real time applications.
3. Compare the cost of multiple projects by using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
4. Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
5. Examine and evaluate the issues in macro-economic analysis.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Introduction to Micro and Macro economics - Kinds of Economic Systems - Production Possibility Frontier - Opportunity Cost - Objective of Organizations - Kinds of Organization.

UNIT II **9 Hours**

DEMAND AND SUPPLY

Functions of Demand and Supply - Law of diminishing Marginal Utility - Law of Demand and Supply - Elasticity of Demand - Demand Forecasting Methods - Indifference curve.

UNIT III **9 Hours**

PRODUCTION AND COST

Production Function - Returns to Scale - Law of Variable Proportion - Cost and Revenue concepts and Cost Curves - Revenue curves - Economies and Dis-economies of scale - Break Even point.

UNIT IV **9 Hours**

MARKET STRUCTURE

Market Structure - Perfect Competition - Monopoly - Monopolistic - Oligopoly - Components of Pricing - Methods of Pricing - Capital Budgeting IRR - ARR - NPV - Return on Investment - Payback Period.

UNIT V **9 Hours**

INTRODUCTION TO MACRO ECONOMICS AND FINANCIAL ACCOUNTING

National Income - Calculation Methods - Problems - Inflation - Deflation - Business Cycle - Taxes - Direct and Indirect Taxes - Fiscal and monetary policies.

FOR FURTHER READING

Nature and characteristics of Indian Economy - Role and functions of Central bank - LPG - GATT - WTO.

Total: 45 Hours

Reference(s)

1. A Ramachandra Aryasri and V V Ramana Murthy, Engineering Economics and Financial Accounting, Tata McGraw Hill Publishing Company Limited, New Delhi, 2006.
2. V L Samuel Paul and G S Gupta,Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Limited, New Delhi, 1981.
3. R Kesavan, C Elanchezhian and T Sunder Selwyn, Engineering Economics and Financial Accounting, Laxmi Publication (P) Ltd, New Delhi, 2005.
4. S N Maheswari, Financial and Management Accounting, Sultan Chand
5. V L Samuel Paul and G S Gupta, Managerial Economics-Concepts and Cases

15TT702 TECHNICAL TEXTILES 3 0 0 3

Course Objectives

- To educate on the physical and chemical properties of fibres used in technical textiles.
- To teach the manufacturing technologies of technical textiles.
- To provide an overview on the applications 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 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.
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. Classify technical textiles based on properties and their applications.
2. Explain types of geotextiles (raw materials, manufacturing), their functionality and applications with life cycle assessment.
3. Summarize the properties of various natural as well as synthetic polymers and textile structures used in medical and protective textiles.
4. Evaluate the techniques of filtration and the textile structures used in filtration processes.
5. Choose engineered textiles for automotives, architecture, agriculture, packaging and footwear 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	3	2		1			2		1	2		3		

3	2	2	3	1			1		2			3		
4	3	2	3	1			2		2			3		
5	2	2	3	1	2		2		2	1		3	2	3

UNIT I **9 Hours**

INTRODUCTION

Classification - products- High strength and modulus organic fibres High chemical and thermal resistance organic fibres. High performance inorganic fibres Ultra fine and Novelty fibres. Technical Yarns- fabrics structures. Textile Composites.

UNIT II **9 Hours**

GEO TEXTILES

Types of materials. Application of geo-synthetics. Functions and application areas of geo-textiles. Fibres and fabric selection criteria for geo-textile applications. Mechanics of reinforcement, filtration and drainage by geotextiles. Soil characteristics. Methods of long term prediction of geo-textile life and survivability in soil.

UNIT III **9 Hours**

MEDICAL TEXTILES AND PROTECTIVE TEXTILES

Polymer and textile based techniques used for medical applications - non-implantable materials - implantable biomedical devices - Extra corporeal devices - Hygiene and healthcare products.

Fire protection - Ballistic protective clothing - Camouflage textiles - NBC protection.

UNIT IV **9 Hours**

INDUSTRIAL TEXTILES

Filtration: Textile and other filter media for dry and wet filtration. Mechanisms of separation. Requirements for good filter media and filtration. Fibre and fabric selection for filtration. Types, method of production and applications of cords, ropes and belts.

UNIT V **9 Hours**

AUTOMOTIVE TEXTILES AND OTHER APPLICATIONS

Applications of textiles in automobiles-tyre cords, airbags and seat belts-methods of production and properties of textiles used in these applications.

Functional requirements and types of textiles used for paper making, agricultural, architecture, packaging and foot wear

FOR FURTHER READING

Braided structures and their technical applications; Textiles for crop covers, bird netting, shades, soil mats; Aerospace textiles and spacesuits.

Total: 45 Hours

Reference(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.
3. Alagirusamy and A. Das, Technical Textile Yarns, CRC press, 2010.
4. P. W. Harrison, The Design of Textiles for Industrial Applications, Textile Institute, Manchester, 1998.

5. Pushpa Bajaj and A. K. Sengupta, Industrial Applications of Textiles for Filtration and Coated Fabrics, Textile Progress Vol.14, 1992.
6. Jarmila Svedova, Industrial Textiles, Elsevier Science Publishing Co Inc. New York, 1990.

15TT703 NONWOVEN TECHNOLOGY 3 0 0 3

Course Objectives

- To teach fundamentals of the various production processes in the manufacture of nonwovens
- To impart knowledge on the different methods of finishing nonwovens
- To enumerate 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.

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.

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. Choose appropriate web laying techniques with appropriate fibres.
2. Select web bonding techniques for specific end use product.
3. Choose nonwoven finish(es) for a given end use application.
4. Characterize nonwovens with appropriate methods.
5. Suggest suitable nonwoven technique(s) for producing nonwovens.

Articulation Matrix

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

UNIT I **9 Hours**

FIBER SELECTION AND WEB FORMATION

Nonwoven classifications - manufacturing processes - properties and applications - environmental considerations. Raw materials for the production of nonwoven: natural fibers -animal fibres - chemical fibres. Web forming: Dry lay (carding, air laid and spun laid)and wet lay.

UNIT II **9 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. Thermal bonding: Hot air -Heat setting - Thermal calendar-Ultrasound. Chemical 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 -ntistatic agents - antimicrobial or biocidal finishes - flameproof finishes -waterproof finishes - softeners- stiffeners.

UNIT IV **9 Hours**

TESTING

Standards and specifications.Testing of raw materials to finished fabrics. Testing process related to end use: hygiene and medical products - household textiles.

UNIT V **9 Hours**

APPLICATIONS

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

FOR FURTHER READING

Techno economics of nonwovens, Foam and spray bonding, Cohesive bonding,UV stabilisers, Application in apparels,Testing process related to end use: Protective clothing, filter fabricsandgeononwovens. Engineering nonwovens for specific end uses.

Total: 45 Hours

Reference(s)

1. Wilhelm Albrecht, Nonwoven Fabrics, WILEY-VCH VerlagGmbh& 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.

15TT704 TEXTILE INDUSTRY AND MILL MANAGEMENT

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)

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 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.
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 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.

Course Outcomes (COs)

1. Characterise 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		2	2	2	2	2	
4	2	2	2		2								2	
5						2	2	2	2				2	

UNIT I **9 Hours**

TEXTILE INDUSTRY

Global scenario Ã¢?? Indian textile Industry Ã¢?? Indian Textile Policy Ã¢?? Trade policy Ã¢?? Fiscal policy Ã¢?? NTC Ã¢?? STC Ã¢?? Textile committee Ã¢?? National Hand loom Development Corporation Ã¢?? Mills association Ã¢?? Research institutions Ã¢?? Technical Textile Units Ã¢?? 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) Ã¢?? Textile Workers Rehabilitation Fund Scheme Ã¢?? Group Work Shed Scheme Ã¢?? Comprehensive Powerloom Cluster Development Scheme Ã¢?? Group Insurance scheme Ã¢?? Scheme for Integrated Textile Parks Ã¢?? Hank Yarn Obligation (HYO) Technology Missions for Technical textiles

UNIT III **9 Hours**

MILL ORGANIZATION AND PLANNING

Organizational Structure and Functioning of Centralized and Decentralized Sectors: Spinning Ã¢?? Weaving Ã¢?? Composite mill Ã¢?? Chemical processing Units. ERP Ã¢?? MIS Ã¢?? Cotton Purchase Practices Ã¢?? Inventory control Ã¢?? Spin plan Ã¢?? Weave plan Ã¢?? Product costing Ã¢?? Managerial responsibilities. Selection of site for textile mills Ã¢?? Various types of buildings.

UNIT IV **9 Hours**

UTILITIES

Power requirements for spinning, weaving, Knitting and Garment machinery Ã¢?? Amenities required Ã¢?? Ventilation, Humidification systems Ã¢?? RH and temperature of various departments. Lighting types Ã¢?? Intensity requirements.

UNIT V **9 Hours**

PERSONNEL AND MARKETING MANAGEMENT

Planning Ã¢?? Selection Ã¢?? Training Ã¢?? Welfare safety Ã¢?? Factory act Ã¢?? Industrial dispute act Ã¢?? Trade union act Ã¢?? Bonus act Ã¢?? ESI, wage structure in textiles and apparel industry Ã¢?? Categories of operatives in textile mills Ã¢?? HOK Ã¢?? OHS. Marketing channel Ã¢?? Physical distribution Ã¢?? Roles and responsibility of personal department in a textile industry.

FOR FURTHER READING

Selection and balancing of machinery Ã¢?? Machinery layout Ã¢?? Technical specifications. Tamil Nadu Industrial Investment Corporation: Small and Medium Enterprises fund. Government policies; taxes and tariff structure; power scenario and energy management in textile mills. Global markets centre of textile Ã¢?? International trade and documentation processes.

Total: 45 Hours

Reference(s)

1. 1. V. D. Dudeja, Management of Textile Industry, Textile Trade Press, Ahmedabad 1990.
2. 2. A. Ormerod, Textile Product Management, The Textile Institute, Manchester 1992.

3. 3. Handbook of Import and Export Procedures, Textile CommissionerÃ¢??s Office Reports, Government of India, Ministry of Textiles, Government of India Publications (2005 Ã¢?? 2010).

15TT707 COMPUTER AIDED TEXTILE AND APPAREL DESIGN LABORATORY **0 0 2 1**

Course Objectives

- To teach the application of computers in the field of fabric structure, woven design and garment design, pattern making and grading.
- To impart hands-on experience in the relevant software

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. Apply CATD software to simulate different types woven fabrics with multiple colours.
2. Apply CATD software 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 **3 Hours**

EXPERIMENT 1

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

2 **3 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 **3 Hours**

EXPERIMENT 3

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

4 **3 Hours**

EXPERIMENT 4

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

5 **3 Hours**

EXPERIMENT 5

Multi layer design â€“ extra warp Weft design concepts

6 **3 Hours**

EXPERIMENT 6

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

7 **3 Hours**

EXPERIMENT 7

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

8 **3 Hours**

EXPERIMENT 8

Lay planning for knitted and woven garments

Total: 24 Hours

15TT708 PRODUCT DEVELOPMENT LABORATORY **0 0 2 1**

Course Objectives

- To demonstrate working of textile machines and equipment
- To select appropriate process parameters and set the machines
- 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 appropriate process parameters to produce a textile product.
2. Choose sequence of operations to produce particular end product.
3. Demonstrate the ability to develop textile products.

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: 0 Hours

15TT709 MINI PROJECT V **0 0 2 1**

Course Objectives

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.

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. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools and techniques that contribute to obtain the solution of the project.
4. Prepare report and give an oral presentation / demonstrations.

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								3		3	3	3	2
3									3	3	3		3	
4	-													

Total: 0 Hours

15GE710 LIFE SKILLS : COMPETITIVE EXAMS 0 0 2 0

Course Objectives

- Understand the concepts of applied mechanics, theory of machines and design.
- Understand the concepts of fluid mechanics and thermal engineering.
- Understand the concepts of materials, manufacturing and industrial engineering.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Solve the problems related to applied mechanics, Theory of Machines and Design concepts
2. Solve the problems related to Fluid Mechanics and Thermal Engineering
3. Explain the concepts of Materials, Manufacturing and Industrial Engineering.

Articulation Matrix

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

1 **10 Hours**

UNIT 1

Engineering Mechanics-Statics and Dynamics, Mechanics of Materials- deflection of beams, testing of materials, Theory of Machines- Kinematics and Dynamics, Vibrations, Machine Design- design of machine elements, shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

2 **10 Hours**

UNIT 2

Fluid Mechanics, Thermodynamics, Heat-Transfer-conduction, convection and radiation, Power Engineering: Air and gas compressors, I.C. Engines, refrigeration, air-conditioning, Turbomachinery.

3 **10 Hours**

UNIT 3

Engineering Materials, Casting, Forming and Joining Processes, Machining and Machine Tool Operations, Metrology and Inspection, Computer Integrated Manufacturing, Production Planning and Control, Inventory Control, Operations Research.

Total: 30 Hours

Reference(s)

1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India Learning Pvt. Ltd, New Delhi, 2010
2. Y. Cengel and Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi,2003.
3. R.K. Bansal, A Textbook of Fluid Mechanics and Machinery, Laxmi Publications Ltd., New Delhi, Revised Ninth edition, 2014.
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2010.
5. Beer, Johnston, Mazurek, Cornwells and Sanghi, Vector Mechanics for Engineers: Statics, Dynamics, 10th Edition, Tata McGraw Hill - Noida, Uttar Pradesh, 2013

15TT804 PROJECT WORK 0 0 0 9

Course Objectives

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 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.
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. Formulate a real world problem, project's goals and criteria for completion.
2. Identify the various tasks of a project and methods to fulfill them.
3. Preparation of standard reports and presentations.

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

Total: 0 Hours

15LC203 CHINESE 3 0 0 3

Course Objectives

- To help students acquire the basics of Chinese language.
- To teach the student show to converse in Chinese in various situations.
- To teach Chinese cultural facets and social etiquettes to the students.

Programme Outcomes (POs)

Course Outcomes (COs)

1. Identify Initials and Finals of Chinese Alphabet.
2. Recognise four different tones in a spoken Chinese sentence.
3. Read Mandarin Chinese through Pinyin.
4. Form sentences using basic Chinese vocabulary.
5. Listen and understand basic Chinese conversation

Articulation Matrix

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

UNIT I **9 Hours**

NÃ‡?HÃ‡?O-Ã„Â½Â Ã…Â¥Â½

XuÃƒÂ©huÃƒÂ¬wÃƒÂ¨nhÃƒÂ²u de jÃ„Â«bÃ„?nbiÃ‡?odÃƒÂ¡yÃƒÂ²ngyÃ‡? - Ã¥Â-Â¦Ã¤Â¼?Ã©?Â®Ã¥??Ã§??Ã¥?ÂºÃ¦?Â¬Ã¨Â¡Â¨Ã¨Â¾Â¾Ã§?Â¨Ã¨Â¯Â ; XuÃƒÂ©huÃƒÂ¬jiÃƒÂ¨shÃƒÂ ozÃƒÂ¬jÃ‡? de xÃƒÂ¬ngmÃƒÂng, guÃƒÂ³jÃƒÂ - Ã¥Â-Â¦Ã¤Â¼?Ã¤Â»?Ã§Â»?Ã¨?ÂªÃ¥Â·Â±Ã§??Ã¥Â§?Ã¥??Ã¯Â¼?Ã¥?Â½Ã©?? ; XuÃƒÂ©huÃƒÂ¬hÃƒÂ nyÃ‡?pÃ„Â«nyÃ„Â«n de shÃƒÂ¨ngmÃ‡? - Ã¥ÂÂ¦Ã¤Â¼?Ã¦Â±?Ã¨Â¯Â-Ã¦?Â¼Ã©?Â³Ã§??Ã¥?Â£Ã¦Â¯? ; yÃƒÂ¹nmÃ‡?hÃƒÂ©shÃ„?ngdiÃƒÂ o - Ã©?ÂµÃ¦Â¯?Ã¥??Ã¥Â£Â°Ã¨Â°? ; PÃ„Â«ndÃƒÂºhÃƒÂ©shÃ„?ngdiÃƒÂ oliÃƒÂ nxÃƒÂ - Ã¦?Â¼Ã¨Â¯ Â»Ã¥??Ã¥Â£Â°Ã¨Â°?Ã§Â»?Ã¤Â¹Â

UNIT II **9 Hours**

UNIT 2

XiÃ nzÃ ij?di?n-????

XuÃ©huÃ¬shÃji?n, rÃ¬qÃ de bi?odÃ¡ - ?????????? ; RÃ¨sh?n - ?? ; Sh?ngcÃ - ?? ; JÃ¹zi - ?? ; HuÃ¬huÃ - ?? ;HuÃ³dÃ²ng - ?? ; KÃ ntÃºwÃ¡nchÃ©nghuÃ¬huÃ - ?????? ; XuÃ©cÃy?shu?shÃ-ji?n ; TÃ¬huÃ nliÃ nxÃ - ????DÃºy?dÃºrÃ¡nhÃ²uliÃ¡nxiÃ n - ??????? ; B?xiÃ miÃ n de cÃ-Ã nzhÃ¨ngquÃ¨ de shÃ¹nxÃ¹pÃ¡iliÃ¨chÃ©ngjÃ¹ - ???????????????

UNIT III **9 Hours**

UNIT 3

NÃ jiÃ nmÃ¡oy?z?nmemÃ i? - ??????? ?

XÃºnwÃ¨njiÃ qiÃ¡njÃqiÃ¡n de bi?odÃ¡ - ????????? ; T?ojiÃ huÃ¡njiÃ - ???? ; TÃ-ch?duÃ¬su?m?id?ngx?dÃ xi?o, yÃ¡nsÃ¨d?ngd?ngjÃ¹t?y?oqiÃº - ?????????????????? ; Sh?ngcÃ-HuÃ³dÃ²ng - ?? ; KÃ ntÃºwÃ¡nchÃ©nghuÃ¬huÃ - ?????? ; XuÃ©cÃy?shu?shÃji?n

;DÃºy?dÃºrÃ¡nhÃ²uliÃ¡nxiÃ n - ??????? ;T?nglÃ¹y?nxu?nzÃ©zhÃ¨ngquÃ¨dÃ¡'Ã n - ????????? ; B?ch?ngcÃy?bi?o - ?????

UNIT IV **9 Hours**

UNIT 4

XuÃ©huÃ¬xÃºnwÃ¨nji?tÃngqÃngkuÃ ng, zhÃyÃ¨hÃ©niÃ¡nlÃng - ?????????????? XuÃ©huÃ¬di?ncÃ itÃy?oqiÃºjiÃ©zhÃ ng - ????????? ; Sh?ngcÃ - ?? ; JÃ¹zi - ?? ; HuÃ¬huÃ - ?? ;HuÃ³dÃ²ng - ?? ; KÃ ntÃºwÃ¡nchÃ©nghuÃ¬huÃ - ?????? ; XuÃ©cÃy?shu?shÃji?n ;DÃºy?dÃºrÃ¡nhÃ²uliÃ¡nxiÃ n - ??????? ;T?nglÃ¹y?nxu?nzÃ©zhÃ¨ngquÃ¨dÃ¡'Ã n - ????????? ; B?ch?ngcÃy?bi?o - ?????JuÃ©sÃ¨bÃ ny?n - ???? ; T?nglÃ¹y?npÃ nduÃ nduÃ¬cuÃ² - ???????

UNIT V **9 Hours**

UNIT 5

N?zÃ in?'erg?ngzuÃ² -?????? XuÃ©huÃ¬xÃºnwÃ¨nji?tÃngqÃngkuÃ ng, zhÃyÃ¨hÃ©niÃ¡nlÃng - ??????????????Sh?ngcÃ - ?? ; JÃ¹zi - ?? ; HuÃ¬huÃ - ?? ; HuÃ³dÃ²ng - ?? ; KÃ ntÃºwÃ¡nchÃ©nghuÃ¬huÃ - ?????? ;T?nglÃ¹y?nxu?nzÃ©zhÃ¨ngquÃ¨dÃ¡'Ã n - ????????? ; B?ch?ngcÃy?bi?o - ????? - T?nglÃ¹y?nxu?nzÃ©zhÃ¨ngquÃ¨dÃ¡'Ã n - ????????? ; B?ch?ngcÃy?bi?o - ?????

Total: 45 Hours

Reference(s)

1. David J. White. My Chinese Classroom, 2005
2. Tiyan Hanyu Shenghuo Pian, Experiencing Chinese, Ying Yu Ban Di 1 Ban. Beijing: Higher Education Press: Gaodengjiaohuchu ban she. 2011
3. Hancel, Don. Mandarine Day. Chinese learning Software
4. www.chinesexp.com.cn www.yiwen.com.cn

15LE101 BASIC ENGLISH I 3 0 0 3

Course Objectives

- To teach students basic English vocabulary and tenses
- To offer practice on various conversation patterns
- To improve spelling and pronunciation by offering rigorous practice and exercises

Programme Outcomes (POs)
Course Outcomes (COs)

1. Students will be able to: Form sentences using basic grammar and vocabulary in English
2. Involve in basic day-to-day conversation
3. Express opinions, agree & disagree on topics of general interest
4. Listen and understand Indian English audio clippings
5. Understand reading comprehension passages and answer related questions

Articulation Matrix

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

UNIT I **7 Hours**

UNIT I

Module Vocabulary/ Grammar Skills Sets Skill Sets
1 Basic words- 12 most used words in English, usage and pronunciation Starting a conversation and talking about what one does Sentence construction bolstered by mother tongue
2 Basic words- 20 often used words, usage and pronunciation Analyzing an action plan Creating and presenting oneÃƒÂ¢??s own action plan
3 Basic words with a focus on spelling Discriminative listening Informal conversation
4 Basic words- 10 often used words, usage and pronunciation Content listening and Intonation Reading comprehension
5 Unit Test I

UNIT II **8 Hours**

UNIT II

Module Vocabulary/ Grammar Skills Sets Skill Sets
6 Basic words + greetings to be used at different times of the day Formal conversation Intonation to be used in formal address
7 Last 28 of the 100 most used words Informal conversation between equals Reading practice and peer learning
8 Using the 14 target words to form bigger words Informal dialogues using contracted forms Guided speaking- talking to peers using contracted forms
9 Palindromes, greetings- good luck, festivals Placing a word within its context- culling out meaning Offering congratulations
10 Unit Test II

UNIT III **7 Hours**

UNIT III

Module Vocabulary/ Grammar Skills Sets Skill Sets
11 Homophones Formal and informal methods of self-introduction Let's Talk is a group activity that gives them some important pointers of speech
12 Homophone partners, matching words with their meanings Contracted forms of the -be verbs, -ve and -s Translating English sentences to Tamil
13 Briefcase words- finding smaller words from a big word Formal and informal ways of introducing others Team work- speaking activity involving group work, soft skills
14 Compound words and pronunciation pointers Giving personal details about oneself using the lexicon
15 Unit Test III

UNIT IV **8 Hours**

UNIT IV

Module Vocabulary/ Grammar Skills Sets Skill Sets
16 Proper and common nouns Asking for personal information and details Pronunciation pointers- an informal introduction to the IPA
17 Pronouns Telephone skills and etiquette Reading aloud and comprehension
18 Abstract and common nouns Dealing with a wrong number Reading practice and comprehension
19 Group names of animals, adjectives Taking and leaving messages on the telephone Pronunciation pointers
20 Unit Test IV

UNIT V **8 Hours**

UNIT V

Module Vocabulary/ Grammar Skills Sets Skill Sets
21 Determiners Interrupting a conversation politely- formal and informal Pair work reading comprehension
22 Conjugation of the verb to be- positive and negative forms Thanking and responding to thanks Comprehension questions that test scanning, skimming and deep reading
23 Am/is/are questions Giving instructions and seeking clarifications Small group activity that develops dialogue writing
24 Present continuous tense-form and usage Making inquiries on the telephone Finishing sentences with appropriate verbs
25 Unit Test V

UNIT VI **7 Hours**

UNIT VI

Module Vocabulary/ Grammar Skills Sets Skill Sets
26 Words with silent 'b'
Present continuous questions Calling for help in an emergency Dialogue writing
27 Words with silent 'c' Simple present tense- form and usage Making requests and responding to them politely Identifying elements of grammar in text extract
28 Simple present tense- rules Describing people Guided writing
29 Words with silent 'g'
Questions in the simple present tense Describing places Filling in the blanks with correct markers of tense
30 Unit Test VI

Total: 45 Hours

Reference(s)

1. 1. Basic English Module, L&L Education Resources, Chennai, 2011.

15LE102 COMMUNICATIVE ENGLISH I 3 0 0 3

Course Objectives

- To communicate effectively in social scenario
- To enhance the ability of reading, summarising and paraphrasing information
- To develop the techniques of writing through appropriate use of grammar and vocabulary

Programme Outcomes (POs)

Course Outcomes (COs)

1. Listen and comprehend different spoken discourses
2. Communicate ideas in English fluently during personal / official conversations
3. Use grammar and vocabulary required at CEFR B1 level in spoken and written discourses
4. Read and understand general & technical text
5. Involve in formal written communication using appropriate mechanics of writing

Articulation Matrix

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

UNIT I **9 Hours**

UNIT I: GRAMMAR

Content words- Structural words - Subject - Verbs and verb phrase - Subject - Verb agreement - Tenses - Active voice and passive voice - Sentence types (declarative, imperative, exclamatory & interrogative) - Framing questions - Comparative adjective

UNIT II **9 Hours**

UNIT II: LISTENING

Listening for specific information: Short conversations / monologues - Impersonal passive - Gap filling - Telephone conversations - Note-taking - Listening for gist / interviews - Listening to songs and completing the lyrics - Clear individual sounds - Telephone etiquette

UNIT III **9 Hours**

UNIT III: READING

Prediction - Skimming for gist - Scanning for specific information - Understanding text and sentence structure - Note Making

UNIT IV **9 Hours**

UNIT IV: WRITING

Letter Writing: Formal letters / Job application - E-mail writing Ã¢?? Report & Proposal writing - Advertisement - Principles of writing a good paragraph: Unity, cohesion and coherence - Paragraph writing (descriptive, narrative, expository & persuasive)

UNIT V **7 Hours**

UNIT V: SPEAKING

Self-introduction (Elevator Pitch) - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Mini-presentation - Expressing opinions and justifying opinions - Likes and dislikes - Tongue twisters

FOR FURTHER READING

Short stories:
"The Astrologer's Day" by R. K Narayan
"How Much Land does a Man Need?" by Leo Tolstoy

Total: 43 Hours

Reference(s)

1. Murphy, Raymond. English Grammar in Use - A Self-Study Reference and Practice Book For Intermediate Learners Of English .IVed. United Kingdom: Cambridge University Press. 2012.
2. 2.Seely, John. Oxford Guide to Effective Writing and Speaking. Indian edition. New Delhi: Oxford University Press. 2005.
3. 3. Anderson, Kenneth. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press. 2004.

15LE201 BASIC ENGLISH II 3 0 0 3

Course Objectives

- To focus on natural acquisition of rudimentary structures in English language through ample listening, reading and writing inputs
- To concentrate on speaking and conversation skills with a view to increase fluency in speaking
- To enhance the ability of correct pronunciation and spelling

Programme Outcomes (POs)

Course Outcomes (COs)

1. The students will be able to: Express themselves clearly in English to individuals / groups without hesitation
2. Use various forms of tenses in speaking and writing
3. Read and understand paragraphs on simple topics
4. Write coherent paragraphs / reports / letters on familiar topics

Articulation Matrix

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

UNIT I **8 Hours**

UNIT I

Module Vocabulary/ Grammar Skills Sets Skill Sets

31 Difference between Present Continuous and Simple Present tense. Calling for help in an emergency Reporting an event- journalistic style

32 Verbs 'have' and 'have got' Describing animals Asking for and giving directions

33 Simple Past Tense Inviting people, accepting and declining invitations Self-enquiry and offering one's opinion on a given topic.

34 Spelling rules & table of Irregular Verbs Refusing an invitation Reading and practicing pre-written dialogues

35 Unit Test I

UNIT II **8 Hours**

UNIT II

36 Questions and the negative form of the simple past tense Apologizing and responding to an apology (Reading) conversation practice

37 Asking questions in the simple past tense Reading comprehension Seeking, granting and refusing permission

38 Past continuous tense Paying compliments and responding to them Pair work: writing dialogues and presenting them

39 Difference between simple past and past continuous- when and where to use each Describing daily routines Reading and comprehension skills

40 Unit Test II

UNIT III **7 Hours**

UNIT III

41 Simple future tense Talking about the weather Making plans- applying grammar theory to written work
42 Simple future tense- more aspects, possessive pronouns Talking about possessions Opening up and expressing one's emotions
43 Future continuous tense Talking about current activities Listening comprehension
44 Revision of future tense- simple and continuous forms, prepositions used with time and date Asking for the time and date Discussion- analyzing and debating a given topic
45 Unit Test III

UNIT IV **8 Hours**

UNIT IV

46 Articles a/an Writing, speaking and presentation skills Transcribing dictation
47 Singular- Plural (usage of a/an) Reading practice- independent and shared reading Comprehension - logical analysis, process analysis and subjective expression
48 Countable and uncountable nouns- a/an and some Listening comprehension Vocabulary: using context tools to decipher meaning
49 Articles- the Sequencing sentences in a paragraph Listening to a poem being recited, answer questions on it and practice reciting the same
50 Unit Test IV

UNIT V **7 Hours**

UNIT V

51 Articles- the: usage and avoidance Speaking: sharing stories about family, village/town, childhood, etc. 10 students Listening: comprehend and follow multiple step instructions read out by the teacher

52 Articles- the: usage and avoidance with like and hate Speaking: sharing stories about family, village/town, childhood, etc. 10 students Reading: make inferences from the story about the plot, setting and characters

53 Articles- the: usage and avoidance with names of places Speaking: sharing stories about family, village/town, childhood, etc. 10 students Comprehension passage

54 This/ that/ these and those Writing a notice- announcement Speaking: Debate

55 Unit Test V

UNIT VI **8 Hours**

UNIT VI

56 One and ones Collaborative learning- problem solving Writing short answers to questions based on reading
57 Capitalization and punctuation Controlled writing Listen to a story and respond to its main elements
58 Syntax and sentence construction- rearrange jumbled sentences Guided writing Listen to a poem and discuss its elements
59 Cloze Free writing Frame simple yet purposeful questions about a given passage
60 Unit Test VI

Total: 46 Hours

Reference(s)

1. Basic English Module, L&L Education Resources, Chennai, 2011.

15LE202 COMMUNICATIVE ENGLISH II 3 0 0 3

Course Objectives

- To acquire skills for using English language effectively in workplace
- To prepare students for taking BEC Vantage level examination
- To enhance the communicative ability from Intermediate to Upper Intermediate level
- To enhance the communicative ability from Intermediate to Upper Intermediate level

Programme Outcomes (POs)

Course Outcomes (COs)

1. The students will be able to: Express themselves orally while interacting with individuals or groups in formal occasions
2. Listen and comprehend business conversations
3. Read and understand business correspondences and company literature
4. The students will be able to use language structures and vocabulary that is required at CEFR B2 level
5. Communicate effectively through formal and informal written business correspondences

Articulation Matrix

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

UNIT I **9 Hours**

UNIT I: GRAMMAR AND VOCABULARY

Simple, Compound and Complex sentences - Direct and Indirect speech - Conditionals -Business vocabulary - Collocations - Discourse markers

UNIT II **9 Hours**

UNIT II: LISTENING

Listening to specific information - short notes - Listening to identify topic, content, function - Sentence stress - Rhythm - Intonation

UNIT III **9 Hours**

UNIT III: READING

Reading graphs and charts - Skimming and scanning texts - Gap Filling - Read business articles for specific information - Understanding the structure of a text - Error identification

UNIT IV **9 Hours**

UNIT IV: WRITING

Formal and Informal English - Business Correspondence, Short Documents: e-mail, memo, message, - Longer Documents: Reports and Proposals - Transcoding

UNIT V **9 Hours**

UNIT V:SPEAKING

Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging information - Language Functions: suggesting - comparing and contrasting -expressing - Finding out facts, attitudes and opinions - Commonly mispronounced words

FOR FURTHER READING

Newspaper and Magazine reading (The Hindu / The New Indian Express / Times of India, India Today / ReadersÃ¢?? Digest) - Reading Novels (The Monk Who Sold His Ferrari by Robin Sharma; Three Mistakes by Chetan Bhagat; The Fountain head by Ayn Rand)

Total: 45 Hours

Reference(s)

1. 1.Guy Book- Hart, BEC Vantage Cambridge Business Benchmark, Upper-Intermediate Cambridge University Press, 2006.
2. 2.Eric H. Glendinning and Beverly Holmstrom, Study Reading: A Course in Reading for Academic Purposes. United Kingdom: Cambridge University Press, 2004.

15LF203 FRENCH 3 0 0 3

Course Objectives

- To help students acquire familiarity in the French alphabet & basic vocabulary
- To teach the students to use French in simple day-to-day conversations
- To prepare the students for French examination (level A1)

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen and comprehend individual sounds of French and simple day-to-day conversations.
2. Apply basic sounds and words in simple sentences for communication
3. Read and understand short passages on familiar topics.
4. Frame basic sentence structures while writing.
5. Recognize and apply 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														
3														
4														
5														

UNIT I **6 Hours**

UNIT 1

Alphabet FranÃƒÂ§ais et Les Accents FranÃƒÂ§ais - Les articles dÃƒÂ©finis, indÃƒÂ©finis Genre - Singulier et pluriel - Salutations

UNIT II **8 Hours**

UNIT II

Verbes - Conjugaison : PrÃƒÂ©sent (Avoir / Ãƒ?tre / ER, IR, RE : RÃƒÂ©gulier et IrrÃƒÂ©gulier) - Adjectifs - NationalitÃƒÂ©s - Professions - Formuler les questions LIRE

UNIT III **10 Hours**

UNIT 3

Moyens de transport (Transport) - Noms de Professions (Professions) - Noms d'endroits communs (Places) - NationalitÃ©s (Nationalities)ECOUTER : (Listening) Ã‰couter l- alphabet associÃ©Ã des prÃ©noms franÃ§ais - Ã‰couter et rÃ©pondre PARLER (Speaking)PrÃ©sntation - mÃªme /PrÃ©sentez- Vous (Introducingoneself)LIRE :Lireles phrases simples

UNIT IV **12 Hours**

UNIT 4

Pronoms (Pronouns) - Noms communs masculins et de femme (Common masculine and Femininenouns) - Verbes communs (Common verbs)COUTER :couter et crier les prnoms - Observer les dessins et couter les dialogues LIRE : Lire les profils d'utilisateurs d'interlingua (alter ego)PARLER :Parler de sa ville - Parler de sa profession

UNIT V **11 Hours**

UNIT 5

Narration de son nom et l'endroit oÃ¹ on vit - Son Ã¢ge et date de naissance - NumÃ©ro de tÃ©lÃ©phone et'dresse - Narration du temps - La France en Europe PARLER :Conversation entre deux amis - Jouer la scÃ¨ne Ã‰COUTER :Ecouter les conversations (CD alter ego)Ã‰CRIRE :Ã‰crireune carte postale

Total: 47 Hours

Reference(s)

1. Grammaire Progressive du FranÃƒÂ§ais, CLÃƒ? International, 2010.
2. Collins Easy Learning French Verbs & Practice, Harper Collins, 2012
3. BarronÃƒÂ¢'s Learn French, 3rd Edition, Elizabeth Bourquin, Language Institute, 2012
4. Cours de Langue et de Civilisation FranÃƒ?Ã,Â§aises, G. Mauger, Hachette, 2014
5. Saison 1, Marie-Noelle Cocton et al, Didier, 2014
6. FranÃƒÂ§ais Linguaphone, Linguaphone Institute Ltd., London, 2000. FranÃƒÂ§ais Harrisonburg: The Rosetta Stone: Fairfield Language Technologies, 2001.

15LG203 GERMAN 3 0 0 3

Course Objectives

- To help students acquire the basics of German language.
- To teach them how to converse in German in day-to-day situations. Ãƒ?Ã‚Â¢?Ãƒ?Ã‚Â¢ To teach them how to converse in German in day-to-day situations

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen and identify individual sounds of German and simple day-to-day conversations.
2. Speak simple sentences using basic sounds and words.
3. Read and understand short passages on familiar topics.
4. Apply basic sentence structures while writing.
5. Apply 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														
3														
4														
5														

UNIT I **6 Hours**

UNIT I

Introduction to German language: Alphabets - Numbers -Greetings - country - nationalities - Working with Dictionary.

UNIT II **6 Hours**

UNIT II

Nouns - Pronouns - definite and indefinite article - Speaking about oneself - Listening to CD supplied with the books, paying special attention to pronunciation.

UNIT III **11 Hours**

UNIT III

Regular verbs - Conjugation - Irregular verbs - Time - Negation - adjectives - family - profession - Introduction to types of sentences.

UNIT IV **12 Hours**

UNIT IV

Question words - Types of Questions - Nominative - Accusative and dative case - framing basic questions and answers -Writing short notes and letter- reading the news boards, directions.

UNIT V **10 Hours**

UNIT V

Imperative case - Possessive articles - propositions - modal auxiliaries - Basic dialogue and group conversation -ordering in restaurants.

Total: 45 Hours

Reference(s)

1. Continuum International Publishing Group Ltd. London / New York, 1992. Eckhard, Christine. Whittle, Black & Ruth. Cassel Language Guides - German.
2. Rusch, Paul. Netzwerk A1. Deutsch AlsFremdsprache. Goyal Publishers & Distributers Pvt. Ltd. New Delhi, 2015.
3. Langenscheidt Universal German Dictionary: German-English, English-German. Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2009.
4. Grundkurs Deutsch A Short Modern German Grammar Workbook and Glossary. Verlag Fur Deutsch.Munichen, 2007.
5. Grundkurs. Deutsch Lehrbuch. Hueber. Munichen, 2007.

15LH203 HINDI 3 0 0 3

Course Objectives

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

Programme Outcomes (POs)

Course Outcomes (COs)

1. Read and identify Hindi letters, words and simple sentences.
2. Construct simple sentences and use appropriate vocabulary during day-to-day oral communication.
3. Identify basic sounds of Hindi language and understand simple conversations on familiar topics.
4. Write common words and sentences.
5. Comprehend elementary level grammar of Hindi.

Articulation Matrix

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

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 IN HINDI

Genders (Masculine & Feminine Nouns ending in a ,e,i,o, u,)- 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 - Speaking practice for various occasions.

Total: 45 Hours

Text Book(s)

1. B. R. Kishore, Self Hindi Teacher for Non-Hindi Speaking People, Vee Kumar Publications (P) Ltd., New Delhi, 2009.

Reference(s)

1. Syed, PrayojanMulak Hindi, RahamathullahVaniPrakasan, New Delhi, 2002.
2. Ramdev, VyakaranPradeep, SaraswathiPrakasan, Varanasi, 2004.

15LJ203 JAPANESE 3 0 0 3

Course Objectives

- To help students learn Japanese alphabet.
- To teach students how to use the basic Japanese sentences in day-to-day conversation.
- To make students familiar with the Japanese cultural facets and social etiquettes.

Programme Outcomes (POs)

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														
3														
4														
5														

UNIT I **9 Hours**

UNIT 1

Introduction to Japanese - Japanese script - Pronunciation of Japanese(Hiragana) - Long vowels - Pronunciation of in,tsu,ga - Letters combined with ya,yu,yo - Daily Greetings and Expressions - Numerals. N1 wa N2 des - N1 wa N2 ja arimasen - S ka - N1mo - N1 no N2 - .san - Kanji - Technical Japanese Vocabulary (25 Numbers) - Phonetic and semantic resemblances between Tamil and Japanese.

UNIT II **9 Hours**

UNIT 2

Introduction - Kore - Sore - are - Kono N1 - Sono N1 - ano N1 - so des - so ja arimasen - S1 ka - S2 ka - N1 no N1 - so des ka ' koko - soko - asoko - kochira - sochira - achira - N1 wa N2 (Place) des - dhoko-N1 no N2 - Kanji-10 - ima-.ji-fun des - Introduction of verb - V mas - V masen - V mashitha - V masen deshitha - N1(Time) ne V - N1 kara N2 des - N1 tho N2 / S ne Kanji-10 - Technical Japanese Vocabulary (25 Numbers) - Dictionary Usage.

UNIT III **9 Hours**

UNIT 3

- N1(Place) ye ikimas - ki mas - kayerimasu - Dhoko ye mo ikimasen - ikimasendheshitha - N1(vehicle) de ikimasu - kimasu - kayerimasu - N1(Personal or Animal) tho V ithsu - S yo. - N1 wo V (Transitive) - N1 wo shimus - Nani wo shimasu ka - Nan & Nani - N1(Place) de V - V masen ka - V masho - Oo. Kanji-10 , N1(tool - means) de V - Word / Sentence wa go nan des ka - N1(Person) ne agemus - N1(Person) ne moraimus - mo V shimashitha - , Kanji-10 - Japanese Typewriting using JWPCE Software, Technical Japanese Vocabulary (25 Numbers).

UNIT IV **9 Hours**

UNIT 4

Introduction to Adjectives - N1wanaadj des. N1 wa ii adj des - naadjna N1 - ii adj ii N1 - Thothemo - amari - N1 wadho des ka - N1 wadhonna N2 des ka - S1 ka S2 - dhore - N1 gaarimasu - wakarimasu - N1 ga suki masu - N1 gakiraimasu - jozu des - hetha des - dhonna N1 - Usages of yoku - dhaithai - thakusan - sukoshi - amari - zenzen - S1 kara S2 - dhoshithe, N1 gaarimasu - imasu - N1(Place) ne N2 gaarimasu - iimasu - N1 wa N2(Place) ne arimasu - iimasu - N1(Person,Place,or Thing) no N2 (Position) - N1 ya N2, Kanji-10 - Japanese Dictionary usage using JWPCE Software, Technical Japanese Vocabulary (25 Numbers).

UNIT V **9 Hours**

UNIT 5

Saying Numbers , Counter Suffixes , Usages of Quantifiers -Interrogatives - Dhonokurai - gurai - Quantifier-(Period) ne -.kai V - Quantifier dhake / N1 dhake Kanji - Past tense of Noun sentences and na Adjective sentences - Past tense of ii-adj sentences - N1 wa N2 yoriadj des - N1 tho N2 tho Dhochiragaadj des ka and its answering method - N1 [no naka] de {nani/dhoko/dhare/ithsu} ga ichiban adj des ka - answering -N1 gahoshi des - V1 mas form dhake mas - N1 (Place) ye V masu form ne ikimasu/kimasu/kayerimasu - N1 ne V/N1 wo V - Dhokoka - Nanika - gojumo - Technical Japanese Vocabulary (25 Numbers)

Total: 45 Hours

Text Book(s)

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

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

Reference(s)

1. Software 1. Nihongo Shogo-1 2. Nihongo Shogo-2 3. JWPCE Software 3. JWPCE Software
2. 1. www.japaneselifestyle.com 2. www.learn-japanese.info/ 3. www.kanjisite.com/ 4. www.learn-hiragana-katakana.com/typing-hiragana-characters/

15PH201 PHYSICS OF MATERIALS 3 0 2 4

Course Objectives

- Understand the physical properties of conductors, semiconductors and superconductors
- Recognize the basic principles of interaction of light with matter and working of optical devices
- Classify the types of dielectric, magnetic materials and polarization mechanisms with their properties

Programme Outcomes (POs)

Course Outcomes (COs)

1. Analyze the properties of conductors and superconductors for different applications
2. Apply the concepts and types of semiconductors for solar cell applications
3. Discuss the types, properties and applications of dielectric materials
4. Explain the properties of optical materials, working mechanism of LEDs and LCDs
5. Classify the magnetic materials with their properties and apply in the data storage devices

Articulation Matrix

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

UNIT I **9 Hours**

CONDUCTING AND SUPERCONDUCTING MATERIALS

Electrical and thermal conductivity of metals - Wiedemann Franz law - band theory of metals - density of states. Superconductors: properties - types - High Tc superconductors- applications.

UNIT II **10 Hours**

SEMICONDUCTORS

Elemental and compound semiconductors - intrinsic semiconductors: carrier concentration - electrical conductivity- band gap. Extrinsic semiconductors: carrier concentration - variation of Fermi level. Hall effect: theory and experimental determination -applications:Solar cells

UNIT III **9 Hours**

DIELECTRIC MATERIALS

Types of polarization: electronic, ionic, orientation and space charge polarization mechanisms - Langevin-Debye equation - frequency and temperature effects on polarization - dielectric strength and loss -dielectric breakdown mechanisms - active dielectric materials: pizo, pyro and ferroelectricity - applications.

UNIT IV **9 Hours**

OPTICAL MATERIALS

Interaction of light with materials - optical absorption - transmission - Luminescence in solids - Fluorescence and Phosphorescence - Optical band gap - LED ,LCD.

UNIT V **8 Hours**

MAGNETIC MATERIALS

Classification and properties - domain theory - hard and soft magnetic materials - anti-ferro and ferri magnetic materials - applications: magnetic recording and memories.

FOR FURTHER READING

Photonic crystals - LIFI

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of travelling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. Saxena, Gupta, Saxena, Mandal, Solid State Physics, Pragati Prakashan Educational Publishers, 13th revised edition, Meerut, India, 2013.

2. M.N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand & Company Ltd., New Delhi, 2011.
3. S. O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2010.
4. M.A. Wahab, N.K. Mehta, Solid state physics-structure and properties of materials, Narosa publishing house Pvt. Ltd, 6th edition, 2010.
5. Semiconductor Physics and Devices, Donald A. Neamen , Mc Graw-Hill, 2011.
6. P.K. Palanisamy, Materials Science, Scitech Publications India Pvt. Ltd, 2014.

15PH202 APPLIED PHYSICS 3 0 2 4

Course Objectives

- Understand conducting, semiconducting, dielectric and magnetic properties of materials and exemplify their applications
- Analyze the basic concepts of thermodynamics and heat transfer with illustrations
- Gain knowledge about acoustical standards of buildings

Programme Outcomes (POs)

Course Outcomes (COs)

1. Analyze the physical properties of conducting and semiconducting materials
2. Discuss the physical properties of dielectric and magnetic materials with their applications
3. Apply the thermodynamic processes and laws to compute the efficiency of heat engines
4. Compare the different heat transfer modes with real time applications of conduction
5. Explain the characteristics of music and select proper sound absorbing materials for good acoustic of buildings

Articulation Matrix

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

UNIT I **11 Hours**

CONDUCTORS AND SEMICONDUCTORS

Conductors: Classical free electron theory - electrical and thermal conductivity- Wiedemann - Franz law - merits and demerits of classical free electron theory - band theory - density of states. Semiconductors: Elemental and compound semiconductors - intrinsic semiconductors -Fermi level and electrical conductivity - band gap energy - extrinsic semiconductors - n-type and p-type semiconductors: variation of Fermi level with temperature (qualitative) - Hall effect - applications.

UNIT II **9 Hours**

DIELECTRIC AND MAGNETIC MATERIALS

Dielectrics: Fundamental terminologies - electronic and ionic polarizations - orientation polarization mechanism (qualitative) - space charge polarization - Langevin -Debye equation - dielectric loss - applications of dielectric and insulating materials. Magnetic Materials: Properties of dia, para and ferromagnetic materials - domain theory of ferromagnetism - hysteresis curve - hard and soft magnetic materials - applications

UNIT III **9 Hours**

THERMODYNAMICS

Zeroth law of thermodynamics - Heat - equilibrium and quasistatic process - path functions - comparison between heat and work - internal energy - first law of thermodynamics - isothermal and adiabatic process - work done - reversible and irreversible process - second law of thermodynamics - entropy - enthalpy - Carnot ideal engine and its efficiency - Carnot's theorem-actual heat engine: Diesel engine and its efficiency

UNIT IV **9 Hours**

HEAT TRANSFER

Modes of heat transfer - thermal conductivity - heat capacity and diffusivity - rectilinear flow of heat - conduction through bodies in series and parallel - determination of thermal conductivity: good conductor: Searle's method - bad conductor: Lee's disc method - applications of heat transfer: formation of ice in ponds - conductivity of earth's crust and age of earth - practical applications

UNIT V **7 Hours**

ACOUSTICS

Classification of sound based on frequency - characteristics of audible sound - reverberation time: Sabine's formula - determination of absorption coefficient - Erying's formula (qualitative). Sound insulation - sound absorbing materials - factors affecting the acoustics of building - remedies

FOR FURTHER READING

Nanomaterials and its applications

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. William D. Callister, Materials Science and Engineering an Introduction, John Wiley and Sons,Inc, 2010
2. BrijLal, N. Subrahmanyam and P. S. Hemne, Heat, Thermodynamics & Statistical Physics, S. Chand & Company Ltd., New Delhi, 2012
3. Saxena, Gupta, Saxena, Mandal, Solid State Physics, Pragati Prakashan Educational Publishers, 13threvised edition, Meerut, India, 2013
4. P.K. Mittal, Applied Physics, I.K. International Publishing House Pvt. Ltd, 2008
5. Donald A. Neamen, Semiconductor Physics and Devices,McGraw-Hill, 2011

15PH203 MATERIALS SCIENCE 3 0 2 4

Course Objectives

- To explain the properties of conducting, semiconducting and dielectric materials
- To impart fundamental knowledge in optical materials
- To understand the nature and applications of different magnetic materials

Programme Outcomes (POs)

Course Outcomes (COs)

1. distinguish electrical properties of different kinds of conducting materials
2. identify the different types of semiconductors and its applications
3. categorize the various polarization mechanisms in dielectrics
4. choose the suitable material for the construction of display devices
5. select appropriate magnetic materials for magnetic storage devices

Articulation Matrix

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

UNIT I **8 Hours**

ELECTRICAL PROPERTIES OF METALS

Quantum free electron theory: Fermi-Dirac distribution function - Fermi energy and its variation with temperature - density of energy states - calculation of density of electrons and fermi energy at 0K - mean energy of electrons at 0K - problems.

UNIT II **10 Hours**

SEMICONDUCTING MATERIALS

Introduction - elemental and compound semiconductors - intrinsic semiconductors: expressions for number of electrons and holes - determination of carrier concentration and position of Fermi energy - electrical conductivity - band gap energy determination - carrier concentration in extrinsic semiconductors. Hall effect: theory and experimental determination - uses - problems.

UNIT III **9 Hours**

DIELECTRICS

Introduction - fundamental definitions in dielectrics - expressions for electronic and ionic polarizations - orientation polarization (qualitative) - space charge polarization - Langevin - Debye equation - frequency and temperature effects on polarization - internal field - expression for internal field (cubic structure) - Clausius-Mosotti equation and its importance - applications of dielectric materials - problems.

UNIT IV **9 Hours**

OPTICAL MATERIALS

Introduction - optical absorption in metals, semiconductors and insulators. Fluorescence and phosphorescence. Light emitting diode: principle, construction, working and applications. Liquid crystal display: general properties - dynamic scattering display - twisted nematic display - applications - comparison between LED and LCD. Blue ray disc - principle - working.

UNIT V **9 Hours**

MAGNETIC MATERIALS

Introduction - orbital and spin magnetic moments - Bohr magneton - basic definitions - classification of magnetic materials - domain theory of ferromagnetism - process of domain magnetization - explanation of hysteresis curve based on domain theory - hard and soft magnetic materials.

FOR FURTHER READING

Optical data storage and Giant magnetoresistance

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. William D. Callister, Materials Science and Engineering an Introduction, John Wiley and Sons, Inc, 2010.
2. S.O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2014.
3. M.N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand & Company Ltd., New Delhi, 2011.
4. P.K. Palanisamy, Physics For Engineers, Scitech Publications (India) Pvt. Ltd., Chennai, 2010.
5. V. Raghavan, Materials Science and Engineering, Prentice Hall of India, New Delhi, 2010.
6. R.K.Gaur and S.L.Gupta, Engineering Physics, Dhanpat Rai publications, New Delhi, 2010.

15PH204 PHYSICS OF ENGINEERING MATERIALS 3 0 2 4

Course Objectives

- To familiarize with the physical properties of materials
- To gain practical applications of modern spectroscopy and microscopy techniques
- To understand the preparation of bio and nanomaterials

Programme Outcomes (POs)
Course Outcomes (COs)

1. identify the electrical and thermal properties of conducting and semiconducting materials
2. analyze the various polarization mechanisms in dielectrics
3. choose specific materials for optical and magnetic data storage devices
4. investigate the specimen with the aid of suitable spectroscopic techniques
5. realize the methods adopted for preparing nano materials

Articulation Matrix

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

UNIT I **10 Hours**

CONDUCTING AND SEMICONDUCTING PROPERTIES

Quantum free electron theory - Fermi-Dirac distribution function - effect of temperature on Fermi function - density of energy states - calculation of density of electrons and Fermi energy at 0 K. Intrinsic semiconductors: expressions for density of electrons and holes - intrinsic carrier concentration - band gap energy. Extrinsic semiconductors: carrier concentration in n-type and p-type semiconductors - variation of Fermi level with temperature and impurity concentration - problems.

UNIT II **9 Hours**

DIELECTRIC PROPERTIES

Introduction: fundamental definitions in dielectrics - types of polarization - expressions for electronic and ionic polarization mechanisms - orientation polarization (qualitative) - Langevin-Debye equation - frequency and temperature effects on polarization - dielectric loss - dielectric breakdown mechanisms - active dielectric materials - applications of dielectric materials - problems.

UNIT III **10 Hours**

OPTICAL AND MAGNETIC PROPERTIES

Optical properties: introduction - light interaction with solids - atomic and electronic interactions - optical properties of metals, semiconductors and insulators - reflection - refraction - absorption - transmission - luminescence and photoconductivity. Magnetic properties: introduction - origin of magnetic moment - properties of dia, para and ferro magnetic materials - domain theory and hysteresis effect - hard and soft magnetic materials - problems.

UNIT IV **8 Hours**

SPECTROSCOPY AND MICROSCOPY TECHNIQUES

Introduction: different types of spectroscopy techniques - basic principle of FTIR spectroscopy and X-ray Photoelectron Spectroscopy (XPS). Basic principle and working mechanisms of Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force Microscope (AFM).

UNIT V **8 Hours**

BIO AND NANO MATERIALS

Biomaterials: classification of biomaterials - development of biomaterials - applications. Nanomaterials: properties - synthesis of nanomaterials - top-down approach: ball milling technique - bottom-up approach: Chemical Vapour Deposition (CVD) - uses of nanomaterials. Carbon nanotubes: properties and applications.

FOR FURTHER READING

Health and environmental impacts

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. William D. Callister, Materials Science and Engineering An Introduction, John Wiley and Sons, Inc, 2010.
2. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
3. Jacob Milliman, Christos Halkias, Satyabrata JIT, Electronic Devices and Circuits, McGraw Hill Education (India) Private Limited, New Delhi, 2014.
4. S. O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2010.
5. Subbiah Pillai, Nanobiotechnology, MJP Publishers, 2010.
6. Yang Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, Wiley-VCH, 2013.

15PH205 SOLID STATE PHYSICS 3 0 2 4

Course Objectives

- To explain the properties of conducting, semiconducting and dielectric materials
- To understand the working mechanism of junction diodes
- To impart knowledge in optical and magnetic materials

Programme Outcomes (POs)

Course Outcomes (COs)

1. identify different types of emission of electrons and significance of Fermi function
2. explore the carrier concentration and its variation with temperature of different semiconducting materials
3. analyze the I-V characteristics of a junction diode
4. investigate the various polarization mechanisms in dielectrics
5. select appropriate optical and magnetic materials for data storage devices

Articulation Matrix

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

UNIT I **10 Hours**

EMISSION PROPERTIES AND QUANTUM THEORY OF SOLIDS

Emission of electrons: types thermionic emission-principle- Richardson equation- secondary emission- principle- work function- Fermi-Dirac distribution function and its temperature dependence significance of Fermi energy- density of energy states- calculation of density of electrons and Fermi energy at 0K- average energy of electrons at 0K problems.

UNIT II **9 Hours**

SEMICONDUCTOR PHYSICS

Intrinsic semiconductors: the law of mass action - expressions for density of electrons and holes - determination of carrier concentration - band gap energy. Extrinsic semiconductors: carrier concentration in p-type and n-type semiconductors. Hall effect: theory - experimental determination of Hall voltage - applications - problems.

UNIT III **9 Hours**

JUNCTION DIODE CHARACTERISTICS

Introduction - pn junction diode - volt-ampere characteristics - diode current equation - static and dynamic resistances - space charge - diffusion capacitance - junction diode switching times. Diode circuit with DC voltage source. Applications: full wave rectifier - capacitor filters - clamper circuits.

UNIT IV **9 Hours**

DIELECTRICS

Introduction: fundamental definitions in dielectrics - expressions for electronic and ionic polarizations - orientation polarization (qualitative) - space charge polarization - Langevin Debye equation -

frequency and temperature effects on polarization - expression for internal field (cubic structure) - Clausius-Mosotti equation - dielectric loss - applications of dielectrics - problems.

UNIT V **8 Hours**

OPTOELECTRONICS AND MAGNETIC MATERIALS

Principle, working and characteristics of LED and LCD - blue ray disc. Magnetic materials: basic definitions - properties of dia, para and ferro magnetic materials - explanation of hysteresis curve based on domain theory - hard and soft magnetic materials. Magnetic storage device: principle - working - giant magnetoresistance.

FOR FURTHER READING

Motion of an electron in uniform and non-uniform magnetic fields - electric and magnetic fields in a crossed configuration.

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. Jacob Millman, Christos Halkias and Satyabrata JIT, Electronic Devices and Circuits, McGraw Hill Education (India) Private Limited, New Delhi, 2014.
2. William D. Callister, Materials Science and Engineering an Introduction, John Wiley and sons, Inc, 2010.
3. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
4. R. S. Sedha, A textbook of Applied Electronics, S. Chand & Company Ltd., New Delhi, 2010.
5. S. O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2010
6. M. N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand & Company Ltd., New Delhi, 2011.

15CH201 ENGINEERING CHEMISTRY 3 0 2 4

Course Objectives

- Recall the terminologies of electrochemistry and explain the function of batteries and fuel cells with its electrochemical reactions
- understand the fundamentals of corrosion, its types and polymers with its applications
- choose appropriate instrumentation technique for interpreting analytical data

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 analyse 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. construct an electrochemical cell and measure its potential using selected reference electrode
2. identify the electrodes, electrolyte and cell reactions in batteries, fuel cells and infer the selection criteria for commercial battery systems with respect to commercial applications
3. Analyze the type of corrosion, factors influencing rate of corrosion on metals and identify suitable corrosion control method
4. differentiate polymers based on its source, properties and applications
5. Select suitable analytical method for the estimation of alkali and alkaline earth metals in aqueous media

Articulation Matrix

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

UNIT I **10 Hours**

INTRODUCTION TO ELECTROCHEMISTRY

Types of electrodes - electrode potential - salt bridge - cell reaction - cell representation - silver-silver chloride electrode - calomel electrode - determination of single electrode potential - electrochemical series and its importance. Ion-selective electrode: glass electrode - measurement of pH using glass electrode. Concentration cells (electrode and electrolyte). Potentiometry - potentiometric titrations (redox titration). difference between electrochemical and electrolytic cells

UNIT II **9 Hours**

ENERGY STORAGE DEVICES

Batteries - characteristics of battery - types of batteries. construction, working and applications: Primary (alkaline) and secondary (lead-acid and nickel-cadmium) - Modern batteries (zinc air battery and lithium batteries) - precautions for battery maintenance. Comparison with conventional galvanic cells. Fuel cells - Types of fuel cells: solid polymer electrolyte fuel cell - solid oxide fuel cells - microbial fuel cell. Hydrogen-oxygen fuel cell - construction, working, advantages and limitations

UNIT III **8 Hours**

CORROSION SCIENCE

Corrosion: definition - types of corrosion: chemical and electrochemical corrosion - Pilling-Bedworth ratio - types of oxide layer (stable, unstable, volatile and porous) - hydrogen evolution and oxygen absorption mechanism for electrochemical corrosion - mechanism for rusting of iron. Types of electrochemical corrosion: Galvanic corrosion - differential aeration corrosion (pitting, waterline and pipeline). Galvanic series - applications. Factors influencing corrosion: nature of metal and environment. Corrosion control methods: sacrificial anode method - impressed current cathodic protection method - electroplating - electroless plating

UNIT IV **10 Hours**

POLYMERS AND ITS PROCESSING

Advantages of polymers over metals. Monomers - polymers - polymerization - functionality - degree of polymerization - classification of polymers based on source and applications - Molecular weight determination. Types of polymerization: addition, condensation and copolymerization - mechanism of free radical polymerization. Preparation, properties and applications of thermosetting (epoxy resin and bakelite) and thermoplastics (polyvinyl chloride and polytetrafluoroethylene). Compounding of plastics - injection and extrusion moulding methods

UNIT V **8 Hours**

INSTRUMENTATION TECHNIQUES FOR CHEMICAL ANALYSIS

Beer - Lamberts law. Principle, instrumentation (block diagram only) and applications: UV-visible spectroscopy - Atomic absorption spectroscopy - Colorimetry (estimation of a transition metal) - Flame photometry (estimation of an alkali metal)

FOR FURTHER READING

Nobel prize winners in chemistry over past 5 years

1 **2 Hours**

EXPERIMENT 1

Preparation of N/10 oxalic acid and M/10 sodium carbonate solution.

2 **4 Hours**

EXPERIMENT 2

Determination of strength of hydrochloric acid present in the given solution by pH measurement.

3 **4 Hours**

EXPERIMENT 3

Determination of strength of HCl by conductometric titration.

4 **4 Hours**

EXPERIMENT 4

Conductometric titration of mixture of acids (Hydrochloric acid and acetic acid).

5 **4 Hours**

EXPERIMENT 5

Estimation of iron in the given sample by potentiometric method using saturated calomel electrode.

6 **4 Hours**

EXPERIMENT 6

Measurement of rate of corrosion on zinc/mild steel in aerated neutral/acidic/alkaline solution by weight loss method.

7 **4 Hours**

EXPERIMENT 7

Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.

8 **4 Hours**

EXPERIMENT 8

Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method.

Total: 75 Hours

Reference(s)

1. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013.
2. A. Pahari and B.Chauhan, Engineering Chemistry, Infinity Science press LLC, New Delhi, 2010.
3. P.H. Rieger, Electrochemistry, Springer, Netherland, Second Edition (Reprint) 2012.
4. Fred W. Billmeyer JR, Textbook of polymer science, John Wiley & sons, Third edition, 2008.
5. Willard Merritt and Dean Settle, Instrumental methods of analysis, CBS publishers, Seventh edition, 2012.

15CH202 APPLIED CHEMISTRY 3 0 2 4

Course Objectives

- understand the necessity of water softening processes
- aware the causes and consequences of corrosion
- acquaint the applications of alloying and phase rule in metallurgy
- recognise the fundamentals and applications of fuels
- characterize the chemical compounds using analytical 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.

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.

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. attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
2. Analyze the type of corrosion, factors influencing rate of corrosion on metals and corrosion control methods
3. Differentiate ferrous and non ferrous alloys based on its properties, applications and illustrate the importance of phase rule in the field of mettallurgy
4. Distinguish the three types of fuels based on calorific value for selected applications
5. Apply suitable analytical methods for the estimation of elements in aqueous media

Articulation Matrix

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

UNIT I **10 Hours**

WATER PURIFICATION

Hardness of water - classification of hardness (temporary and permanent) - units of hardness (ppm, mg/l, degree Clark, degree French) - expression of hardness in terms of calcium carbonate equivalence - estimation of hardness by EDTA Method - Uses of water for industrial purpose - requirements of boiler feed water - disadvantages of using hard water in industrial boilers: scale, sludge, priming, foaming and caustic embrittlement. Removal of dissolved salts from hard water: internal conditioning (phosphate, carbonate, calgon and colloidal methods), external conditioning (ion exchange process, reverse osmosis, electrodialysis). Uses of water for domestic purpose - municipal water treatment (screening, aeration, coagulation, sedimentation, filtration and disinfection of water - break point chlorination).

UNIT II **8 Hours**

CORROSION SCIENCE

Corrosion - chemical and electrochemical corrosion - Pilling-Bedworth rule - mechanism (types of oxide layer, oxygen absorption - hydrogen evolution) - Galvanic series -types of electrochemical corrosion: Galvanic corrosion - differential aeration corrosion (pitting, pipeline and waterline)-Factors influencing corrosion (nature of metal and environment). Corrosion control: sacrificial anode - impressed current method.Protective coatings - paint -constituents and functions.

UNIT III **9 Hours**

ALLOYS AND PHASE RULE

Alloys: purpose of alloying - function and effects of alloying elements - properties of alloys - classification of alloys. Ferrous alloys: nichrome and stainless steel. Non-ferrous alloys: brass and bronze. Heat treatment of alloys (annealing, hardening, tempering, normalising, carburizing and nitriding).

Phase rule: phase - component - degree of freedom - phase rule - phase diagram - applications- one component system (water system). Reduced phase rule - two component system (lead and silver system).

UNIT IV **10 Hours**

FUELS

Classification - characteristics - calorific value - solid fuel - coal - types - analysis of coal (proximate and ultimate analysis) - processing of coal to coke - carbonization - types (low temperature and high temperature carbonization) - manufacture of metallurgical coke (Otto Hoffmann method). Liquid fuels - petroleum - refining of crude oil - knocking - octane number - cetane number. Liquid fuel from coal (Bergius process). Gaseous fuels - natural gas (CNG) - coal gas - producer gas - syn gas - shale gas.

UNIT V **8 Hours**

INSTRUMENTAL METHODS

Beer - Lamberts law. Principle, instrumentation (block diagram only) and applications: Ultra violet spectroscopy - Infrared spectroscopy - Atomic absorption spectroscopy - Colorimetry (estimation of transition metal) - Flame photometry (estimation of alkali metal).

FOR FURTHER READING

Synthesis and applications of bio-fuels.

1 **2 Hours**

EXPERIMENT 1

Preparation of N/10 oxalic acid and N/10 sodium carbonate solution.

2 **4 Hours**

EXPERIMENT 2

Water quality of BIT campus - River - Bore well water with respect to hardness, TDS and pH.

3 **4 Hours**

EXPERIMENT 3

Conductometric titration of mixture of acids (HCl CH3COOH).

4 **4 Hours**

EXPERIMENT 4

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

5 **4 Hours**

EXPERIMENT 5

Determination of the strength of Fe(II) in the given sample by potentiometric method.

6 **4 Hours**

EXPERIMENT 6

Measurement of rate of corrosion on mild steel in aerated / neutral / acidic / alkaline medium by weight loss method.

7 **4 Hours**

EXPERIMENT 7

Estimation of copper content in brass by EDTA method.

8 **4 Hours**

EXPERIMENT 8

Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method.

Total: 75 Hours

Reference(s)

1. A. Pahari and B.Chauhan, Engineering Chemistry, Infinity Science press LLC, New Delhi, 2010.
2. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013.
3. Willard Merritt and Dean Settle, Instrumental methods of analysis, CBS publishers, Seventh edition, 2012.
4. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishers New Delhi, 16th Edition, 2013.
5. R. Mukhopadhy and S. Datta, Engineering Chemistry, New age international Pvt. Ltd, New Delhi, 2010.
6. Shashi Chawla, Engineering Chemistry, Dhanpat Rai Publishers New Delhi, 2nd Edition, 2003.

15CH203 APPLIED ELECTROCHEMISTRY 3 0 2 4

Course Objectives

- Understanding the basic concepts of electrochemistry and their application
- Expanding knowledge about corrosion and methods of control
- Gaining information regarding principle, working and application of batteries 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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Construct an electrochemical cell and calculate its cell potential.
2. Measure the emf of a cell using different electrodes.
3. Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.
4. Differentiate types of corrosion and its prevention by suitable techniques.
5. Recognize the importance of fuel cells and solar battery.

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	2	1												
4	2	2												
5	3	1												

UNIT I **9 Hours**

FUNDAMENTALS OF ELECTROCHEMISTRY

Introduction - electrical conductance in solution - electrical double layer - electrode potential - importance of electrode potential. Electrochemical cell - standard cell: Weston cadmium cell - Concentration cell: electrode and electrolyte - applications. Applications of electrolytic cells: electrolysis of water, electrolysis of brine and electroplating of copper and gold

UNIT II **9 Hours**

REFERENCE ELECTRODES

Primary and secondary reference electrodes - metal-metal ion electrode, metal-metal insoluble salt electrodes: silver-silver chloride electrode, calomel electrode - ion-selective electrode: glass electrode - measurement of pH of a solution using glass electrode. Quinhydrone electrode: construction - advantages - limitations. Applications of EMF measurements: Potentiometric titrations: acid-base titration - oxidation-reduction titration - precipitation titration

UNIT III **10 Hours**

ENERGY STORING DEVICES

Types of batteries - alkaline, lead-acid, nickel-cadmium and lithium batteries - construction, working and commercial applications. Electrochemical sensors. Decomposition potential: variation of decomposition potential for different metals - importance of decomposition potential. Over voltage: factors affecting over voltage value. Maintenance and precautions in battery handling

UNIT IV **10 Hours**

CORROSION SCIENCE

Corrosion - causes - dry and wet corrosion - Pilling-Bedworth rule - mechanism (hydrogen evolution and oxygen absorption) - rusting of iron. Galvanic series - applications. Galvanic corrosion - differential aeration corrosion (pitting, waterline and stress) - factors influencing corrosion. Corrosion control - sacrificial anode and impressed current cathodic protection methods - Metallic coatings: chromium plating - nickel plating - galvanizing and tinning

UNIT V **7 Hours**

FUEL CELL AND SOLAR BATTERY

Introduction - types of fuel cell: low, medium and high temperature fuel cell. Hydrogen-Oxygen fuel cell - advantages. Solid polymer electrolyte fuel cell, solid oxide fuel cells, biochemical fuel cell. Solar battery - domestic, industrial and commercial applications. Environmental and safety issues

FOR FURTHER READING

Document the various batteries with its characteristics used in mobile phones and laptops Maintenance free batteries, Battery recycling

1 **2 Hours**

EXPERIMENT 1

General instructions to students - Handling reagents and safety precautions.

2 **4 Hours**

EXPERIMENT 2

Determination of strength of a commercial mineral acid by conductometric titration.

3 **4 Hours**

EXPERIMENT 3

Electroplating of copper onto a stainless steel object.

4 **4 Hours**

EXPERIMENT 4

Determination of strength of iron in a given solution by potentiometric method.

5 **4 Hours**

EXPERIMENT 5

Determination of amount of hydrochloric acid present in the given sample using pH meter.

6 **4 Hours**

EXPERIMENT 6

Conductometric titration of mixture of acids.

7 **4 Hours**

EXPERIMENT 7

Determination of corrosion inhibition on mild steel using natural inhibitors.

8 **4 Hours**

EXPERIMENT 8

Estimation of barium by precipitation titration.

Total: 75 Hours

Reference(s)

1. J. C. Kuriacose and J. Rajaram, Chemistry in Engineering & Technology, Vol. 1&2, Tata McGraw-Hill, New Delhi, 2010.
2. B. S. Chauhan, Engineering Chemistry, 3rd Edition, Laxmi Publication Ltd, New Delhi, 2010.
3. B. R. Puri, L. R. Sharma and Madan S Pathania, Principles of physical chemistry, 46th Edition, Vishal publishing Ltd, New Delhi, 2013.
4. B. S. Bahl, G. D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 5th Edition, S. Chand & Company, New Delhi, 2012.
5. S. Vairam, Engineering Chemistry, 1st Edition, John -Willy, India private limited, New Delhi, 2014.
6. Sashi Chawla, Text Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi, 2010.

15CH204 INDUSTRIAL CHEMISTRY 3 0 2 4

Course Objectives

- impart knowledge on the principles of water characterization, treatment methods and industrial applications
- understand the principles and application of electrochemistry, fuel and combustion
- recognize the fundamentals of polymers, nano chemistry and analytical 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.
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.

Course Outcomes (COs)

1. identify the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
2. utilize the concepts of electrochemistry in real time applications.
3. realise the importance of fuel chemistry in day to day life.
4. differentiate the polymers used in day to day life based on its source, properties and applications
5. familiarize with the synthesis and characterization techniques of nanomaterials.

Articulation Matrix

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

UNIT I **10 Hours**

WATER PURIFICATION TECHNOLOGY: SOFTENING AND DESALINATION

Hardness of water: Equivalents of calcium carbonate - Units of hardness - Degree of hardness and estimation (EDTA method). Use of water for industrial purposes: Boiler feed water-scale-sludge - priming and foaming -caustic embrittlement. Softening of hard water: External conditioning - ion exchange methods - Internal conditioning - trisodium, dihydrogen, trihydrogen phosphate and sodium hexameta phosphate- carbonate- colloidal methods. Desalination: Reverse osmosis - electrodialysis. Domestic water treatment - Disinfection of water - break point chlorination

UNIT II **10 Hours**

ELECTROCHEMISTRY

Introduction - EMF - Single electrode potential -Calomel electrode - Glass electrode -pH measurement using glass electrode - Electrochemical series. Cells: Electrochemical cells - Cell reactions- Reversible cells and irreversible cells. Batteries - characteristics of battery - types of batteries, construction, working and applications: Primary (alkaline) and secondary (lead-acid and nickel-cadmium) - Modern batteries (zinc air battery and lithium batteries) - precautions for battery maintenance. Fuel cell: Hydrogen - Oxygen fuel cell.Electroplating of copper and electroless plating of nickel

UNIT III **8 Hours**

FUELS AND COMBUSTION

Fuel: Introduction - classification of fuels - calorific value - higher and lower calorific values - analysis of coal (proximate and ultimate) - carbonization - manufacture of synthetic petrol (Bergius process) - knocking - octane number - cetane number - natural gas - Compressed Natural Gas (CNG)- Liquefied Petroleum Gases (LPG) - producer gas - water gas. Combustion of fuels: introduction-theoretical calculation of calorific value - calculation of stoichiometry of fuel and air ratio - ignition temperature

UNIT IV **9 Hours**

POLYMER AND COMPOSITES

Monomers - functionality - degree of polymerizations - classification of polymers based on source and applications; porosity - tortuosity - molecular weight determination by Ostwald method - polymerization methods: addition, condensation and copolymerization - mechanism of free radical polymerization -thermosetting and thermoplastics. Polymer blends - composites, significance, blending-miscible and immiscible blends, phase morphology, fibre reinforced plastics, long and short fibre reinforced composites

UNIT V **8 Hours**

NANOMATERIALS

Types of Nanomaterials - Nano particles - nanoclusters - nano rod - nanowire -nano tube. Synthesis: Top down process: laser ablation - electrodeposition - chemical vapor deposition. Bottom up process: Precipitation - thermolysis - hydrothermal - solvothermal process. Carbon nanotubes: Types - production - properties - applications. Working principle and applications - Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - UV-Visible spectrophotometer

FOR FURTHER READING

Application of nanomaterials in medicine, environment, energy, information and communication sectors

1 **2 Hours**

EXPERIMENT 1

General instructions to students - Handling reagents and safety precautions

2 **4 Hours**

EXPERIMENT 2

Water quality of BIT campus - River - Bore well water with respect to hardness, TDS and pH

3 **4 Hours**

EXPERIMENT 3

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

4 **4 Hours**

EXPERIMENT 4

Determination of strength of a commercial mineral acid by conductometric titration

5 **4 Hours**

EXPERIMENT 5

Conductometric titration of mixture of acids

6 **4 Hours**

EXPERIMENT 6

Determination of the strength of iron in the given sample by potentiometric method

7 **4 Hours**

EXPERIMENT 7

Determination of molecular weight of polyvinyl alcohol by Ostwald viscometry method

8 **4 Hours**

EXPERIMENT 8

Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method

Total: 75 Hours

Reference(s)

1. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013
2. A. Pahari and B.Chauhan, Engineering Chemistry, Infinity Science press LLC, New Delhi, 2010
3. P.H. Rieger, Electrochemistry, Springer, Netherland, Second Edition (Reprint) 2012
4. Fred W. Billmeyer JR, Textbook of polymer science, John Wiley & sons, Third edition, 2008
5. G. Cao, Ying Wang, Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, World Scientific, New Jersey, 2011
6. S. Sarkar, Fuels and combustion, 3rd edition, Orient Longman Ltd. New Delhi, 2010

15CH205 WATER TECHNOLOGY AND GREEN CHEMISTRY

3 0 2 4

Course Objectives

- Imparting the knowledge on the principles of water technology and green chemistry
- Understanding the principles and applications of green technology in water treatments
- Infer the engineering applications of green chemistry in dyes, corrosion engineering and nanotechnology

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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Explain the importance of green chemistry with its emergence and development.
2. Realize the designing of safer methodologies for green technology to meet the objectives of green engineering.
3. Identify the type of corrosion and its mechanism which will help to develop the corrosion control methods.
4. Apply suitable technique to extract natural dye from its source.
5. Familiarize with the synthesis and characterization techniques of nanomaterials.

Articulation Matrix

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

UNIT I **9 Hours**

WATER TREATMENT

Water quality parameters - Hardness of water - Disadvantages of hard water - Degree of hardness and its estimation (EDTA method) - Boiler feed water - Boiler troubles: Priming, foaming and caustic embrittlement - Softening of hard water: Internal conditioning: Sodium hexameta phosphate - Phosphate methods; External conditioning: Ion exchange method - Desalination: Reverse osmosis - Electrodialysis. Domestic water treatment - Disinfection of water - Break point chlorination.

UNIT II **8 Hours**

WASTE WATER ANALYSIS

Basic principles and concept of green chemistry - Need of green chemistry in day-to-day life - Scientific areas for practical applications of green chemistry - Industrial effluents - Waste water analysis: Concept of chemical oxygen demand (COD) and biological oxygen demand (BOD) - Removal of trace pollutants in waste water: Membrane Bioreactor (MBR) technology - Wet oxidation method.

UNIT III **10 Hours**

CHEMISTRY OF CORROSION

Corrosion: Mechanism of corrosion - chemical and electrochemical - Pilling-Bedworth rule - oxygen absorption - hydrogen evolution - galvanic series. Types of corrosion: Galvanic corrosion - differential aeration corrosion (pitting, pipeline, water line and wire fence corrosion) - factors influencing corrosion. Methods of corrosion control: choice of metals and alloys - proper designing - cathodic protection (Sacrificial anode method, impressed current method)-modifying the environment. Protective coatings: Concept of electroplating: electroplating (gold and copper) - electroless plating (nickel and copper).

UNIT IV **9 Hours**

NATURAL DYES

Introduction - definition - classification of natural dyes - concept of chromophores and auxochromes - Extraction process of colour component from natural dyes: Aqueous extraction, non-aqueous extraction - Purification of natural dyes: Chromatography techniques - Types - Column chromatography - thin layer chromatography - Qualitative analysis: UV-Visible spectroscopic study - Mordant: Metallic and non-metallic mordant - advantages and disadvantages of natural dyes.

UNIT V **9 Hours**

NANOMATERIALS

Types of Nanomaterials - Nano particles - nanoclusters - nano rod - nanowire - nano tube. Synthesis: Top down process: laser ablation - electrodeposition - chemical vapor deposition. Bottom up process: Precipitation - thermolysis - hydrothermal - solvothermal process. Carbon nanotubes: Types - production - properties - applications. Working principle and applications: Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - UV- Visible spectrophotometer. Synthesis of Au and Ag nanoparticles using plant extract - Advantages.

FOR FURTHER READING

Protection of metals in concrete against corrosion
Microwave technology on green chemistry

1 **2 Hours**

EXPERIMENT 1

General instructions to students - Handling reagents and safety precautions

2 **4 Hours**

EXPERIMENT 2

Water quality- river/bore well water with respect to hardness and TDS

3 **4 Hours**

EXPERIMENT 3

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

4 **4 Hours**

EXPERIMENT 4

Estimation of strength of iron by potentiometric method using calomel electrode

5 **4 Hours**

EXPERIMENT 5

Extraction of a natural dye by aqueous extraction method

6 **4 Hours**

EXPERIMENT 6

Measurement of rate of corrosion of mild steel in aerated neutral/acidic/alkaline solution by weight loss measurements/Tafel polarization method

7 **4 Hours**

EXPERIMENT 7

Determination of dye concentration in a given sample by using UV-Visible spectroscopic method

8 **4 Hours**

EXPERIMENT 8

Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method

Total: 75 Hours

Reference(s)

1. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013
2. V K Ahluwalia, Green Chemistry - Environmentally Benign Reactions, Ane Books Pvt. Ltd., New Delhi, 2nd Edition, 2012
3. Giusy Lofrano, Green Technologies for Wastewater Treatment - Energy Recovery and Emerging Compounds Removal, Springer Dordrecht Heidelberg, New York, London, 2012
4. Ashis Kumar Samanta and Adwaita Konar, Natural Dyes - Dyeing of Textiles with Natural Dyes, Dr.Emriye Akcakoca Kumbasar (Ed.), InTech Publisher, New Delhi, 2011
5. J. C. Kuriacose and J. Rajaram, Chemistry in Engineering & Technology, Vol. 1&2, Tata McGraw-Hill, New Delhi, 2010
6. David Pozo perez, Nanotechnology and Nanomaterials, InTech Publishers, NewDelhi, 2010

15TT001 LONG STAPLE SPINNING TECHNOLOGY 3 0 0 3

Course Objectives

- To impart knowledge on the properties of long staple fibres
- To educate the students on the 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 choose fibre extraction methods.
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 manmade 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**

UNIT I LONG STAPLE FIBRES

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**

UNIT II 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**

UNIT III 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.

UNIT IV **9 Hours**

UNIT IV 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**

UNIT V 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, Abishek 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

15TT002 TEXTURING TECHNOLOGY 3 0 0 3

Course Objectives

- 1. To provide a broad overview of texturing technology and textured yarn.
- 2. To enable the students to prepare technological solutions for 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.
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. Select texturing technique based on the knowledge of raw materials, texturing machines, methods and end-uses.
2. Choose machine and process parameters, evaluate the properties and the structure of false-twist textured yarn.
3. Decide machine and process parameters, evaluate properties and the structure of air jet textured yarn.
4. Select machine and process parameters, evaluate the properties and the structure of BCF textured yarn.
5. Appraise miscellaneous other texturing methods; carry out testing of textured yarns.

Articulation Matrix

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

UNIT I **9 Hours**

CONCEPTS OF TEXTURING

Purpose Ã¢?? Types of textured yarns Ã¢?? Classification of process Ã¢?? Comparison of textured with other types of yarns and fabrics Ã¢?? suitability of POY, LOY and UDY for texturing Ã¢?? Role of spin finish on textured yarns.

UNIT II **9 Hours**

FALSE TWIST TEXTURING

Basics of false-twist texturing Ã¢?? machine variables Ã¢?? process variables Ã¢?? Draw texturing Ã¢?? simultaneous and sequential draw texturing - Twisting devices. Structure and properties of FT textured yarns.

UNIT III **9 Hours**

AIR JET TEXTURING

Basics of air jet texturing Ã¢?? types of yarns produced Ã¢?? machine variables Ã¢?? process variables Ã¢?? Air texturing jet Ã¢?? structure and properties of Air jet textured yarns.

UNIT IV **9 Hours**

BCF PROCESS

Basics of BCF Process Ã¢?? BCF Draw texturing machine Ã¢?? machine parameters Ã¢?? process variables Ã¢?? structure and properties of BCF textured yarns.

UNIT V **9 Hours**

OTHER METHODS OF TEXTURING

Stuffer box and edge crimping methods: Principles, limitations, and applications. Knit-deknit and gear crimping methods Ã¢?? texturing of polypropylene Ã¢?? Chemo-mechanical and thermo-mechanical texturing. Testing of Textured Yarns: Measurement of shrinkage force Ã¢?? Crimp contraction - dye uniformity.

FOR FURTHER READING

Quality assurance of feed material, Quality of textured yarns , Friction disc texturing, Air jet Nozzles, Machine developments for high speed texturing.

Total: 45 Hours

Reference(s)

1. 1. J.W.S. Hearle, L. Hollick and D.K. Wilson, Yarn Texturing Technology, Woodhead Publishing, UK, 1998
2. 2. L. Hes and P. Ursing, Yarn Texturing Technology, Eurotex, Universidade do Minho, 1994.
3. 3. Hassan Mohamed Behery Ali Demir, Synthetic Filament Yarn: Texturing Technology, Prentice Hall, 1997.
4. 4. R. S. Gandhi, Textured yarns, MANTRA, 1998
5. 1. 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.

15TT003 APPAREL PRODUCTION PLANNING AND CONTROL

3 0 0 3

Course Objectives

- To understand the concepts in production planning and control.
- 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 analyse 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.

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. 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		3		3	
2	1								2		3		3	
3	1								2		3		3	
4	1	3									2			2
5	1	3									2			3

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-Extending the original product information-Value analysis-Problems in lack of 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.

FOR FURTHER READING

Prototype to production model analysis producing many styles consecutively in one line establishing factory capacity, planning for multi style production Plant loading for multi-style production for extended period Challenges/ issues faced in apparel industry

Total: 45 Hours

Reference(s)

1. Steven Nahmias, "Production and Operations Analysis", 6 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.

15TT004 QUANTITATIVE METHODS IN TEXTILES 3 0 0 3

Course Objectives

- Compute the production rates of spinning machines and parameters of limit irregularity, yarn twist and moisture of fibres, intermediate products and yarnsproduction processes efficiently and effectively
- Prepare yarn realization, spin plan and productivity reports in spinning department
- Compute the production rates and technical parameters in all weaving preparatory machines
- Estimate yarn requirements and prepare reports on weaving productivity, yarn-fabric reconciliation; compute knitting production and technical parameters
- 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 analyse 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 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.

Course Outcomes (COs)

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

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			1	3	
4	3	2							2	3	2	1	3	
5	3	2							2			1	3	

UNIT I **9 Hours**

SPINNING

Linear density (count): Tex, English, Denier, Metric, Woollen, Worsted Ã¢?? count conversions Ã¢?? 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 Ã¢?? Material content (length and mass) in all spinning containers and packages. Twist and twist multipliers in Tex, Ne and Metric systems Ã¢?? Yarn twist contraction. Draft, twist and production constants in spinning machines.

UNIT II **9 Hours**

SPINNING CONT

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

UNIT III **9 Hours**

FABRIC FORMATION

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

UNIT IV **9 Hours**

FABRIC FORMATION CONT

Hard waste: theoretical and actual Ã¢?? Yarn requirements for a given product mix Ã¢?? Weave plan: production balancing Ã¢?? yarn-fabric reconciliation Ã¢?? Weaving productivity measures, labour complement in weaving. Weaving snap study. Optimization of package sizes: warpers and weaverÃ¢??s beams. Knitting production: circular, flat bed and warp Ã¢?? loop length Ã¢?? tightness factor Ã¢?? stitch density Ã¢?? 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 Ã¢?? oBe to oTw to g/cc Ã¢?? Normality Ã¢?? Molarity - Molality. Lab-to-shop floor calculations for preparation, colouration and finishing. Estimation of degradation in Preparatory Processes: Calculation of Copper Number Ã¢?? carboxyl group content. Dye exhaustion to the fabric in padding process. Colour difference Ã¢?? shade sorting Ã¢?? CIE Whiteness Index Ã¢?? ASTM Yellowness Index. Utilities consumption.

FOR FURTHER READING

Reconciliation of hank meter production and actual production; UKG Ã¢?? power tariffs; Terry fabric: beam, yarn requirements; Marker utilisation, fabric and sewing thread consumption in garment manufacture; Heat energy for drying in stenter.
Guest lecture: PP&C and costing topics.

Total: 45 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.

15TT005 PROCESS AND QUALITY CONTROL IN SPINNING AND WEAVING

3 0 0 3

Course Objectives

- Select suitable raw material for the manufacturing of the yarn with required yarn quality
- Choose the machinery and process parameters for the manufacturing of yarn with required quality and propose remedial measures for trouble shooting in spinning process.
- Select the machinery and process parameters for the manufacturing of fabric with required quality
- Choose the parameters for the manufacturing of fabric with required quality and propose remedial measures for trouble shooting in weaving process.
- Identify the parameters for the satisfactory performance of various intermediate processes 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 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.

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

Scope for process control in spinning - mixing quality - concept of fibre quality index and its application - prediction of spinnability and yarn quality - Bale Management Techniques - blending irregularity. Causes of nep generation - nep removal in carding and combing machines. Cleaning and control of wastes - yarn realisation. Use of HVI and AFIS for process control operations.

UNIT II **9 Hours**

YARN QUALITY CONTROL

Within and between bobbin count variations Ã¢?? control of count variations in preparatory machines and ring frame Ã¢?? yarn unevenness and imperfections Ã¢?? causes for unevenness and imperfections Ã¢?? Unevenness Ã¢?? analysis and interpretation spectrograms. Yarn faults Ã¢?? causes and methods to reduce faults. Causes and remedial measures for variability in strength. Measures for control of hairiness. Measures to control end breaks in spinning.

UNIT III **9 Hours**

PROCESS CONTROL IN WEAVING PREPARATION

Scope of Process and Quality Control in weaving Ã¢?? Yarn quality requirements for shuttle and shuttleless looms Ã¢?? Quality and performance in winding, warping, pirn winding, sizing and beam gaiting Ã¢?? weaving package defects, causes and remedies Ã¢?? choice of size recipe Ã¢?? selection of weaving accessories.

UNIT IV **9 Hours**

PROCESS CONTROL IN WEAVING

Fabric defects Ã¢?? causes Ã¢?? control measures. Inspection standards Ã¢?? cloth realization Ã¢?? value loss. Snap study in loomshed Ã¢?? Process performance studies and norms (including preparatory sections).

UNIT V **9 Hours**

PRODUCTIVITY IN SPINNING AND WEAVING

Factors affecting productivity in spinning and weaving Ã¢?? productivity indices Ã¢?? Loom efficiency: factors influencing loom efficiency Ã¢?? maximizing production and productivity in spinning and weaving.

FOR FURTHER READING

Online monitoring and control of neps; Machine audit; Control of hard waste; Ambient conditions in weaving; Establishment of productivity indices

Industry Visit: Collection of industrial issues and possible solution by observations and discussions.

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.

15TT006 THEORY OF SPINNING 3 0 0 3

Course Objectives

- 1. To teach the underlying theoretical principles of various processes that take place during spinning
- 2. To impart knowledge on the mechanisms of yarn formation.
- 3. 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 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.
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 Ã¢?? Principles Ã¢?? Blending delay time Ã¢?? Blend proportion Ã¢?? Perfect blend Ã¢?? Blending deficiencies Ã¢?? Optimum blending. Mixing: Optimisation Ã¢?? linear programming Ã¢?? goal programming Ã¢?? Index of blend irregularity.

UNIT II **9 Hours**

OPENING, CLEANING AND CARDING

Intensity of opening. Opening and cleaning principles: tearing Ã¢?? picking Ã¢?? plucking Ã¢?? beating Ã¢?? combing Ã¢?? tossing. Degree of cleaning Ã¢?? carding and doffing disposition Ã¢?? Centrifugal forces. Action between feedroller and Licker-in, three licker-in theory Ã¢?? main cylinder and flats wide-width theory Ã¢?? Fibre transfer Ã¢?? mechanism of elimination of neps.

UNIT III **9 Hours**

DOUBLING AND DRAFTING

Principle Ã¢?? Perfect draft Ã¢?? Actual draft Ã¢?? Law of Doubling Ã¢?? Addition of irregularity Ã¢?? Roller Drafting Ã¢?? Apron drafting Ã¢?? Drafting by opening roller. Periodic variations Ã¢?? Roller nip movements Ã¢?? Roller speed variation Ã¢?? stick-slip curve. Drafting force Ã¢?? Piecing irregularity in combing.

UNIT IV **9 Hours**

YARN FORMATION

Mechanism of twist Ã¢?? Fibre migration phenomena: Obliquity, coherence curve. Twist insertion techniques: False Ã¢?? Flyer Ã¢?? Ring and traveller twisting, up twisting - down twisting - Cabling. OpenÃ¢??end Ã¢?? Self twisting Ã¢?? 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 Ã¢?? carding Ã¢?? Chute feed system Ã¢?? draw frame Ã¢?? comber Ã¢?? roving Ã¢?? yarn regularity. Hairiness.

FOR FURTHER READING

Self-study topics: Blending machines; Hook theory; Theory of friction field; Packing fraction; Package formation.
Presentation: Research papers on yarn structure

Total: 45 Hours

Reference(s)

1. 1. R. Chattopadhyay, Advances in Technology of Yarn Production, NCUTE Publication, New Delhi, 2002.
2. 2. Carl Lawrence, Fundamentals of Spun Yarn Technology, CRC Press limited, U.K., 2003
3. 3. K. Slater, Yarn Evenness, Textile Progress, The Textile Institute, Manchester, U.K., 1986.
4. 4. W. Klein, The Technology of Short Staple Spinning, Vol. I Ã¢?? V, The Textile Institute, 2010.
5. 5. Anindhaya Ghosh and R. S. Rengasamy, Predictive Model for Strength of Spun Yarns: An Over View, Autex Research Journal, March 2005.

15TT007 THEORY OF WEAVING 3 0 0 3

Course Objectives

- To impart the fundamental understanding of weaving motions.
- Developing an attitude to carry of 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.
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. Apply principles of shedding motions for design, development and operations
2. Appraise picking motions from the perspectives of design, development and operations
3. Assess beat-up motion and factors related to weft insertion from design, development and operations angle.
4. Appraise projectile and rapier looms from design, development and operations perspective.
5. Evaluate air-jet, water jet and multiphase looms for design, development 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	1	3	2
2	3		3		2						1	1	3	2
3	3		3		2						1	1	3	2
4	3		3		2						1	1	3	2
5	3		3		2						1	1	3	2

UNIT I **9 Hours**

THEORY OF SHEDDING

Geometry of warp shed -Types of shed Ã¢?? Characteristics of different sheds Ã¢??Ã¢?? Design of cams Ã¢?? Design of heald reversing motion. Matched cam shedding Ã¢?? Factors that limits the size of repeat Ã¢?? Mechanics of dobby shedding Ã¢?? Lever Ã¢?? 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 Ã¢?? Elastic properties of the picking mechanism Ã¢?? Retardation of shuttle Ã¢?? Rest position of shuttle Ã¢?? Shuttle flight.

UNIT III **9 Hours**

MECHANICS OF BEAT UP

Types of Beat-up mechanismÃƒÂ¢?? 4 link and 6 link beat up ÃƒÂ¢?? Cam beat up ÃƒÂ¢?? Sley speed and acceleration ÃƒÂ¢?? Beat up theory ÃƒÂ¢?? Beat up time. Sley eccentricity and its effects ÃƒÂ¢?? Dwell period ÃƒÂ¢?? Warp and cloth control: Bumping conditions ÃƒÂ¢?? disturbed weaving conditions ÃƒÂ¢?? causes for variation in pick spacing

Weft Measurement

Weft accumulation systems ÃƒÂ¢?? Pick length measurement - Weft tensioning ÃƒÂ¢?? Weft unwinding for individual pick.

UNIT IV **9 Hours**

WEFT INSERTION Ã,?? PROJECTILE AND RAPIER

Weft velocity in shuttleless looms Ã¢?? Rate of weft insertion Ã¢?? Weft insertion cycle Ã¢?? Projectile flight through the warp. Types of Rapier weaving machineÃ¢?? Weft insertion in loop form Ã¢?? Tip transfer system Ã¢?? Rapier guide control in the warp sheet Ã¢?? Rapier speeds.

UNIT V **9 Hours**

WEFT INSERTION ÃƒÂ¢?? AIR JET, WATER JET, MULTIPHASE

Air jet loom ÃƒÂ¢?? Jet guides ÃƒÂ¢?? Design concepts of air jet picking ÃƒÂ¢?? Theory of air jet picking ÃƒÂ¢?? Timing diagram ÃƒÂ¢?? Weft motion through the shed ÃƒÂ¢?? relay nozzles ÃƒÂ¢?? Textile dust remover. Water jet loom ÃƒÂ¢?? Tractive force in the weft thread ÃƒÂ¢?? Jet and weft thread velocity ÃƒÂ¢?? Braking of the weft thread ÃƒÂ¢?? Timing diagram for weft insertion. Multiphase weaving: Technological problems in multi phase weaving

FOR FURTHER READING

Motion of the sley, healds and shuttle. Velocity and acceleration curve for torsion bar picking. Characteristics of weft supply packages. Weft tension before the beat up.

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.
5. A. Ormerod, W. S. Sondhelm, Weaving Technology & Operations, Textile Institute Publication, 1995.
6. J. J. Vincent, Shuttleless Loom, Textile Institute, 1988

15TT008 ADVANCED KNITTING TECHNOLOGY 3 0 0 3

Course Objectives

- To provide knowledge of advanced technologies in warp, weft and flat knitting.
- To teach the mechanisms involved in advanced knitting machines
- To provide exposure to 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 analyse 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 state-of-the-art tricot and raschel knitting machines and technologies.
3. Analyse modern features of flat knitting to produce flat knit structures.
4. Apply the principles of warp knitting science to produce, assess, predict and improve quality of warp knits.
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**

UNIT I 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**

UNIT II 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**

UNIT III 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**

UNIT IV 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**

UNIT V YARN PREPARATION

Methods of yarn preparation - Indirect /mill warping - Direct Warping - Direct warping equipment for filament yarns -Warping machines - yarn creel - attachments.

FOR FURTHER READING

High-performance tricot machines, Production of technical textiles fabrics using Raschel knitting machines,

Recent developments in flat knitting machines and fabrics, Production calculations, Types of warping equipment

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 Technolog, 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.

15TT009 ADVANCES IN CHEMICAL PROCESSING TECHNOLOGY

3 0 0 3

Course Objectives

- To know the advancements in the chemical processing of textile materials.
- To educate on the alternative processes using enzymes in preparation and finishing
- To impart 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 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.
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 of latest textile finishes.
4. Appraise the issues involved in the design, operation and maintenance of effluent treatment plants.
5. Select state-of-the-art 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	2	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 method - Developments in E controls dyeing machines - Low liquor and Low wet pickup techniques, super critical carbondioxide 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.

FOR FURTHER READING

Limitations of combined preparatory process, Limitations of low wet pick up techniques,Structure and significance of microcapsule, Enzymes for effluent treatment, Limitations of bioscouring.

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.

15TT010 TEXTILE EFFLUENT TREATMENT **3 0 0 3**

Course Objectives

- To create the awareness on control of effluents arising from wet processing.
- To provide knowledge of different methods of treating the effluents from wet 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 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.
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. Appraise water quality.
4. Propose inputs for the design, development and operation of effluent treatment plants.
5. Develop 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	3											3
5	2	3	2											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.

FOR FURTHER READING

Norms for potable water, Comparison of filtration techniques, COD and BOD analysis,Comparison of individual ETP and CETP, Norms for treated water for discharge

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

15TT011 PROCESS AND QUALITY CONTROL IN TEXTILE CHEMICAL PROCESSING

3 0 0 3

Course Objectives

- To impart knowledge on the fundamental principles of quality and process control in chemical processing
- To educate students on the use and interpretation of norms and standards as 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 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.
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.

FOR FURTHER READING

Norms for desized, scoured and bleached fabrics, Comparison of dyes meant for dyeing and printing, Problems associated with knits: picking and snagging, Influence of mechanical finishes on fabric properties, Evaluation of wetting agent and chelating agent.

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 Indi

15TT012 COLOUR SCIENCE 3 0 0 3

Course Objectives

- To impart fundamental knowledge of colour science and objective measurement of colour
- To teach the basics of kinetics and thermodynamics of 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.
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 and hardware for quality control of colour
5. Select software and hardware for quality control of colour

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**

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.

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

Different colour difference equation - factor 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.

FOR FURTHER READING

Colour blindness: reasons, Beer-Lambert law, Need for calibration of colour matching system, Half-time dyeing, Role of preparation on shade variation

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.

15TT013 CLOTHING SCIENCE 3 0 0 3

Course Objectives

- To impart knowledge of textiles from the perspective of human-clothing interface
- To impart knowledge on the effects of fibre, yarn, fabric and garments properties on apparel utility characteristics â€“ 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 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.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Appraise transmission characteristics of air and heat for the development of end-use specific garments.
2. Apply transformation characteristics of textiles to produce functional and aesthetic textiles.
3. Select 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 various 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.

FOR FURTHER READING

Gestalt of comfort, Significance of drape coefficient, Comparison of KES and FAST, Human skin and comfort, Factors to be considered while developing apparels for specific end use

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.
6. T. Mastudaira and M. N. Suresh, Design Logic of Textile Products, Textile Progress, The Textile Institute, Manchester, 1997.

15TT014 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.
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. 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**

INTRODUCTION TO PATTERN MAKING

Patternmaking tools -Principles of Pattern making pattern production terms. Figure analysis ,proportions, seven and half and eight-head theory. Measuring techniques -measuring tools -measuring the form ?circumference measurement -vertical measurements -horizontal measurements. Flat pattern designing -industrial -commercial -individual figure analysis (Bespoke Methods).

UNIT II **9 Hours**

BASIC PATTERN AND MANIPULATION:

Drafting Bodice Blocks, Torso Blocks -Skirt Blocks. Fitting the blocks -Bodice -Necklines -Arm hole -Sleeve. Dart manipulation -slash and spread and pivotal transfer methods. Displacement of bust dart -waist line -side seam -arm hole -neck line - front edge. Creating Fullness: tuck darts - pleats.

UNIT III **9 Hours**

BODY COMPONENTS: SLEEVE, COLLAR, CUFF

Sleeve: Set-in-Sleeves (plain - puff - bell - bishop - circular - leg-o-mutton) - Sleeves combined with bodice (Modified armholes - Kimono - Dolman). Cuff: shirt cuff - self-faced cuff- French cuff - contoured cuff. Collars: Classification - Factors to be considered while selecting Collars. Types - peter pan - partial roll - cape - scalloped - sailor - square -full roll convertible- shawl - Shakespeare. Raglan sleeves

UNIT IV **9 Hours**

BODY COMPONENTS: YOKE, POCKET

Yokes: Factors to be considered while selecting, Yoke, preparing patterns for yokes - partial yoke - yoke without fullness - yoke with fullness - yoke supporting or releasing fullness. Pockets: Factors to be considered while selecting Pocket. Types - patch - bound - side seam - front hip. Waist band - facing - interlinings. Allowances: Ease - seam - in-turn and in-lay

UNIT V **9 Hours**

PATTERN GRADING

Size Charts - Men's - Women's and Children's. Grading: principles of grading - master and basic grades -front - back - sleeve - collar - cuff and facing grading. Styles of grading - grading of shirt - trousers and jacket. Selecting a grading system: multi-track grading and simplified system.

SELF STUDY

Quality control in pattern design, Creating fullness: Flares, gathers, style lines,Raglan sleeves, Welt pockets

Total: 45 Hours

Reference(s)

1. Helen Joseph Armstrong, Pattern Making for Fashion Designers 4th Edition, Prentice-Hall, New Jersy, 2006.
2. Winifred Aldrich, Pattern Cutting for Menswear, 4th edition, Blackwell Science Publisher, USA, 2006.
3. Mary Mathew, Practical Clothing Construction, Part-II, Designing Drafting and Tailoring, Cosmic Press, Chennai, 1999.
4. Winifred Aldrich, Metric Pattern Cutting, Om Book Service, 1997.
5. Kapoor Bela, Pattern Drafting and Making, Phoenix Publishing House Pvt. Ltd., 1997.
6. Gerry Cooklin, Master Patterns & Grading for Women, Outsize Blackwell Scientific Publications, 1995.

15TT015 GARMENT PRODUCTION MACHINERY AND EQUIPMENT

3 0 0 3

Course Objectives

- To impart knowledge on the design, construction and operational features of garment production machinery and equipment
- To teach 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.
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, set and operate the spreading and cutting machines and evaluate their 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, set and operate overlock sewing machines for apparel manufacture.
5. Select, set and operate 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	2
5	3		2										3	2

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 ÃƒÂ¢?? left, right, double; feller, hemmer, etc. Collar turning machines, folding machinery, fusing and pressing machinery.

FOR FURTHER READING

Automation in sewing machines , parts and functions of flat lock machines , smocking machines, multi thread chain lock sewing machines

Total: 45 Hours

Text Book(s)

1. Jacob Solinger, Apparel Manufacturing Handbook, VanNostrand Reinhold Company, 1988.
2. Peyton B. Hudson, Guide to Apparel Manufacturing, MediApparel Inc. 1989.

Reference(s)

1. H. Carr and B. Latham, The Technology of Clothing Manufacture, Blackwell Scientific Publications, 1988.

15TT016 MANAGEMENT OF APPAREL UNITS 3 0 0 3

Course Objectives

- To equip the students with knowledge of the apparel industry.
- To teach students the basics of managing a garment production factory.

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.

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. Construct organization charts for various sizes of woven, knitted or leather apparel industry.
2. Plan, produce and exercise control in an apparel unit.
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		3	
2		2									3	1	3	
3		2									3	1		3
4		2									3	1	3	
5		2									3	1	3	

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 - sports wear - 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.

SELF STUDY

Market research, Certifications, Welfare measures in apparel industry,

Total: 45 Hours

Reference(s)

1. Ruth E Glock, Grace I Kunz, Apparel Manufacturing - Sewn Product Analysis - 3rd Edition, Prentice Hall Inc., 2000.
2. Jacob Solinger, Apparel Manufacturing Handbook - Analysis Principles and Practice, Bobbin Blenheim Media Corp; 2nd edition (December 1988).

15TT017 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.

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 analyse 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.
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. 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.

SELF STUDY

GATT, Labelling and licensing, Just In Time, Factors influencing the terms of payment, Foreign exchange regulations, Managing risk in exports.

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.

15TT018 COATED AND LAMINATED TEXTILES 3 0 0 3

Course Objectives

- To impart knowledge on the science and technology of coating and lamination of textile materials.
- To gain knowledge on 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 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.
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. 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. 4. Select coated textile-structure-based materials for specific end-uses. 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 Clothings - 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.

FOR FURTHER READING

Mechanism of adhesion of adhesives- Rotary screen coating- Flocking- High visibility garments- Special tests for chemical and biological hazards

Total: 45 Hours

Reference(s)

1. W. Fung, Coated and Laminated Textiles, Woodhead Publishing, England, 2002.
2. A. K. Sen, Coated Textiles â€“ Principles and Applications, Technomic Publication, Lancaster, 2001.
3. S. C. Anand and W. Horrocks, Technical Textiles, Woodhead Publishing limited, CambridgeEngland, 2000.
4. R. S. Lenk, Polymer Rheology, Applied Science Publishers, London, 2000.
5. W. C. Smith, Smart Textile Coatings and Laminates, Woodhead Publishing, CambridgeEngland, 2010.

15TT019 NANO TEXTILES 3 0 0 3

Course Objectives

- To teach the concept of nano technology and its application in textiles.
- To teach the production methods of nano fibres.
- To impart 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 nano fibres produced by electrospinning technique.
2. Develop and characterize carbon nano tubes and nano composites.
3. Develop polymer layered silicate nano composites; dye polypropylene using nano technology.
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**

NANOTUBES 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.

Nanofabrication of thin polymer fibre - "Grafting from" and "Grafting to" techniques for synthesis of polymer films, synthesis of smart switchable coatings.

FOR FURTHER READING

Carbon nanotubes applications - Assessment of dyed modified polypropylene - Applications of nano coated textiles for filtration - Synthesis of hdrophobic materials.

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.

15TT020 HIGH PERFORMANCE FIBRES 3 0 0 3

Course Objectives

- To impart knowledge of Structure and manufacturing methods for various high performance fibres.
- To teach 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 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.
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. 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			2		2			3		
2	3	2		1			1		2			3		
3	3	2	3	1			2		1			3		
4	3	2	3	1			2		2			3		

5	3	2	3		2		1		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: Molecular arrangements, physical properties: compression and bending properties â€“ 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. Carbon nano-tubes. Structural aspects of PAN based and pitch based carbon fibres. Glass fibres â€“ Types and compositions â€“ Manufacturing processes â€“ Fibre structures â€“ Properties â€“ Applications.

UNIT III **9 Hours**

INORGANIC FIBRES

Ceramic fibres â€“ Classification of silicon carbide fibres. Aluminium Oxide fibres â€“ Compositions of Aluminium Oxide fibres. Manufacturing process â€“ Fibre structure â€“ properties â€“ applications. Lead fibres â€“ preparation of Lead fibre â€“ Structure and properties of lead fibres â€“ applications â€“ Sound control and 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 RESISTANCE 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.

UNIT VI **9 Hours**

SELF STUDY

Stress-strain characteristics, Vapour grown carbon fibres, Asbestos fibres: Types, compositions, manufacturing processes, fibre structure, Properties and applications, Manufacturing and applications of thermotropic liquid crystal aromatic polyester,

Total: 54 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

15TT021 TEXTILE COMPOSITES 3 0 0 3

Course Objectives

- To infuse the students with the knowledge of various manufacturing and processing technologies for composite materials
- To understand mechanical characterisation and applications of textile composites
- To impart 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 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.
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.
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. Classify the composite materials and evaluate the role of reinforcement and matrix in a composite.
2. Analyse physical and chemical properties of high performance reinforcements and matrix materials and the methods to improve interfacial bonding.
3. Outline methods of manufacturing advanced composite preforms for designing composite materials.
4. Analyse composite manufacturing techniques for selective end-use applications.
5. Evaluate the mechanical properties of composite materials employing standard test methods.

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	3	2		2			2		1			3		
3	3	2	3	1			1		2			3		

4	3	2	3	2			2		1			3		
5	3	2	3	1	2		1		2			3	2	3

UNIT I **9 Hours**

INTRODUCTION TO COMPOSITE MATERIALS

Classification: fibre - particulate -laminar composites. Constituents of composite materials- functions of fibre and matrix - Properties of fibres and matrix materials- Critical fibre length - Aligned and random fibre composites - property prediction - rule of mixtures- simple problems.

UNIT II **9 Hours**

COMPOSITE MATERIALS

Types of high performance fibres - properties- types of matrix materials - Thermoset and Thermo plastics properties fibre matrix interface coupling agents - coupling of interfaces and interfacial reaction in fibre composites.

UNIT III **9 Hours**

TEXTILE STRUCTURAL COMPOSITE REINFORCEMENTS

Textile Structural Composite Reinforcements Introduction to manufacturing techniques Ã¢?? property requirements Ã¢?? Textile preforms Ã¢?? weaving, knitting braiding, filament winding, pultrusion. Prepregs - Introduction, manufacturing techniques, property requirements, compaction and applications - Advantages and disadvantages of prepreg materials.

UNIT IV **9 Hours**

COMPOSITES PROCESSING TECHNIQUES

Vacuum bagging - compression moulding - injection moulding - pultrusion - thermoforming - resin transfer moulding (RTM), VARTM, SMC, BMC

UNIT V **9 Hours**

MECHANICAL CHARACTERISATION OF COMPOSITES

Introduction to structural material characterisation standards- ASTM, ISO, BSI. Testing of composites materials- Fibre volume fraction - tensile- shear - compression - Impact-Fatigue -- flexural properties -Damage Tolerance assessmentÃƒÂ¢?? Non- Destructive testing of composites.

FOR FURTHER READING

Applications of textile composites in various fields, Short fibre composites, Modelling of internal geometry of textile performs, Filament winding, Interlaminar fracture/failure modes in composites

Total: 45 Hours

Reference(s)

1. L. Gupta Advanced Composite Materials, Himalayan Books, New Delhi, 1998.
2. D. Hull, An introduction to composite materials Ã¢?? Cambridge University Press, Cambridge, 1998
3. C. Long, Design and manufacture of Textile composites, Woodhead Publishing Limited, 2005.
4. A. C. Long, Mechanical testing of advanced fibre composites, Woodhead Publishing Limited, 2005.
5. F. L. Mathews and R. D. Rawlings, Composite Materials Engineering Science, Chapman & Hall, London, 1994.

6. A. Bogdanovich and C. Pastore, Mechanics of Textile and Laminated composites, Chapman & Hall, 1997.

15TT022 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

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 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.
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. 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		1				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 :
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.

FOR FURTHER READING

Customer Survey, Supplier rating, Total Productive Maintenance, Toyota Production System, Role of HR in TQM.

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

15TT023 MAINTENANCE MANAGEMENT 3 0 0 3

Course Objectives

- To teach the principles of maintenance management as applied to textile industry
- 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 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.
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		2				2				-	
2	-	-	2		2				2				-	
3	-	-	3		2				2				-	
4		-	2		2				2				-	
5	-	-			2				2				-	

UNIT I **9 Hours**

UNIT I 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**

UNIT II SPINNING PREPARATION

Maintenance schedules - Frequency - manpower - Time required - Special tools - Gauges. Maintenance of Card Clothing: Wire inspection - Grinding procedure Â¬ Burnishing - Flat end milling - Aprons - Flyer - Bottom roller - Top roller - Cots: selection - mounting - Buffing frequency - Grinding - BerkolisingÂ¬ - Acid treatment - Cot life - Top roller greasing

UNIT III **9 Hours**

UNIT III 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**

UNIT IV 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**

UNIT V 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.

FOR FURTHER READING

Safety audit, Card wire mounting operation, Characteristics of lubricants, Weaving maintenance cost control, Energy conservation and maintenance

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.

15TT024 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 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.

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.
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	3	2							1	2	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 ÃƒÂ¢?? 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.

FOR FURTHER READING

Remedial measures for low productivity, Flow diagram for Textile and Garment Industry, Calculation of Standard Minutes Value (SMV), Layout for Textile and garment units, Hygiene, Feeding and Convenience related services.

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

15TT025 UTILITIES ENGINEERING 3 0 0 3

Course Objectives

- To make the student familiar with fundamentals of utilities engineering
- To teach 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 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.
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.
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 their operations 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	3	-	-
2	1	-	-								2	3	-	-
3	1	-	-									2		-
4	-	-	-								1	2	-	-
5	-	-	-	2		1						3		-

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.

FOR FURTHER READING

Developments in industrial lighting, Speed control of motors, Boiler fuels, Norms for utilities (ATIRA & SITRA), Government regulations covering utilities.

Total: 45 Hours

Reference(s)

1. SITRA norms for spinning mills, The South India Textile Research Association, Coimbatore. 2004

15TT026 HOME TEXTILES **3 0 0 3**

Course Objectives

- To educate the student about textiles based products used in homes and their selection.
- To impart 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 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.

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	3	-	-										
3	3	2	-											
4	3	3	3											
5			3	2										

UNIT I **9 Hours**

HOME FURNISHING

Textile Furnishing â€“â€“ Woven and Non-woven. Selection of: Fibers â€“ Colors â€“ Designs. Kitchen Textiles: Apron-Dish cloth â€“ Bread Bag â€“ Pot Holders. Table textiles: Mats - Table cloths â€“ Types - Materials. Upholstery: Materials - Fixed upholstery â€“ Non-stretch loose covers â€“ 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 â€“ Curtains â€“ 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 - Flamability.

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.

UNIT VI **9 Hours**

SELF STUDY

Performance specifications, Finishes, Market scenario, Ornamentation, Eco friendly home textiles

Total: 54 Hours

Reference(s)

1. Subrata Das., Performance of Home Textiles, Woodhead Publishing India PVT. LTD, 2010.
2. Alexander N.G., Designing Interior Environment, Mass Court Brace Covanorich, Newyork, 1972.
3. Wingate I.B., & Mohler J.E., Textile Fabrics & Their Selection, Prentice Hall Inc, New York, 1984.

15TT027 MECHANICS OF TEXTILE MACHINES 3 0 0 3

Course Objectives

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 analyse 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 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. Select power transmission systems for textile machinery.
2. Demonstrate the knowledge of types and use of epicyclic 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 for 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	1	3
2	2	2									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

Total: 0 Hours

15GE001 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)

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														

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

15GE002 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)

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														

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

15GE0C3 POLYMER CHEMISTRY AND PROCESSING

3 0 0 3

Course Objectives

- Impart knowledge on the basic concepts of polymers and its mechanism
- Use the appropriate polymerization techniques to synthesize the polymers and its processing
- Select the suitable polymers for various applications

Programme Outcomes (POs)

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														
3														
4														
5														

UNIT I **10 Hours**

POLYMERS AND ELASTOMERS

Classification of polymers - Mechanism: Addition polymerization - free radical polymerization - cationic, anionic and co-ordination (Ziegler-Natta) polymerization, copolymerization, condensation polymerization (nylon-6,6) ring opening polymerization (nylon-6). Elastomers: Natural rubber - vulcanization - synthetic rubber: styrene -butadiene rubber (SBR), butyl, neoprene, thiocol rubbers. High performance polymers: polyethers, polyether ether ketone(PEEK), polysulphones, polyimides.

UNIT II **8 Hours**

POLYMERIZATION TECHNIQUES

Homogeneous and heterogeneous polymerization - bulk polymerization (PMMA, PVC) solution polymerization - polyacrylic 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 by 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 plactics 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

15GE0P1 NANOMATERIALS SCIENCE 3 0 0 3

Course Objectives

- Understand the fundamentals of physics of nanomaterials
- Correlate on multidisciplinary branch
- Acquire the knowledge in nanomaterials synthesis, compile and analyze data and draw conclusions at nano level

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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Classify the size dependant properties of different nanomaterials
2. Explain different experimental methods used for the preparation of nanomaterials
3. Analyse the data using different characterization techniques
4. Illustrate the different techniques to synthesize semiconductor nanostructures and utilize them for application
5. Identify the impact of nanomaterials and their applications in Nano devices

Articulation Matrix

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

UNIT I **9 Hours**

NANO SCALE MATERIALS

Introduction-Feynman's vision-national nanotechnology initiative (NNI) - past, present, future - classification of nanostructures,nanoscale architecture - effects of the nanometer length scale - changes to the system total energy, and the system structures- effect of nanoscale dimensions on various properties -magnetic properties of nanoscale materials -differences between bulk and nanomaterials 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 - chemical vapour deposition, plasma enhanced CVD, colloidal and sol-gel methods - template based growth of nanomaterials - ordering of nanosystems, self-assembly and self-organization - DC sputtering and RF sputtering process.

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 - thermogravimetric analysis of nanomaterials.

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 nanomaterials.

UNIT V **9 Hours**

NANOMACHINES AND NANODEVICES

Microelectromechanical systems (MEMS) and Nanoelectromechanical systems (NEMS)-fabrication, actuators-organic FET- principle, description, requirements, integrated circuits- organic LEDÃƒÂ¢??s - basic processes, carrier injection, excitons, optimization - organic photovoltaic cells- nano motors - bio nano particles-nano - objects - applications of nano materials in biological field.

FOR FURTHER READING

Application of graphene in various field - supercapacitors - third generation solar cell-dye sensitized solar cell (DSSC) -fuel cells.

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, AuliceScibioh M, Fuel cells: Principles and Applications, University Press, 2009.

15GE0P3 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 analyse 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	1	2												
3	2	1												
4	2	1												
5	2	2												

UNIT I **9 Hours**

LASER FUNDAMENTALS

Introduction - principle - Einstein's prediction - spontaneous emission - stimulated emission - Einstein's relations - A and B coefficients - population inversion - condition for large stimulated emission - spontaneous and stimulated emission in optical region - light amplification. Components of lasers: active medium - pumping - pumping mechanisms - resonant cavity.

UNIT II **9 Hours**

CHARACTERISTICS AND TYPES OF LASERS

Introduction - directionality - intensity - coherence - monochromaticity. Classification of lasers - principle, construction, working, energy level diagram and applications of CO2 laser - dye laser - excimer laser - Nd:YAG laser - semiconductor laser.

UNIT III **9 Hours**

LASERS IN SCIENCE

Harmonic generation - stimulated Raman emission - lasers in chemistry - laser in nuclear energy - lasers and gravitational waves - LIGO - rotation of the earth - measurement of distance - velocity measurement - holography.

UNIT IV **9 Hours**

LASERS IN MEDICINE AND SURGERY

Eye laser surgery - LASIK - photocoagulations - light induced biological hazards: Eye and skin - homeostasis - dentistry - laser angioplasty - laser endoscopy - different laser therapies.

UNIT V **9 Hours**

LASERS IN INDUSTRY

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

FOR FURTHER READING

Q-switching - mode locking - thermo-optic effects - astronomy lasers - fighting crime with lasers - laser engraving.

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.

15TT0YA YARN AND FABRIC MANUFACTURE 3 0 0 3

Course Objectives

- To provide an overview of the technological aspects of yarn and fabric manufacture for engineering/technology students of other disciplines
- To enable the students to prepare technological solutions for textile field from other engineering/technology disciplines

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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
n. Develop new designs (woven / printed / dyed) and products (knitted / woven / nonwoven) for apparel and technical applications.

Course Outcomes (COs)

1. Classify textile fibres and summarize their properties.
2. Outline staple fibre yarn manufacture.
3. Summarise fabric manufacture in shuttle looms.
4. Understand the principles of fabric manufacture in shuttleless looms.
5. Identify methods of fabric value addition

Articulation Matrix

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

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.

FOR FURTHER READING

Fire protection and safety, Material Handling in Spinning and Weaving, Standards in the Textile Industry, Use of electronics in Spinning and Weaving, Quality Control in yarn and fabric manufacture.

Total: 45 Hours

Reference(s)

1. Bernard P. Corbman, Textiles: Fiber to Fabric, McGraw Hill, 1983.
2. Andrea Wynne, Textiles (Motivate Series Ã¢?? Macmillan texts for industrial vocational & technical education), 1997.
3. J. Gordon Cook, Handbook of Textile Fibres: Natural Fibres: Volume 1, Woodhead Textiles Series No. 4, Woodhead Publishing Limited, UK, 2001.
4. J. Gordon Cook, Handbook of Textile Fibres: Manmade Fibre: Volume 2, Woodhead Textiles Series No. 4, Woodhead Publishing Limited, UK, 1999.
5. W. Klein, Vol. 1 Ã¢?? 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. P. Marks and A. T. C. Robinson Principles of Weaving, The Textile Institute, 1989.

15TT0YB COLORATION OF TEXTILES 3 0 0 3

Course Objectives

- To make the students understand the need for fabric preparation and different processes involved in fabric preparation
- To educate students about the application of different classes of dyes on the textile materials.
- To make students understand the different methods of assessment and evaluation of dyed and printed 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 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.

Course Outcomes (COs)

1. Select processes, machines and process parameters for cotton and wool preparation
2. Choose processes, machines and process parameters for bleaching and mercerisation
3. Apply the principles of colour measurement and colour matching
4. Choose dyes and develop dye recipes for dyeing
5. Appraise textile wet processing machines according to wet processing requirements

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	-	-	3	3										
4	3	3	2											
5	3	3	2											

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. Spectrophotomer 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

FOR FURTHER READING

Assessment of wool wax - impurities and silk sericin. Mercerisation of blends Whiteness and yellowness indices. Colouration of textile accessories.

Total: 45 Hours

Reference(s)

1. E. R. Trotman, Dyeing and Chemical Technology of Textile Fibres, Charles Griffin and Co. Ltd., London. 1990.
2. V. A. Shenai, Technology of Bleaching and Mercerzing - Vol. III, Sevak Publications, Mumbai 1991.
3. V. A. Shenai, Technology of Dyeing - Vol. VI, Sevak Publications, Mumbai 2000
4. V. A. Shenai, Technology of Printing - Vol. IV, Sevak Publications, Mumbai 1996.
5. R. S. Bhagwat, Handbook of Textile Processing, Colour Publication, Mumbai, 1999
6. S. R. Karmakar, Chemical Technology in the Pre-treatment Processes of Textiles, Elsevier, New York, 1994.

15TT0YC TEXTILES IN ENGINEERING APPLICATION

3 0 0 3

Course Objectives

- Demonstrate knowledge of textiles materials, their manufacturing processes and their suitability for high end engineering applications.
- Use high performance organic and inorganic fibres and polymers for producing structural composites
- Design and develop composites for automotive applications.
- Design and develop technical textiles in fields of healthcare and personal safety
- Design and develop technical textiles for general 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 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.

Course Outcomes (COs)

1. Relate various textiles materials for high end engineering application.
2. Highlight the properties of high performance organic and inorganic fibres and polymers and their application in textile structural composites.
3. Explain applications of various (textile reinforced) composite materials.
4. Suggest the structural composites for healthcare and personal safety.
5. Suggest the structural composites for general industrial applications.

Articulation Matrix

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

UNIT I **9 Hours**

OVERVIEW OF TEXTILES

Introduction to textile technology: Fibres Ã¢?? Yarn Numbering systems Ã¢?? Spinning Ã¢?? Weaving Ã¢?? Knitting Ã¢?? Nonwovens Ã¢?? Chemical Processing Ã¢??Garmenting Ã¢?? 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 Ã¢?? High chemical and thermal resistance organic fibres. High performance inorganic fibres Ã¢?? Ultra fine and Novelty fibres. Textile Composites
Reinforcement fibres Ã¢?? matrix materials Ã¢?? Classification of textile reinforcement structures Ã¢?? Composite manufacturing techniques.

UNIT III **9 Hours**

TEXTILES IN AUTOMOBILE AND CIVIL ENGINEERING

Tyre cord manufacturing techniques. Airbags: materials and properties Ãƒ??Ãƒ?Ã‚Â¢?? Manufacturing techniques. Seat belts and fabrics Ãƒ??Ãƒ?Ã‚Â¢?? liner fabrics.

Reinforcing textile material for concrete and other civil structural elements. Geotextiles functions and applications
- road and railway construction.

UNIT IV **9 Hours**

TEXTILES IN HEALTH CARE INDUSTRY AND SAFETY

Classification and fibres used ÃƒÂ¢?? requirements. Detailed study and application of textiles in: implantable ÃƒÂ¢?? non-implantable ÃƒÂ¢?? extracorporeal devices. Health care and hygienic products.

Waterproof fabrics ÃƒÂ¢?? breathable fabrics ÃƒÂ¢?? Fire protection ÃƒÂ¢?? Heat and cold protection ÃƒÂ¢?? Ballistic protective clothing ÃƒÂ¢?? Camouflage textiles ÃƒÂ¢?? NBC protection.

UNIT V **9 Hours**

GENERAL APPLICATIONS

Textiles in Industrial belting - Marine Engineering Ã¢?? Filtration Ã¢?? Aviation Ã¢?? Sound proofing materials Ã¢?? Printed Circuit Boards Ã¢?? Battery Separators.

Total: 45 Hours

Reference(s)

1. Sabit Adanur and Wellington Sears, Handbook of Industrial Textiles, Technomic Publishing company Inc., USA, 1995.
2. R. Horrocks and S. C. Anand, Handbook of Technical Textiles, Woodhead Publishing Limited and The Textile Institute, 2000
3. Alagirusamy and A. Das, Technical Textile Yarns, CRC press, 2010.
4. P. W. Harrison, The Design of Textiles for Industrial Applications, Textile Institute, Manchester, 1998.
5. Pushpa Bajaj and A. K. Sengupta, Industrial Applications of Textiles for Filtration and Coated Fabrics, Textile Progress Vol.14, 1992.
6. Jarmila Svedova, Industrial Textiles, Elsevier Science Publishing Co Inc. New York, 1990.

15TT0YD GENERAL TEXTILE TECHNOLOGY 3 0 0 3

Course Objectives

- To provide a broad overview of yarn and fabric manufacture for engineering/technology students of other disciplines
- To enable the students to prepare technological solutions for textile field from other engineering/technology disciplines

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 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.

Course Outcomes (COs)

1. Classify natural and synthetic fibres based on properties and applications.
2. Demonstrate knowledge of manufacturing process of spun yarn from staple fibres
3. Illustrate manufacturing of fabrics form yarns.
4. Explain the process of colouration for different materials using right choice of dyes.
5. Demonstrate knowledge of testing of fibre, yarn and fabrics and explain the garment manufacturing processes

Articulation Matrix

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

UNIT I **9 Hours**

TEXTILE FIBRES

Classification of textile fibres. Properties and applications: Natural fibres- cotton Ã¢?? wool Ã¢?? silk Ã¢?? flax - jute; Regenerated fibres - viscose Ã¢?? bamboo; Synthetic fibres Ã¢?? nylon 6 Ã¢?? nylon 66, polyester Ã¢?? acrylic Ã¢?? polypropylene.

UNIT II **9 Hours**

YARN MANUFACTURE

Principles of opening, cleaning and mixing/blending of fibrous materials Ã¢?? blowroom Ã¢?? card - draw frame Ã¢?? comber Ã¢?? speed frame Ã¢?? ring frame; doubling Ã¢?? single and doubled yarn. Rotor spinning. Airjet spinning. Sewing thread. High bulk hand-knitting yarns

UNIT III **9 Hours**

FABRIC MANUFACTURE

Winding Ã¢?? cheese and cone winding. Yarn clearers and tensioners - splicing. Warping Ã¢?? sectional and direct warping machines. Sizing Ã¢?? creel, size box Ã¢?? drying range Ã¢?? head stock. Pirn winding. Weaving - primary and secondary motions Ã¢?? dobby and jacquard shedding. Techniques of weft insertion - Shuttle loomÃ¢?? shuttleless loom. Principles of weft and warp knitting.

UNIT IV **9 Hours**

CHEMICAL PROCESSING

Preparatory processes for cotton, wool and silk Ã¢?? Scouring Ã¢?? Bleaching - Mercerization. Dyeing: Classification of dyes. Dyeing of cotton, wool, silk, polyester, nylon and acrylic with appropriate dye classes - machines used. Determination of wash, light and rubbing fastness. Printing Ã¢?? methods of dye fixation after printing.

UNIT V **9 Hours**

TEXTILE TESTING

Measurement of fiber properties Ã¢?? length Ã¢?? fineness- strength - trash- HVI - AFIS. Measurement of yarn properties - count, twist and strength Ã¢?? evenness. Measurement of fabric properties: GSM- air permeability - tensile strength - tear strength. Comfort properties: KES - FAST. Garment manufacture

Spreading, cutting and marker planning. Sewing: Stitches - thread types - sewing mechanism. Packing.

UNIT VI **9 Hours**

FOR FURTHER READING

Ropes and braids, Automation in spinning, Online monitoring systems, Finishing of fabrics

Total: 54 Hours

Reference(s)

1. 1. E.P.G. Gohl and L.D. Vilensky , Textile Science, Textile science, Longman Cheshire Pvt. Limited, 1980
2. 2. W. Klein, Rieter Manual of Spinning Volume 1Ã¢??6, Rieter, 2010.
3. 3. P. K. Sriramalu, D. B. Ajgaonkar and M. K. Talukdar, Weaving Machines Ã¢?? Mechanisms, Management Mahajan publishers, Ahmedabad 1998.
4. 4. C. V. Kaushik, Chemical Processing of Textiles, NCUTE, 2004.
5. 5. David J. Tyler, Carr and LathamÃ¢??s Technology of Clothing Manufacture, Blackwell Publishing, 2008.
6. V. A. Shenai, Technology of Bleaching and Mercerisation, Sevak Publication, Bombay, 1996.

15TT0XA COTTON FIBRES: OPTIONS AND ALTERNATIVES **1 0 0 1**

Course Objectives

- To teach key concepts related to organic cotton and genetically modified cottons.
- To teach 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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Understand the different types of cotton and their cultivation process for organic cotton
2. 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												

UNIT I **15 Hours**

UNIT I

Cotton Fibres: Morphology - Properties. Organic Cotton: Definition - Cultivation Methods - GOTS Certification system. Genetically Modified Cotton: Need for modification - Methods - Advantages - Properties of GM Cotton. Coloured Cotton: Types - Natural Colourants. Alternative Fibres: Bamboo fibres - Natural and Regenerated fibres - Regeneration process - Cultivation and extraction of natural bamboo fibres - Properties. Modal Fibres -Comparison of process sequence with conventional viscose rayon - Advantages - Properties

Total: 15 Hours

Reference(s)

1. Journal of Natural Fibres
2. http://www.cicr.org.in/

15TT0XB FANCY YARNS 1 0 0 1

Course Objectives

- To teach the various types of fancy yarns, their structure and characteristics.
- To provide knowledge on the working principles of various machines used for the production of fancy yarns
- To understand the various effects of these yarn on fabric appearence

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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Understand the production of various types of fancy yarns
2. Understand the various parameters which affect the quality and performance of yarn made from long staple system.

Articulation Matrix

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

UNIT I **15 Hours**

UNIT I

Characteristics features, technology of production and end uses of: 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. Production Methods for the manufacturing of fancy yarns in Ring spinning, Rotor spinning and Air Jet spinning - Production of Fancy yarns in short staple spinning systems - Factors influencing the fancy effects. Applications: Manufacturing of apparel fabric & home furnishing using fancy yarns.

Total: 15 Hours

Reference(s)

1. R. H. Gong and R. M. Wright, Fancy yarns â€“ Their manufactures and applications, Wood head Publishing Limited, 2002.

15TT0XC DENIM FABRICS AND GARMENTS 1 0 0 1

Course Objectives

- To teach the key properties, structure and production of denim fabrics.
- To provide knowledge on 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 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.
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. Understand the key properties, structure and production of denim fabrics.
2. Understand the various finishing treatments available 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	-				-							

UNIT I **15 Hours**

DENIM FABRICS AND GARMENTS

Yarn Requirements and Characteristics for Denim - Weaving of Denim Fabrics - Physical properties of denim fabrics. Dyeing of Warp Yarn - Indigo dyeing - Indigo & Sulphur dye combinations. Garments: Design and construction - production process of denim garments. Finishing of Denim fabrics and Garments - Stone and Stoneless Washing of Denim Garments. Bleaching of Denim Garments using Oxidative and Enzyme Treatments - Backstaining of Garments and Remedies.

Total: 15 Hours

Reference(s)

1. M. S. Parmar, S. S. Satsanji and Jai Prakash, Denim Ã¢?? A Fabric for All, NITRA Publications, 1996.
2. J. V. Rao, Denim Washing, Northern India Textile Research Association, Ghaziabad, 2006.

15TT0XD TESTING OF DYES 1 0 0 1

Course Objectives

- To teach the working principle of various testing instruments meant for measuring the properties of dyes
- To educate on the operating procedures for different testing instruments used for 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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Analyze the strength and purity of textile dyes.
2. 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												

UNIT I **15 Hours**

TESTING OF DYES

Testing of dyes: Need for testing. Purity and strength: chemical - colourimetric methods - laboratory dyeing trials. Properties characteristics to a dye class: Direct - Vat - Disperse - Basic - Reactive dyes. Testing of dyeing auxiliaries: dye fixing agent - dispersing agent - leveling agent - carrier. Identification of dyes on fibres. Environmental and toxicological effects of dyes.

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

15TT0XE TESTING OF AUXILIARIES 1 0 0 1

Course Objectives

- To teach the working principle of various testing instruments meant for measuring the properties of auxiliaries used in textile chemical processing
- To educate on the operating procedures for different testing instruments used for testing auxiliaries used in 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 analyse 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. Understand testing instruments meant for measuring the properties of auxiliaries used in textile chemical processing
2. Operate testing instruments used 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	3	3												

UNIT I **15 Hours**

TESTING OF AUXILIARIES

Assessment of Auxiliaries used in Fabric Preparation
Surfactant: Ionic Nature - Active Content - Performance.
Strength of sodium hydroxide - Hydrogen Peroxide - Sodium hypochlorite.
Assessment of Auxiliaries used in Dyeing and Printing
Assessment of Dispersing Agents - Detergents - Rongalite C.
Assessment of Auxiliaries used in Finishing
Assessment of FBA for Active Strength - Softening Agents.

Total: 15 Hours

Reference(s)

1. Orientation Programme in Wet Processing â€“ 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

15TT0XF ECO PROCESSING 1 0 0 1

Course Objectives

- To teach ecology related issues connected with the Textile Industry, their consequences and the Standards applicable.
- To impart 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 analyse 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 ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Understand the eco friendly methods of processing of textiles.
2. KUnderstand 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	3					3	3		-	-			

UNIT I **15 Hours**

ECO-PROCESSING

Environmental Issues - Eco Standards. Environmental friendly fibres - Harmful substances in natural fibres - Eco standards. Banned amines and toxic substances - Sources of contaminations - Approaches for Eco-processing: Reduce - Recycle - Reuse.
Eco-friendly Preparation, Dyeing, Printing and Finishing: Eco-friendly fabric preparation methods - Solvent assisted preparation - ozone bleaching - peracetic acid. Hazardous nature of synthetic dyes - types of hazards - alternative dyes. Eco-friendly chemicals and auxiliaries in dyeing and finishing: Reducing agents - oxidizing chemical - thickeners - sequestering agents - bio-surfactants. Eco-friendly finishing chemicals: Cross-linking treatment - formaldehyde-free chemicals - softeners - biopolishing.

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, BTRA, 1996.

15TT0XG ERECTION AND COMMISSIONING OF TEXTILE MACHINES

1 0 0 1

Course Objectives

- To impart knowledge on the basic steps to be followed during erection and commissioning of textile machinery
- To educate on the use of 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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Understand the fundamentals of machinery erection
2. Understand the application of tools and equipment used during erection

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 **15 Hours**

UNIT I

Floor levelling using U tube water level - Machine case handling while shifting machines - packing list and physical stock verification - arranging components for erection - storing sensitive and expensive components - work table arrangement - special tools - provisions for power and pneumatic lines - manpower: skilled and un-skilled manpower requirement - machine layout line marking - positioning the base machine - machine levelling - erection sequence - - training to operators & maintenance personnel - reports and sign off.

Total: 15 Hours

Reference(s)

1. LMW erection manuals and handouts

15TT0XH WORKLOAD AND WORK ASSIGNMENTS

1 0 0 1

Course Objectives

- To teach the key principles by which workloads are assigned in the textile industry.
- To familiarize 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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Understand the various factors concerning work load assignement
2. 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												

UNIT I **15 Hours**

UNIT I

Definitions of Workload and Work assignment - multi-machine work assignment - interference. Workloads and assignments in Spinning, Weaving, Chemical Processing, Knitting and Garment industries - Factors influencing work assignments - measures for increasing productivity. Calculation of Productivity Measures in Spinning, Weaving and Chemical Processing. Productivity Indices.

Total: 15 Hours

Reference(s)

1. T. V. Ratnam et al, SITRA Norms for Spinning Mills, The South India Textile Research Association, Coimbatore, 2004.

15TT0XI AIR ENGINEERING IN TEXTILE INDUSTRY

1 0 0 1

Course Objectives

- To teach the significance of maintaining humidity and temperature in textile mill operations
- To educate on the 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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Understand the controls and parameters for maintaining the humidity level
2. Design a humidification plan 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	2												
2	3	3												

UNIT I **15 Hours**

UNIT I

Humidity, Relative Humidity - Need for Maintaining Humidity - Types of Humidifiers: Steam - Evaporator Pan - Water Spray. Localised Humidification Control - Air Curtains - Air Handling Units - Concept of Total Air Control - Humidity and Health. Air Conditioning Units - Dehumidification - HVAC Systems.

Total: 15 Hours

Reference(s)

1. B. Purushothama, Humidity and Ventilation Management in Textile Industry, Woodhead Publishing Limited, New Delhi, 2009

15TT0XJ PRODUCT CERTIFICATION 1 0 0 1

Course Objectives

- To teach the importance and necessity for product certification
- To familiarize 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 analyse 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. Understand the importance and necessity for product certification
2. Understand 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				3		3						

UNIT I **15 Hours**

PRODUCT CERTIFICATION

Necessity for certification - GOTS -Introduction - Certification - Licensing and labelling: Intertek - Chemical certification - Eco certification - Green leaf mark certification for customer goods - WRAP certification - Oeko-Tex R Standard 100 - Oeko-Tex R Standard 1000 - Oeko-Tex R Standard 100 plus - Product certification schemes of BIS - BRC - USDA organic - Organic exchange certification - Eco labels in Textiles - Woolmark - Silkmark ÃƒÂ¢?? Handloom mark.

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/

15TT0XK ENERGY CONSERVATION IN THE TEXTILE INDUSTRY

1 0 0 1

Course Objectives

- To offer the students a broad overview of energy conservation techniques applicable in 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 analyse 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. Understand the various factors that influence the energy consumption of various machines in textile industry
2. Understand the various factors that influence the energy consumption of processes and utilities 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							

UNIT I **15 Hours**

UNIT I

Need for energy conservation. Energy consumption: Spinning - Weaving - Knitting - Processing - Garmenting. Auxiliary machineries - Component wise consumption - Specific energy consumption (UKG). Energy Audit: Concept - Types of audit - Instrumentation - methodology - analysis. Electrical and Thermal audit. Techniques of energy saving: Energy efficient equipments for various processing machines and ancillaries - Preparatory - Spinning - Post Spinning - Weaving Wet Processing - Humidification/Air conditioning - Lighting - Compressors - Boilers - Generators.

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.

15LE101 BASIC ENGLISH I 3 0 0 3

Course Objectives

- To teach students basic English vocabulary and tenses
- To offer practice on various conversation patterns
- To improve spelling and pronunciation by offering rigorous practice and exercises

Programme Outcomes (POs)
Course Outcomes (COs)

1. Students will be able to: Form sentences using basic grammar and vocabulary in English
2. Involve in basic day-to-day conversation
3. Express opinions, agree & disagree on topics of general interest
4. Listen and understand Indian English audio clippings
5. Understand reading comprehension passages and answer related questions

Articulation Matrix

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

UNIT I **7 Hours**

UNIT I

Module Vocabulary/ Grammar Skills Sets Skill Sets
1 Basic words- 12 most used words in English, usage and pronunciation Starting a conversation and talking about what one does Sentence construction bolstered by mother tongue
2 Basic words- 20 often used words, usage and pronunciation Analyzing an action plan Creating and presenting oneÃƒÂ¢??s own action plan
3 Basic words with a focus on spelling Discriminative listening Informal conversation
4 Basic words- 10 often used words, usage and pronunciation Content listening and Intonation Reading comprehension
5 Unit Test I

UNIT II **8 Hours**

UNIT II

Module Vocabulary/ Grammar Skills Sets Skill Sets
6 Basic words + greetings to be used at different times of the day Formal conversation Intonation to be used in formal address
7 Last 28 of the 100 most used words Informal conversation between equals Reading practice and peer learning
8 Using the 14 target words to form bigger words Informal dialogues using contracted forms Guided speaking- talking to peers using contracted forms
9 Palindromes, greetings- good luck, festivals Placing a word within its context- culling out meaning Offering congratulations
10 Unit Test II

UNIT III **7 Hours**

UNIT III

Module Vocabulary/ Grammar Skills Sets Skill Sets
11 Homophones Formal and informal methods of self-introduction Let's Talk is a group activity that gives them some important pointers of speech
12 Homophone partners, matching words with their meanings Contracted forms of the -be verbs, -ve and -s Translating English sentences to Tamil
13 Briefcase words- finding smaller words from a big word Formal and informal ways of introducing others Team work- speaking activity involving group work, soft skills
14 Compound words and pronunciation pointers Giving personal details about oneself using the lexicon
15 Unit Test III

UNIT IV **8 Hours**

UNIT IV

Module Vocabulary/ Grammar Skills Sets Skill Sets
16 Proper and common nouns Asking for personal information and details Pronunciation pointers- an informal introduction to the IPA
17 Pronouns Telephone skills and etiquette Reading aloud and comprehension
18 Abstract and common nouns Dealing with a wrong number Reading practice and comprehension
19 Group names of animals, adjectives Taking and leaving messages on the telephone Pronunciation pointers
20 Unit Test IV

UNIT V **8 Hours**

UNIT V

Module Vocabulary/ Grammar Skills Sets Skill Sets
21 Determiners Interrupting a conversation politely- formal and informal Pair work reading comprehension
22 Conjugation of the verb to be- positive and negative forms Thanking and responding to thanks Comprehension questions that test scanning, skimming and deep reading
23 Am/is/are questions Giving instructions and seeking clarifications Small group activity that develops dialogue writing
24 Present continuous tense-form and usage Making inquiries on the telephone Finishing sentences with appropriate verbs
25 Unit Test V

UNIT VI **7 Hours**

UNIT VI

Module Vocabulary/ Grammar Skills Sets Skill Sets
26 Words with silent 'b'
Present continuous questions Calling for help in an emergency Dialogue writing
27 Words with silent 'c' Simple present tense- form and usage Making requests and responding to them politely Identifying elements of grammar in text extract
28 Simple present tense- rules Describing people Guided writing
29 Words with silent 'g'
Questions in the simple present tense Describing places Filling in the blanks with correct markers of tense
30 Unit Test VI

Total: 45 Hours

Reference(s)

1. 1. Basic English Module, L&L Education Resources, Chennai, 2011.

15LE102 COMMUNICATIVE ENGLISH I 3 0 0 3

Course Objectives

- To communicate effectively in social scenario
- To enhance the ability of reading, summarising and paraphrasing information
- To develop the techniques of writing through appropriate use of grammar and vocabulary

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen and comprehend different spoken discourses
2. Communicate ideas in English fluently during personal / official conversations
3. Use grammar and vocabulary required at CEFR B1 level in spoken and written discourses
4. Read and understand general & technical text
5. Involve in formal written communication using appropriate mechanics of writing

Articulation Matrix

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

UNIT I **9 Hours**

UNIT I: GRAMMAR

Content words- Structural words - Subject - Verbs and verb phrase - Subject - Verb agreement - Tenses - Active voice and passive voice - Sentence types (declarative, imperative, exclamatory & interrogative) - Framing questions - Comparative adjective

UNIT II **9 Hours**

UNIT II: LISTENING

Listening for specific information: Short conversations / monologues - Impersonal passive - Gap filling - Telephone conversations - Note-taking - Listening for gist / interviews - Listening to songs and completing the lyrics - Clear individual sounds - Telephone etiquette

UNIT III **9 Hours**

UNIT III: READING

Prediction - Skimming for gist - Scanning for specific information - Understanding text and sentence structure - Note Making

UNIT IV **9 Hours**

UNIT IV: WRITING

Letter Writing: Formal letters / Job application - E-mail writing Ã¢?? Report & Proposal writing - Advertisement - Principles of writing a good paragraph: Unity, cohesion and coherence - Paragraph writing (descriptive, narrative, expository & persuasive)

UNIT V **7 Hours**

UNIT V: SPEAKING

Self-introduction (Elevator Pitch) - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Mini-presentation - Expressing opinions and justifying opinions - Likes and dislikes - Tongue twisters

FOR FURTHER READING

Short stories:
"The Astrologer's Day" by R. K Narayan
"How Much Land does a Man Need?" by Leo Tolstoy

Total: 43 Hours

Reference(s)

1. Murphy, Raymond. English Grammar in Use - A Self-Study Reference and Practice Book For Intermediate Learners Of English .IVed. United Kingdom: Cambridge University Press. 2012.
2. 2.Seely, John. Oxford Guide to Effective Writing and Speaking. Indian edition. New Delhi: Oxford University Press. 2005.
3. 3. Anderson, Kenneth. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press. 2004.

15MA301 FOURIER SERIES AND TRANSFORMS 3 2 0 4

Course Objectives

- Understand the concepts of Fourier series, Transforms and Boundary Conditions, 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.
- Summarize and apply the mathematical aspects that contribute to the solution of one dimensional wave equation
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Identify the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series.
2. Formulate a function in frequency domain whenever the function is defined in time domain.
3. Apply the Fourier transform, which converts the time function into a sum of sine waves of different frequencies, each of which represents a frequency component.
4. Classify a partial differential equation and able to solve them.
5. Use the Z-transform to convert a discrete-time signal, which is a sequence of real or complex numbers, into a complex frequency domain representation.

Articulation Matrix

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

UNIT I **12 Hours**

FOURIER SERIES

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

UNIT II **12 Hours**

LAPLACE TRANSFORM

Laplace Transform- Existence Condition -Transforms of Standard Functions - Unit step function, Unit impulse function- Properties- Transforms of Derivatives and Integrals - Initial and Final Value Theorems - Laplace transform of Periodic Functions - Inverse Laplace transforms.

UNIT III **11 Hours**

FOURIER TRANSFORM

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

UNIT IV **11 Hours**

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of Second Order Quasi Linear Partial Differential Equations - Fourier Series Solutions of One Dimensional Wave Equation - One Dimensional Heat Equation - Steady State Solution of Two-Dimensional Heat Equation - Fourier Series Solutions in Cartesian Coordinates.

UNIT V **12 Hours**

Z -TRANSFORM

Z-Transform - Elementary Properties - Inverse Z-Transform - Convolution Method- Partial fraction method - Solution of Difference Equations using Z-Transform.

FOR FURTHER READING

Solutions of one dimensional wave equation and heat equations using Laplace transforms method.

Total: 88 Hours

Reference(s)

1. Larry.C.Andrews and Bhimsen.K.Shivamoggi, Integral Transforms for Engineers, First Edition, PHI Learning, New Delhi, 2007
2. Ian.N.Sneddan, The Use of Integral Transforms, Second Edition, McGraw Hill companies, 1972.
3. E. Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, Inc, Singapore, 2008.
4. Peter V. O. Neil,Advanced Engineering Mathematics, Seventh Edition, Cenage Learning India Private Ltd, 2012.
5. B.S. Grewal, Higher Engineering Mathematics, Fortieth Edition, Khanna Publications, New Delhi 2007.
6. C. Ray Wylie and C. Louis Barrett,Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd, 2003.